

# MUHAMMAD IMRAN

## BT401 Genetic Resources & Conservation

### ALL PAST MCQs AND SOLVED QUESTIONS

QUIZ NO 1

QUIZ NO 2

GRAND QUIZ

MID TERM MCQs

FINAL TERM MCQs

## FINAL TERM SOLVED QUESTIONS

### Grand Quiz

### 1 to 60 lessons for grand quiz

1. NCCP stands for \_\_\_\_\_ **national culture collection of Pakistan**
2. Area of great genetic diversity are protected from human interference are known as \_\_\_\_\_ **gene sanctuary**
3. Madhuca insignis is a species of plant in the family \_\_\_\_\_ **Sapotaceae.**
4. Causes of migration in animals are \_\_\_\_\_ **ALL OF THEM**
5. superior offspring of quality." are produced in \_\_\_\_\_ **Outbreeding**
6. Conservation of plant genetic resource is necessary for \_\_\_\_\_ food security and agrobiodiversity **Both A&B**
7. A concrete plan of action especially designed to achieve concrete goals is called \_\_\_\_\_ **strategy**
8. The migration of birds by powerful wind and hurricanes to very long distance. \_\_\_\_\_ **Irregular migration**
9. The ..... is the reduction in genetic variation that results when a small subset of a large population is used to establish a new colony. \_\_\_\_\_ **Founder Effect**
10. Genetic stock can be divided into ----- general groups. \_\_\_\_\_ **3**
11. The frequency of gene pool can be affected by \_\_\_\_\_ **all of them**
12. The plant that grow spontaneously in self-maintaining populations in natural or semi-natural ecosystems and can exist independently." Are called \_\_\_\_\_ **wild plant**
13. The last member of passenger pigeon, named ".....,"died at age 29 at the Cincinnati Zoo in 1914. \_\_\_\_\_ **Martha**
14. gene transfer between different species occur in \_\_\_\_\_ **Horizontal gene transfer**
15. animal genetic resources" referred to as \_\_\_\_\_ **ALL**
16. the degree of relationship among breeding is less intense than in .... Breeding system \_\_\_\_\_ **Linebreeding**
17. genetic drift shows changes in the genome that may be \_\_\_\_\_ **ALL OF THEM**

18. resources are classified into ..... types \_\_\_\_\_ 3
19. gene bank is the type of \_\_\_\_\_ **Ex Situ conservation**
20. Plant diversity is urgently & effectively conserved is an objective of \_\_\_\_\_ **GSPC**
21. The species that help the entire ecosystem is \_\_\_\_\_ **keystone species**
22. Scientific name of house cat is \_\_\_\_\_ **Felis catus**
23. transfer of genetic variation from one population to another is termed as \_\_\_\_\_ **Gene flow**
24. scientific name of wild horse is \_\_\_\_\_ - **equus ferus**
25. **PGRFA** stands for \_\_\_\_\_ **plant genetic resource for food and agriculture**
26. Dwarf lake iris is a \_\_\_\_\_ **plant**
27. the transfer of DNA from one cell to another by a virus \_\_\_\_\_ **Transduction**
28. hazard to animals migration caused by human action or human involvement are called \_\_\_\_\_ **anthropogenic hazards**
29. other species of crops are derived from \_\_\_\_\_ **wild crops**
30. sympatric speciation is due to \_\_\_\_\_ **Reproductive isolation**
31. sharp lowering of population gene pool is called \_\_\_\_\_ **bottleneck effect**
32. sub species of black rhino was declared extinct in \_\_\_\_\_ **2011**
30. Northern elephant seals have reduced genetic variation due to \_\_\_\_\_ **bottleneck effect**
31. Populations with a lesser number of genes in their gene pool will be \_\_\_\_\_ **susceptible to problems**
32. Living genetic resources such as seed or tissue that are maintained for the purpose of animal and plant breeding are called \_\_\_\_\_ **germplasm**
33. salmon move to ..... for spawning \_\_\_\_\_ **river**
34. in Pakistan total area under vegetable is \_\_\_\_\_ **75%**
35. Mating of relatives beyond 2<sup>nd</sup> generation and upto 6<sup>th</sup> generation. Comes under \_\_\_\_\_ **Mild Inbreeding**
36. Peste des petits ruminants (PPR), also known as \_\_\_\_\_ **sheep and goat plague**
37. scientific name of Marco Polo sheep is \_\_\_\_\_ **Ovis ammon**
38. Migration is... occur for the survival of organism. \_\_\_\_\_ **behavioral adaptation**
39. Preservation of biological material in liquid nitrogen is called \_\_\_\_\_ **Cryopreservation**
40. Transfer of gene from parent to offspring \_\_\_\_\_ **Vertical transfer of gene**
41. Woody plants like trees have a -- genetic diversity than vascular plants like grasses. \_\_\_\_\_ **Higher**
42. According to IUCN extinction rate of amphibians is \_\_\_\_\_ **30 %**
44. Bubal Hartebeest which had extinct was an \_\_\_\_\_ **animal**
45. The combination of all the genes present in a given population is called the \_\_\_\_\_ **gene pool**
46. According to FAO species of mollusk are \_\_\_\_\_ **85000**
47. The Pitcher's thistle grows for **five to eight** years before it flowers \_\_\_\_\_ **4 to 5**
48. vitrification is solidification due to increased viscosity rather than crystallization technique used in \_\_\_\_\_ **Cryopreservation**
49. is the reduced biological fitness in a given population as a result of inbreeding or breeding of related individuals. \_\_\_\_\_ **Inbreeding depression**

50. Specific group of domestic animals with a homogeneous appearance, \_\_\_\_\_ **breed**
51. GSPC was found in \_\_\_\_\_ **1999**
52. which disease spread due to consuming mercury poisoned fishes by people \_\_\_\_\_ **MINAMATA disease**
53. Genetic stocks can be derived into \_\_\_\_\_ general groups \_\_\_\_\_ **3**
54. Coral reefs are also threatened Reefs are home to-----of marine animal \_\_\_\_\_ **25%**
55. A chemical substance produced by microorganisms that can kill or stunt the growth of other microorganisms-----? \_\_\_\_\_ **Antibiotic**
56. Total area under major pulse crops in pakistan is about \_\_\_\_\_ **1.5m hectares**
57. \_\_\_\_\_are areas of terrestrial and coastal ecosystems promoting solutions to resolve the conservation of biodiversity with its sustainable use. \_\_\_\_\_ **Biosphere Reserve**
58. A species of plant or animal that is in immediate danger of becoming extinct and needs protection to survive is called \_\_\_\_\_ **Endangered Specie**
59. A specie that is vulnerable to endangerment if it is not protected is -----? \_\_\_\_\_ **Threatened Species**
60. A physical or chemical agent that permanently changes genetic material, usually physical composition of a DNA or gene in an organism is -----? \_\_\_\_\_ **Mutagen**
61. ----- is the process of protecting an endangered species by placing in an artificial environment. \_\_\_\_\_ - \_\_\_\_\_ **ex situ**
62. Alarming situation of the earth can be measured by \_\_\_\_\_ species \_\_\_\_\_ **Endangered**
63. \_\_\_\_\_ is used for plant varieties that usually breed through self-pollination \_\_\_\_\_ **Line breeding**
64. In Pakistan the total area under vegetables is \_\_\_\_\_ ? \_\_\_\_\_ **75%**
65. ----- conservation means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings\_\_ **In situ**
66. conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species is called \_\_\_\_\_ **In Situ conservation**
67. A goat is a hoofed mammal in the genus \_\_\_\_\_ **Capra.**
68. Plant genetic resources are used by farmers and scientists as the raw material for: \_\_\_\_\_ **none of the above**
69. Issues such as predation and hunting can be monitored and managed more easily by ----- -- conservation \_\_\_\_\_ **Ex situ**
70. Agricultural genetic resources are important because ..... \_\_\_\_\_ **All of them**
71. Mantagazza in ----- suggested sperm banks for frozen human sperm. \_\_\_\_\_ **1866**
72. The degree of relationship among breeding species is less intense in ..... breeding system. \_\_\_\_\_ **Line breeding**
73. Toxicity of high concentration of cry protectants used and microbial contamination of liquid nitrogen are concerns for ----- . \_\_\_\_\_ **Vitrification**
74. The \_\_\_\_\_ is the space used for conservation of nature through legal means. \_\_\_\_\_ **Protected Areas**
75. Challenges for vitrification are \_\_\_\_\_ . \_\_\_\_\_ **all of them**
76. According to the world database on protected areas there are over ..... protected areas around the world. \_\_\_\_\_ **210,000**
77. Hematopoietic stem cells are found in ----- . \_\_\_\_\_ **Bone marrow**
78. Yellowstone National park was designated as 'Park' in \_\_\_\_\_ . \_\_\_\_\_ **1872**
79. Blaxter (1953) reported ----- - \_\_\_\_\_ **Fish sperm cryopreservation**
80. Domesticated animal resources are important due to \_\_\_\_\_ reason \_\_\_\_\_ **All given**

81. The frequency of genes in gene pool may be affected by ..... ? \_\_\_\_\_ - **All of them**
82. Cell division and metabolism of bacteria is \_\_\_\_\_ during storage of culture. \_\_\_\_\_  
**Completely arrested**
83. Preservation of biological materials in liquid nitrogen is called ..... ? **Cryopreservation**
84. For long term storage of material \_\_\_\_\_ temperature is provided in liquid nitrogen. \_\_\_\_\_ **-196**
85. The disadvantages of egg preservation are \_\_\_\_\_ **All of them**
86. First successful cryo-preservation of \_\_\_\_\_ was used to propagate endangered species. \_\_\_\_\_ **Bull semen**
87. Barcelona Convention for the protection of Mediterranean areas was developed in -----  
\_\_\_\_\_. **1980's**
88. Procedure to preserve sperm cells is known as ---- . \_\_\_\_\_ **Sperm banking**
89. In ----- Spallanzani was the first to report the maintenance of motility of human spermatozoa after exposure to low temperatures. \_\_\_\_\_ **1776**
90. Subspecies of black rhino was declared extinct in ..... **2011**
91. Which of the following factors are important for selection of plant material. \_\_\_\_\_  
\_\_\_\_\_. **Both nature and density**
92. ABSA is abbreviation of \_\_\_\_\_ **access and benefit sharing agreement**
- 93.

1. PGRA stands for ..... **plant genetic resource for food and agriculture**
2. IBPGR stand for ..... **international board of plant genetic resource**
3. FGR stands for ..... **Forest genetic resources**
4. AnGR stands for ..... **Animal genetic resources**
5. IUCN stands for ..... **International Union for Conservation of Nature**
6. WCPA stands for ..... **World Commission on Protected Areas**
7. CBD stands for ..... **Convention on Biological Diversity**
8. PGR is abbreviation of ..... **plant genetic resources**
9. GSPC stands for ..... **Global Strategy for Plant Conservation**
10. GEWIS stand for ..... **A genome wide interaction scan**
11. Gene bank is the type of ..... **Ex Situ conservation**
12. According to FAQ species of mollusk are ..... **85000**
13. Conservation of plant genetic resource is necessary for ..... **All of them**
14. The global strategy for plant conservation GSPC is a program to save the world plant founded in ..... **1999**

15. The plant that grows spontaneously in self-maintaining populations in natural or seminatural ecosystems and can exist independently.” are called ..... **wild plant**
21. The plant resources that grow spontaneously in self-maintaining populations in natural or semi-natural ecosystems and can exist independently.” are called ..... **wild plant resources**
22. Total area of major pulse/legume crop in Pakistan..... **1.5m hectares**
23. Plant diversity is urgently & effectively conserved is an objective of ..... **GSPC**
24. which disease spread due to consuming mercury poisoned fishes by people ..... **MINAMATA disease**
25. \_\_\_\_\_ is an interdisciplinary subfield that aims to understand the dynamics of genes in population to avoid extinction..... **Genetic conservation**
26. Ex-Hepatin an \_\_\_\_\_ is used to control clots in blood, is obtained from Ox Lungs..... **anti-coagulant**
27. Tiger’s claw is another name for ..... **Coral tree plant**
28. The combination of all the genes present in a given population is called the ..... **Gene pool**
29. \_\_\_\_\_ are plant or population having unique valuable germplasm which are generated..... **Genetic stocks**
30. Genetic material is ..... **functional units of heredity**
31. Increasing genetic diversity interprets daughter chromosomes contain genes from ..... **both parents**
32. Resources have to be maintained in such a state that it minimize the risk of loss and allow either its ..... **plants genetic resources conservation / Germplasm conservation**
33. Domesticated animals’ resources are important due to \_\_\_\_ reasons..... **All given**
34. Crossing over is \_\_\_\_..... **Exchange of segments between chromosomal section**
35. The activity of keeping animals or plants in order to produce animals or plants is called ..... **Breeding**
36. Genetic resources for food, agriculture and forestry include.....  
..... **Both wild species and domesticated forms**
37. Maintenance of ecosystem is main goal of conserve ----- resources..... **Genetic**

38. \_\_\_\_\_ is the process of protecting an endangered species by placing in an artificial environment.....**Ex situ**
39. \_\_\_\_\_ lines/ populations developed in breeding programs have narrow genetic base and often contain valuable gene combination..... **Breeding**
40. A phenomenon occurring during prophase I of meiosis is..... **Crossing over**
41. The varieties which were developed by systematic breeding effort. were once commercially cultivated but are no more grown are called..... **obsolete**
42. Sum total of all hereditary material that can be used to maintain plant and animal breeding is called.....**Germplasm**
43. The article no says that “The Contracting parties shall develop and maintain appropriate policy and legal measures to promote the sustainable use of plant genetic resources for food and agriculture” ..... **Article 6**
44. Animal genetic resources refereed as..... **All**
45. \_\_\_\_\_ % of the total land of Pakistan is covered by covering vegetables is.....**75%**
46. Sharp lowering of population’s gene pool because of an environmental or humancaused, change is..... **Bottleneck effect**
47. ‘The Global Strategy for Plant Conservation (GSPC) is a program of the UN's Convention on ----diversity founded in 1999..... **Biological**
48. National parks are the examples of \_\_\_\_\_ conservation..... **In Situ**
49. Genetic stocks can be divided into \_\_\_\_ general groups.....**3**
50. Out of total global population of Markhor\_\_\_\_\_ number is found in Pakistan..... **1500**
51. The term mycorrhiza refers to the role of the \_\_\_\_\_ in the plant’s rhizosphere, its root system..... **Fungus**
52. Scientific name of wild horse is \_\_\_\_.....**Equus ferus**
56. \_\_\_\_\_ conservation means the conservation of ecosystems and natural habitats and the maintenance and recovery of via populations of species in their natural surroundings..... **In situ**
57. The diversity of life on earth is essential to .....**the survival of humanity**
58. \_\_\_\_\_ could be called as genetic resource..... **Germplasm**
59. Resources are classified into \_\_\_\_\_ Types.....**3**



60. The term animal genetic resources (AnGR) is used to include..... **all animal species, breeds and strains**
61. What is the consequence of a change in the genetic diversity?..... **Loss of biological diversity**
62. Aquatic genetic resources include all genetic resources living in:..... **water**
63. A species of plant or animal that is in immediate danger of becoming extinct and needs protection to survive is called..... **Endangered species**
64. Plant genetic resources are used by farmers and scientists as the raw material for..... **Breeding new plant varieties and in biotechnology**
65. \_\_\_\_\_ broadly defined as plants or population generated and/or selected for gene..... **Genetic stocks**
66. GSPC was founded in ..... **1999**
67. Peste des petits ruminants also known as..... **Sheep & goat plague**
68. Woody plants like trees have a \_\_\_\_\_ genetic diversity than vascular plants like grasses..... **Higher**
69. In ecosystem microorganisms are important for the reason..... **All of these (Symbionts, Nitrogen fixers, Involve in Biodegradation)**
70. \_\_\_\_\_ are the link from generation to generation of all living matter..... **Genes**
71. The strategy of GSPC seeks to halt the continuing loss of \_\_\_\_\_ diversity..... **Plant**
72. \_\_\_\_\_ are the areas of terrestrial and coastal ecosystems promoting solution to reconcile the conservation of biodiversity ..... **Biosphere reserve**
73. Other species of crops are derived from ..... **Wild crops**
74. Natural and cultural heritage protected permanently by ..... **In Situ conservation**
75. MINAMATA disease was spread due to consuming \_\_\_\_\_ poisoned fishes by people..... **Mercury**
76. The special about agricultural genetic resources are ..... **All of them (To feed the world, Conservation, Food security)**
77. The transfer of genes from parents to offspring is called ..... **Vertical genetic transfer**
78. The global strategy for plant conservation (GSPC) is ... **useful for plant conservation**
79. Living genetic resources such as seeds or tissues that are maintained for the purpose of animal and plant breeding are called ..... **germplasm**

80. Issues such as predation and hunting can be monitored and managed more easily by \_\_\_\_\_ conservation..... **Ex Situ**
81. Alarming situation of the earth can be measured by \_\_\_\_\_ species..... **endangered**
82. Direct and indirect impact of human on environment is termed as ..... **Anthropogenic effect / Genetic effect**
83. \_\_\_\_\_ is the process whereby wild plants have been evolved into crop plants through artificial selection..... **plant domestication**
84. A goat is hoofed mammal in the genus ..... **capra**
85. Bottleneck effect increase the effect of..... **Gene pool**
86. \_\_\_\_\_ of the total land of Pakistan is covered by covering vegetables..... **75%**
87. In \_\_\_\_\_ Phenomenon the original population can give rise to different new populations..... **Founder effect**
88. *Madhuca insignis* is a species of plant in the family..... **Sapotaceae**
89. Causes of migration in animals are ..... **All of them**  
(Availability of food, Fast deposition, Photoperiodism, All of them)
90. "superior offspring of quality." are produced in..... **Outbreeding**
91. The migration of birds by powerful wind and hurricanes to very long distance..... **Irregular migration**
92. The \_\_\_\_\_ is the reduction in genetic variation that results when a small subset of a large population is used to establish a new colony..... **Founder Effect**
93. Genetic stock can be divided into ----- general groups..... **3**
94. The frequency of genes in gene pool can be affected by..... **all of them**  
(gene flow, mutation, founder effect, inbreeding, natural selection, genetic drift)
95. The last member of passenger pigeon, named " \_\_\_\_\_ " and died at age 29 at the Cincinnati Zoo in 1914..... **Martha**
96. Gene transfer between different species occur in..... **Horizontal gene transfer**
97. The degree of relationship among breeding is less intense than in .... Breeding system..... **Line breeding**



98. Genetic drift shows changes in the genome that may be.....**All of them (Advantageous, Deleterious, Have no effect)**
99. The species that help to define entire ecosystem is.....**keystone species**
100. Transfer of genetic variation from one population to another is termed as**Gene flow**
101. Dwarf lake iris is a.....**plant / Blue flower**
102. The transfer of DNA from one cell to another by a virus.....**Transduction**
103. Hazard to animals migration caused by human action or human involvement are called.....**anthropogenic hazards**
104. Sympatric speciation is due to.....**Reproductive isolation**
105. Sub species of black rhino was declared extinct in.....**2011**
106. Northern elephant seals have reduced genetic variation due to.....**bottleneck effect**
107. Populations with a lesser number of genes in their gene pool will be.....**susceptible to problem**
108. Salmon move to ..... for spawning.....**river**
109. Mating of relatives beyond 2<sup>nd</sup> generation and upto 6<sup>th</sup> generation. Comes under.....**Mild Inbreeding**
110. Scientific name of Marco Polo sheep is.....**Ovis ammon**
111. Migration is... occur for the survival of organism.....**behavioral adaptation**
112. Preservation of biological material in liquid nitrogen is called.....**Cryopreservation**
113. According to IUCN extinction rate of amphibians is.....**25-30 % (highest 30%)**
114. According to IUCN \_\_\_\_\_ specie has highest rate of extinction..... **amphibians**
115. Bubal Hartebeest which had extinct was an.....**animal**
116. The Pitcher's thistle grows for \_\_\_\_\_ years before its flowers.....**4 to 5**  
(correct is 5 to 8 years, but in quiz it is not given)
117. Vitrification is solidification due to increased viscosity rather than crystallization technique used in.....**Cryopreservation**
118. Specific group of domestic animals with a homogeneous appearance.....**breed**
119. Genetic resources are sometimes called.....**first resource**
120. Landraces is a.....**local variety of domesticated plants**

121. \_\_\_\_\_ is the reduced biological fitness in a given population as a result of inbreeding or breeding of related individuals.....**Inbreeding depression**
122. Which is called rosewood.....**Dalbergia Sissoo / Sheesham tree**
123. Which one is extinct features of species.....**white rhino**
124. Total remaining snow leopard in Pakistan.....**200**
125. Microorganisms produces in.....**Antibodies**
126. According to world database on protected area there are over.....**210,000 protected areas around the world**
127. Rhino are hunted for.....**horns**
128. Natural selection will always result in the ----- that gives an advantage to its Possessor.....**selection of allele**
129. Cryopreservation is done in liquid nitrogen.....**at -196 degree**
130. Cryopreservation is done over solid carbon dioxide.....**at -79 degree**
131. Cryopreservation is done in low temperature & deep freezer.....**at -80 degree**
132. Cryopreservation is done in vapor phase nitrogen.....**at -150 degree**
- 133 How many categories of gene flow.....**2**  
(vertical and horizontal gene transfer)
134. Breeding type that is not closer to half-sister half-brother and cousins.....**close breeding / Line breeding**
135. The strongest effect of genetic drift on.....**small population**
136. Themes of genetic resources.....**2**
137. Plant genetic resources are the building blocks and fundamental not only in \_\_\_\_\_ but also for the very survival of the species in time and space....**crop improvement program**
138. Biologist suspect we're living through the ----- mass extinction...**Sixth major**
139. Honey bee pollinates how much plants.....**250,000 species of plants**
140. is a pioneer species easily regenerated from seed.....**Acacia nilotica**
141. Sheep was domesticated by humans in.....**10,000BC**
142. Allele frequency affected by\_\_\_\_such as mountain... **evolutionary mechanism**  
(\*gene flow \*inbreeding\* natural selection\* founder effect\* random genetic drift)

143. Population bottleneck in 1890s due to..... **overhunting**
144. Reason for crustaceans migration?.....**for breeding**
145. Sterculia khasiana was endemic tree of.....**Khasi Hills In Meghalaya In India**
146. Which involves storage in high and low temperature.....**cold storage**
147. Which of the following is the earliest modern protected area?.....**yellowstones national park**
148. Bees are responsible for pollinations.....**250,000species**
149. Mild form of breeding.....**line breeding**
150. Type of inbreeding.....**3 (close inbreeding, mild breeding, line breeding)**
151. Longest migration was observed in.....**artic tern bird**
152. Cryopreservation of tissue is done at the following temperature ..... **--196 °C**
153. Calypha belongs to family\_\_\_\_\_ **Euphorbiaceae (spurge family)**
154. Cause behind extinction of Steller sea cow.....**hunting**
155. Darwin finches is example of.....**adaptive radiation**
156. Result of environment and human change.....**bottleneck effect**
157. Genetic diversity is the variation of individual.....**amount of genetic information**
158. Sigillaria was a tree.....**spore bearing**
159. The tecopa pupfish was native to the.....**mojava desert**
160. Extinction rate of mammals.....**20%**
161. Which of the following approach can be taken to analyze GxE interaction.....**polygenic approach**
162. Northern areas of Pakistan serving as..... **habitat**
163. Population of Himalayan brown bear.....**150-200 in Pakistan**
164. Which is used to protect individuals in protected environment.....**In situ**
165. Which is used large scale for food and agriculture.....**sheep**  
(pig, goat, sheep, cattle, buffalo, horse, donkey/Ass, Dromedary, Bactrian camel are used for food and agriculture)
166. Example of founder effect?.....**all (haemophilia, dwarfism, infant death)**
167. Which is example of in situ.....**all (national park, biosphere, Gene sanctuaries)**

168. Pakistan is the ----- largest producer of kinow oranges.....6<sup>th</sup>
169. In 19<sup>th</sup> century only elephant seals were present.....20
170. Coral Reef are home to \_\_\_\_\_ marine animals.....25%
171. Gene pool types.....3 (Primary GP1, secondary GP2, tertiary GP3)
172. Crow follow migration.....daily
173. Dwarf lake iris appearance.....deep blue
174. Cooling process in which water of tissue become glass rather than crystal.....vitrification
175. Cryopreservation is applicable to fishery medical, animal-husbandry.....all
176. Cause of extinction.....all (climate change, hunting, over-population)
177. Yellow stone national park designed.....1872
178. Sea cow hunted \_\_\_\_ to extinction .....1768
179. Extinct plant still cultivated in captivity is.....Cyanea superba
180. Breeding line have.....narrow genetic base
181. Species in danger extinction are.....endangered
182. How many animal species in danger.....20,000 (not confirm)
183. For which purpose the crustacean can migrate.....Breeding
184. Microorganisms are \_\_\_\_\_ diversity than other living organisms .....highest
185. Wildebeest are the part of.....migration
186. Variation in genetic information of with in of same individual of population.....genetic diversity
187. Phenylketonuria is the genetic disease caused by.....mutation
188. \_\_\_\_\_ is a local variety of domesticated plant species.....Landrace
189. Animal closely related to.....Inbreeding /close breeding
190. Gene flow blocked by physical barriers results in .....allopatric speciation
191. Population bottleneck in 1980s due to.....over hunting
192. Reef provide habitat to marine life.....25%

193. Landrace is known as \_\_\_\_\_ **cultivar**
194. Which of the following is used to protect at suitable environment..... **in situ**
195. Trigger of migration..... **4**  
(local climate, local availability of food, season of the year, for matting reasons)
196. Which is hazard of migration..... **all (climate change, drought, food supply)**
197. Natural selection shows ----- change in genome..... **positive**
198. Dart-poison of frog yield compound like..... **alkaloid**
199. Reef provide habitat to..... **marine life**
200. Which of the following is result of reproductive isolation ..... **sympatric speciation**
201. Which of the following population has strong genetic drift..... **small population**
202. National strategy of PGRFA need to be review if ----- changes..... **Country**
203. Main threat to large number of species..... **Pollution**
204. If the advantageous gene is removed then the effect is called..... **genetic drift**
205. Microorganisms are..... **more diverse**
206. Together with the components which fulfill agrieological functions genetic reason are grouped under the concept..... **Agrobiodiversity**
207. PGR (plant genetic resources) are components of \_\_\_\_\_ which sustain the humankind..... **biodiversity**
208. The degree of relationship is not closer than half-brother or half-sister matings or cousin matings..... **line breeding**
209. keystone species ..... **Grizzle bear**
210. Cryopreservation occur.... **All (liquid nitrogen, freezing temperature, vapor nitrogen)**
211. Derived genetic diversity except..... **inbreeding**
212. .... Cannot permeate the cell membrane such as..... **sugar**
213. ----- rare treat for eye..... **Hart's Tongue Fern**
214. The introduction of genetic material by interbreeding from one population of species to another is..... **gene flow**

215. An individual can be protected in controlled environment is... **Ex situ conservation**
216. Twins develop from one zygote which splits and forms two embryos are called..... **Monozygotic**
217. Genes can be transferred sexually or asexually..... **vertical transfer**
218. Which one is the reason of bottleneck effect by..... **all of the above**  
(mutation, gene flow, inbreeding)
219. Which one of the following is the example artificial barrier..... **All (the great china wall, dams, barrages)**
220. Genetic resource are heritable characteristics ... of real potential benefit... **both a & b**  
[(a) plant, (b) animal, (c) none, (d) both a & b]
221. A membrane is ..... **Both a & b**  
[ (a) permitting, (b) non membrane permitting, (c) a & b, (d) None ]
222. Migration involves following type of hazards, ..... **2 type**  
(natural hazards, anthropogenic hazards to migrants)
223. Trigger of migration..... **all**  
(local climate, local availability of food, season of the year, for matting reasons)
224. GEWIS stands for ..... **A genome wide interaction scan**
225. Monach butterflies show migration to escape..... **Cold weather**
226. The set of all genes, or genetic information, in any population is called... **Gene pool**
227. Migration of animals from resting site to feeding area is known as..... **Daily migration**
228. Allopatric speciation is speciation that results when a population is separated by a..... **Physical barrier**  
(Physical barrier, Population, Natural barrier)
229. A-species may become functionally extinct which are unable to reproduce due to..... **All of them**  
(Poor health, Age, lack of individuals)
230. An agent of substance that can bring about a permanent alteration to the physical composition of a DNA gene is..... **Mutagen**
231. Which of the following activity affects the Genetic diversity?..... **Anthropogenic**

232. Man made activities increases the number of changes occurring to individual and populations. Such pressure is exerted by..... **Artificial selection**
233. Breeding for disease resistance requires.....**All given**  
(Good source of resistance, Disease test, Planned hybridization)
234. Microorganisms are important in Agriculture because ..... **All of the above**
235. The severe reduction in the population size is..... **Bottlenet effect**
236. Random changes in gene frequency especially in small populations when leading to preservation or extinction of particular genes is..... **Genetic drift**
237. The allele frequency in a population's gene pool can be affected by.....**All given**  
(Mutations, Gene flow, Inter breeding)
238. Which is a chemical substance produced by microorganisms that can kill or inhibit the growth of other microorganisms..... **Antibiotic**
239. Nearly \_\_\_\_\_ species of plants and animals are at a high risk of extinction.....**20,000**
240. When two different genotypes respond to environmental variation in different ways. It is known as..... **Gene-Environment interaction**
241. Transfer of genetic material from one species to another is called..... **horizontal gene transfer**
242. A specie of plant or animal that is no longer living is..... **Extinct Specie**
243. Genetic drift is change in the allele frequency of a population due to.-  
\_\_\_\_\_ **Random chance**
244. Mating with non-relatives is termed as..... **Out breeding**
246. Animals migrate due to reasons..... **All given**
247. In \_\_\_\_ type of migration only male members move a short distance..... **Moult**
248. A specie that is likely to become endangered if it is not protected is.\_\_\_\_\_  
\_\_\_\_\_ **Threatened Specie**
249. Population at with small gene pools are in danger of acquiring.....**All given**
250. Genetic drift is largely influenced by..... **Population size**
251. The effect of genetic diversity increase as the population size \_\_\_\_ .....**Decreases**
252. Preserving germplasm in frozen state is \_\_\_\_.....**Cryopreservation**



253. \_\_\_\_\_ molecule can freely diffuse through the cell membrane..... **All given**
254. Pure line breed refers to \_\_\_\_\_ **Homozygous only**
255. The transfer of DNA from one cell to another through cell-cell contact often involving plasmid is called..... **conjugation**
256. Out breeding increases the ..... **Heretozygosity**

## MID TERM

1. Genetic resources are sometimes called \_\_\_\_\_ **first resource**
2. Landraces is a \_\_\_\_\_ **local variety of domesticated plants**
3. Which is called rosewood \_\_\_\_\_ **dalbergiaSissoo**
4. Total area under legume crop in Pakistan \_\_\_\_\_ **1.5m hectares**
5. Which one is extinct features of species \_\_\_\_\_ **white rhino**
6. Total remaining snow leopard in Pakistan \_\_\_\_\_ **200**
7. GSPC program founded in \_\_\_\_\_ **1999**
8. Microorganisms produces in \_\_\_\_\_ **Antibodies**
9. According to world database on protected area there are over \_\_\_\_\_ **protected areas around the world. 210,000**
10. Rhino are hunted for \_\_\_\_\_ **horns**
11. Natural selection will always result in the -----that gives an advantage to its possessor \_\_\_\_\_ **selection of allele**
12. Cryopreservation in liquid nitrogen \_\_\_\_\_ **at-196 degree**
13. How many categories of gene flow \_\_\_\_\_ **2**
14. Breeding type that is not released to half sister brother and cousins \_\_\_\_\_ **close breeding**
15. The strongest effect of genetic drift on \_\_\_\_\_ **small population**
16. Themes of genetic resources \_\_\_\_\_ **2**
17. Himalayan brown bear \_\_\_\_\_ **150-200**
18. Pakistan in kinow production \_\_\_\_\_ **6<sup>th</sup> number**
19. Tigers of migration \_\_\_\_\_ **all**
20. Gene flow blocked by physical barriers \_\_\_\_\_ **allopatric speciation**
21. Plant genetic resources are the building blocks and fundamental not only in----- but also for the very survival of the species in time and space \_\_\_\_\_ **crop improvement program**
22. Biologist suspect we're living through the ----- mass extinction \_\_\_\_\_ **sixth major**
23. Honey bee pollinates how much plants \_\_\_\_\_ **250,000 species of plants**
24. \_\_\_\_\_ is a pioneer species easily regenerated from seed. \_\_\_\_\_ **Acacia nilotica**
25. Sheep was domesticated by humans in \_\_\_\_\_ **10,000BC**
26. Phenylketonuria caused by \_\_\_\_\_ **mutation**

27. Allele frequency affected by \_\_\_ such as mountain \*gene flow \*inbreeding\* natural selection\* founder effect?\* random genetic drift \_\_\_\_\_ evolutionary mechanism
28. Population bottleneck in 1890s due to \_\_\_\_\_ overhunting
29. Reason for crustaceans migration? \_\_\_\_\_ for breeding
30. Sterculia khasiana was endemic tree of \_\_\_\_\_ Khasi Hills In Meghalaya In India
31. Which involves storage in high and low temperature \_\_\_\_\_ cold storage
32. Which of the following is the earliest modern protected area? \_\_\_\_\_ yellow stones national park
33. Bees are responsible for pollinations \_\_\_\_\_ 250,000 species
34. Mild form of breeding \_\_\_\_\_ line breeding.
35. Migration involves following type of hazards, \_\_\_\_\_ 2 type natural hazards, anthropogenic hazards to migration).
36. Type of inbreeding \_\_\_\_\_ 3 1-close inbreeding, 2-mild breeding, 3-line breeding
37. Gene bank is a type of \_\_\_\_\_ ex-situ conservation
38. Area of greatest genetic diversity are protected from human interface are known as \_\_\_\_\_ gene sanctuary
39. PGRA stands for \_\_\_\_\_ plant genetic resource for food and agriculture
40. NCCP stands for ----- national culture collection of Pakistan
41. Peste de petites ruminants also known as \_\_\_\_\_ sheep and goat plaque
42. According to FAQ species of mollusk are \_\_\_\_\_ 85000.
43. Longest migration was observed in \_\_\_\_\_ arctic tern bird
44. Cryopreservation can be done \_\_\_\_\_ -196c.
45. Calypha belongs to family \_\_\_\_\_ spurge family \_\_\_\_\_ euphorbaceae / spurge family
46. Cause behind extinction of steller sea cow \_\_\_\_\_ hunting
47. Rhino were hunt for \_\_\_\_\_ horns
48. Darwin finch is example of \_\_\_\_\_ adaptive radiation
49. Result of environment and human change \_\_\_\_\_ bottleneck effect
50. Types of breeding \_\_\_\_\_ 3
51. Genetic diversity is the variation of individual \_\_\_\_\_ amount of genetic information
52. Example of extinct species \_\_\_\_\_
53. Population of Himalayan bear \_\_\_\_\_ 150-200 in Pakistan
54. Which species is easily regenerated \_\_\_\_\_ acacia nilotica
55. Sigillaria was a tree \_\_\_\_\_ spore bearing
56. The tecopa pupfish was native to the \_\_\_\_\_ mojave desert
57. Extinction rate of mammals \_\_\_\_\_ 20%
58. Wild bees are the part of \_\_\_\_\_ great migration
59. Which of the following approach can be taken to analyze GxE interaction \_\_\_\_\_ polygenic
60. Northern areas of Pakistan serving as \_\_\_\_\_ habitat
61. Longest migration was observed in \_\_\_\_\_ arctic tern bird
62. Cryopreservation can be done \_\_\_\_\_ -196c
63. Calypha belongs to family \_\_\_\_\_ spurge family \_\_\_\_\_ euphorbaceae / spurge family
64. Cause behind extinction of steller sea cow \_\_\_\_\_ hunting
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68. Types of breeding \_\_\_\_\_ 3
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70. Example of extinct species \_\_\_\_\_
71. Population of himalyan bear \_\_\_\_\_ 150-200 in Pakistan
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76. Wild beest are the part of \_\_\_\_\_ great migration
77. Which of the following approach can betaken to analyze GxE interaction \_\_\_\_\_ polygenic
78. Northern areas of Pakistan serving as \_\_\_\_\_ habitat
79. Land race is known as \_\_\_\_\_ weed, mutant, cultivator, primitive
80. Which is used to protect individuals in protected environment \_\_\_\_\_ in situ.
81. Which is used large scle for food and agriculture \_\_\_\_\_ sheep.
82. Phenyl ketonuria is generation caused by \_\_\_\_\_ mutant.
83. Example of founder effect ?(hemophilia, dwarfism, infant death, \_\_\_\_\_ all
84. Tigers of migration \_\_\_\_\_ 4
- 84.85. PGR are components of \_\_\_\_\_.
86. Genetic resolution are sometimes called \_\_\_\_\_
87. According to FAQ species of mollusk \_\_\_\_\_ 85000
88. Which hazard of migration \_\_\_\_\_ all
89. Plant genetic resource are building and fundamental not only in.....but also for the very survival of species in time and space, \_\_\_\_\_ crop improvement program
90. Which is example of in situ - A, national park, biosphere, gene bank. \_\_\_\_\_ all
91. -----is known as indian rosewood. \_\_\_\_\_ DalbergiaSisoo
92. Pakistan is the ----- largest producer of kinow oranges \_\_\_\_\_ 6<sup>th</sup>
93. In 19<sup>th</sup> century only elephant seales were present \_\_\_\_\_ 20
94. -Reef are home to \_\_\_\_\_ % marine animals \_\_\_\_\_ 25
95. Gene pool types \_\_\_\_\_ 3
96. Crow follow migration, \_\_\_\_\_ daily
97. Dwarf lake iris appearance \_\_\_\_\_ deep blue
98. Cooling proces in which water of tissue become glass of crystal \_\_\_\_\_ vetrification
99. Cryopreservation is applicable to fishery medical animal-husbandry \_\_\_\_\_ all
100. Cause of extinction climate change hunting population \_\_\_\_\_ all
101. Yellow stone national park designed \_\_\_\_\_ 1872
102. Sea cow hunted \_\_\_\_\_ to extinction \_\_\_\_\_ 1768
103. Extinct plant fill cultivated in capacity is \_\_\_\_\_ cynea superba
104. Breeding line have \_\_\_\_\_ narrow genetic base
105. Cause of extinction \_\_\_\_\_ climate change hunting, pollution \_\_\_\_\_ all
106. Honey bee pollinates plants \_\_\_\_\_ 250000
107. Cryopreservation id one in low temperature and deep at freezing \_\_\_\_\_ -80degree
108. Species in danger extinction are \_\_\_\_\_ endangered
109. How many animal species in danger \_\_\_\_\_ 20,000 not confirm
110. For which purpose the crustacean can migrate \_\_\_\_\_ mating

111. Microorganisms are \_\_ diversity than other living organisms \_\_\_\_\_ highest
112. Wildebeest are the part of \_\_\_\_\_ migration
113. Variation in genetic information of with in of same individual of population \_\_\_\_\_ genetic diversity
114. Allele frequency is affected by \_\_\_\_\_ all given
115. Population bottleneck in 1890s due to \_\_\_\_\_ overhunting
116. GWIS stand for \_\_\_\_\_ A genome wide interaction scan
117. Phenyle- alkaptonuria is the genetic disease caused by \_\_\_\_\_ mutation
118. \_\_\_\_\_ is a local variety of domesticated plant species \_\_\_\_\_ Landrace
120. Sea cow hunted to extinction in ----- \_\_\_\_\_ 1768
121. Animal closely related to ----- \_\_\_\_\_ close breeding
122. Dart poison frog have compound \_\_\_\_\_ alkaloid
123. Genetic resources are sometimes called \_\_\_\_\_ first resource
124. Landraces is a \_\_\_\_\_ local variety of domesticated plants
125. Which is called rosewood \_\_\_\_\_ dalbergia Sissoo
126. Total area under legume crop in Pakistan \_\_\_\_\_ 1.5m hectares
127. Which one is extinct features of species \_\_\_\_\_ white rhino
128. Total remaining snow leopard in Pakistan \_\_\_\_\_ 200
129. Microorganisms produces in \_\_\_\_\_ Antibodies
130. According to world database on protected area there are over \_\_\_\_\_ 210,000 protected areas around the world.
131. Rhino are hunted for \_\_\_\_\_ horns
132. Natural selection will always result in the----- that gives an advantage to its possessor \_\_\_\_\_ selection of allele
133. Cryopreservation in liquid nitrogen \_\_\_\_\_ at-196 degree
134. How many categories of gene flow \_\_\_\_\_ 2
135. Breeding type that is not released to half sister brother and cousins ----line breeding
136. Themes of genetic resources \_\_\_\_\_ 2
137. Himalayan brown bear \_\_\_\_\_ 150-200
138. Pakistan in kinow production \_\_\_\_\_ 6<sup>th</sup> number
139. Tigers of migration \_\_\_\_\_ all
140. Gene flow blocked by physical barrios \_\_\_\_\_ allopatric speciation
141. Plant genetic resources are the building blocks and fundamental not only in crop improvement program, but also for the very survival of the species in time and space
142. Biologist suspect we're living through the sixth major mass extinction
143. Honey bee pollinates how much plants \_\_\_\_\_ 250,000 species of plants
144. Acacia nilotica is a pioneer species easily regenerated from seed.
145. Sheep was domesticated by humans \_\_\_\_\_ 10,000BC
146. Phenyl alketonuria caused by \_\_\_\_\_ mutation
147. Allele frequency is effected by evolutionary mechanism such as (mutation\*gene flow\_ in -breeding, natural selection, founder effect, random genetic drift).
148. Population bottleneck in 1980 due to \_\_\_\_\_ over hunting
149. Reason for crustacean migration \_\_\_\_\_ for breeding

150. Sterculia khasiana was endemic of tree \_\_\_\_\_ **khasi hills in Meghalaya India**
151. Which involves storage low and non freezing temperature \_\_\_\_\_ **cold storage**
152. Migration involves five types of hazards \_\_\_\_\_ **2type**  
**national hazards, anthropogenic hazards to migrants**
153. Type of inbreeding \_\_\_\_\_ **3type** \_\_\_\_\_ **1.close**  
**inbreeding, 2.mild breeding, in line breeding)**
154. Gene bank is type of \_\_\_\_\_ **ex situ conservation**
155. Area of great genetic diversity are protected from human interference are known as \_\_\_\_\_ **gene**  
**sanctuary**
156. NCCP stand for ---- \_\_\_\_\_ **--national culture collection for Pakistan**
157. Conservation of plant genetic resource is necessary for \_\_\_\_\_ **food security and**  
**Agrobiodiversity** \_\_\_\_\_ **both A&B**
158. Peste de petis ruminants also known as \_\_\_\_\_ **sheep & goat plague**
159. According FAO species mollusk are \_\_\_\_\_ **85000**
160. Which disease is spread due to consuming mercury poisoned fishes by people \_\_\_\_\_ **MNAMATA**
161. The earliest modern protected area ----- \_\_\_\_\_ **-- yellow stone national park**
162. Longest migration was observed in \_\_\_\_\_ **arctic tern bird**
163. Cryopreservation can be done \_\_\_\_\_ **-196c**
164. Calypha belongs to family \_\_\_\_\_ **spurge family euphorbaceae**
165. Cause behind extinction of steller sea cow \_\_\_\_\_ **hunting**
166. Darwin finches is example of \_\_\_\_\_ **adaptive radiation**
167. Result of environmental human change \_\_\_\_\_ **bottleneck effect**
168. Genetic diversity is the variation of individual in \_\_\_\_\_ **the amount of genetic information**
169. Which species easily generated \_\_\_\_\_ **acacia nilotica**
170. Sigillaria is a tree \_\_\_\_\_ **spore bearing**
171. Thetecopa pupfish is native to the \_\_\_\_\_ **Mojava Desert**
172. Extinction rate of mammals \_\_\_\_\_ **20%**
173. Wild beast are the part of \_\_\_\_\_ **great migration**
174. Which of the following approach can be taken to analyze GxE interaction \_\_\_\_\_ **polygenic**
175. Northern areas of Pakistan are serving \_\_\_\_\_ **habitat**
176. Reef provide habitat to marine life \_\_\_\_\_ **25%**
177. Land race is known as \_\_\_\_\_ **cultivar.**
178. Which used to protect individual in protected environment \_\_\_\_\_ **in situ conservation**
179. Which is used as large scale for food and agriculture \_\_\_\_\_ **sheep**
180. Phenyl ketonuria is genetic condition caused by \_\_\_\_\_ **mutant**
181. Which has strong genetic drift \_\_\_\_\_ **large, small. average,** \_\_\_\_\_ **all**
182. Example of founder effect **hemophilia, dwarfism, infant death,** \_\_\_\_\_ **all**
183. Tigers of migration \_\_\_\_\_ **local climate, local availability of food, season of the**  
**year, formatting reasons.** \_\_\_\_\_ **4**
184. Which of the following is used to protect at suitable environment \_\_\_\_\_ **in situ**
185. Which is hazard of migration \_\_\_\_\_ **drought, food supply,** \_\_\_\_\_ **all**
186. Natural selection shows ----- change in genome, \_\_\_\_\_ **positive**

187. Biologist suspect we are living through \_\_\_ major mass extinction, \_\_\_\_\_ six
188. Dart poison of frog yield compound like \_\_\_\_\_ alkaloid
189. Sigrilla was a tree \_\_\_\_\_ spore bearing
190. ....are from generation to generation of all living matter \_\_\_\_\_ genes
191. Which is example of in situ \_\_\_ national park, biosphere, gene bank. \_\_\_\_\_ all
192. ABSA is stand for \_\_\_\_\_ access and benefit sharing agreement by \_\_\_\_\_ interfering
193. Northern areas of Pakistan are serving as \_\_\_\_\_ habitat
194. In 19<sup>th</sup> century only elephant scales were present \_\_\_\_\_ 20
195. Darwin finchis are classical example of \_\_\_\_\_ adaptive radiation
196. For which purpose crustacean migrate for ----- \_\_\_\_\_ ---- breeding
197. Reef provide habitat to \_\_\_\_\_ marine life
198. Gene pool types \_\_\_\_\_ 3
199. Dwarf lake iris appearance \_\_\_\_\_ Deep Blue
200. Cooling process in which water of tissue become glass instead of crystal \_\_\_\_\_ verification
201. Cryopreservation is applicable to \_\_\_\_\_ fishery medical, animal husbandry. \_\_\_\_\_ all
- 
202. yellow stone national park is designed in \_\_\_\_\_ 1872
203. Causes of extinction \_\_\_\_\_ climate change, hunting, pollution, \_\_\_\_\_ all
204. Sea cow hunted to extinction in \_\_\_\_\_ 1768
205. Extinct plant still cultivated in captivity is \_\_\_\_\_ Cyanea superba
206. Cryopreservation is done low temp and deep freezer at \_\_\_\_\_ -80degree
207. Allele frequency is affected by \_\_\_\_\_ mutation gene flow breeding \_\_\_ all
208. Breeding line have \_\_\_\_\_ narrow genetic base
209. Animal closely related in \_\_\_\_\_ close breeding
210. Species in danger of extinction \_\_\_\_\_ endangered
211. GWIS stand for \_\_\_\_\_ a genome wide interaction scan
212. Microorganisms are \_\_\_\_\_ diversity than other living animals \_\_\_\_\_ high
213. Variation in genetic information of with in same individual of population \_\_\_\_\_ genetic diversity
- 
214. How many animal species are in danger \_\_\_\_\_ 20,000
215. Phenyl alkatonuria is genetic disease caused by \_\_\_\_\_ mutation
216. \_\_\_\_\_ is local variety of domesticated plants species. \_\_\_\_\_ landrace
217. Which of the following is result of productive isolation sympatric \_\_\_\_\_ speciation
218. Which of the following population has strong gentec drift \_\_\_\_\_ small population



219. National strategy of PGRFA need t be review if ----- changes \_\_\_\_\_ world
220. Main threat to large number of species -----, \_\_\_\_\_ Pollution
221. If the advantageous gene is removed then the effect is called \_\_\_\_\_ genetic drift
222. Microorganisms are \_\_\_\_\_ more diverse
223. Main reason behind meleda disease.
224. Natural selection effects on ecosystem.
225. Together with the components which fulfill agri-ecological functions genetic  
.reason are grouped under the concept \_\_\_\_\_ agro biodiversity
226. PGR are components of.....which sustain the humankind \_\_\_\_\_ biodiversity
227. Genetic resource are heritable characteristics ... of real potential benefit A plant b  
animal c none ,d both a & b \_\_\_\_\_ both a & b



228. The degree of relationship is not closer half brother or sister mating or cousin mating a breeding b out breeding c pure breeding .d line breeding\_\_\_\_\_ **line breeding**
229. -----is a keystone species , a grizzel bear b Pyrenean ibex c snow leopard d, sea mink \_\_\_\_\_ **grizzel bear**
230. Cryopreservation occur a liquid nitrogen b freezing temperature c vapor nitrogen \_\_\_\_\_ **All**
231. Derived genetic expect \_\_\_\_\_ **inbreeding**
232. .... Can not permeate the cell membrane such as \_\_\_\_\_ **sugar**
233. A membrane permeating b non membrane permeating c and b , d none \_\_\_\_\_ **non membrane permeating membrane**
234. ----- rare treat for eye \_\_\_\_\_ **hurt fem**
235. The introduction of genetic material by inter-breeding from one population of species to another is \_\_\_\_\_ **gene flow**
236. Which one of the following is the example artificial barriers **the great china wall, dams, barrages ,** \_\_\_\_\_ **All**
237. An individual can be protected in controlled environment is \_\_\_\_\_. **Ex situ conservation**
238. Wild best is an example of \_\_\_\_\_ **great migration**
239. Which one is the reason of bottleneck effect by \_\_\_\_\_ **mutation, gene flow, inbreeding,** \_\_\_\_\_ **all of the above.**
240. Example of founder effect haemophilia , dwarfism, still birth, /infant birth \_\_\_\_\_ **all of these**
241. Sheep was domesticated by human in \_\_\_\_\_ **10,000BC**
242. Which is easily regenerated from seed \_\_\_\_\_ **acacia nilotica**
243. Genes can be transferred sexually or asexually ----- \_\_\_\_\_ - **vertical transfer**

## Quiz 1

- Which disease was spread due to consuming mercury poisoned fishes by people \_\_\_\_\_ **Minamata disease** **SPC**
- NCCP stands for -----, \_\_\_\_\_ **Natural cultural collection of Pakistan** **1000**
- Plant diversity is urgently & effectively conserved is an objective of \_\_\_\_\_
- According to FAO species of mollusks are approximately -----, \_\_\_\_\_ **n**
- Areas of great genetic diversity are protected from human interference are known as -----, \_\_\_\_\_ **GENE Sanctuary**
- Peste des petits ruminants also known as -----, \_\_\_\_\_ **Sheep and goat plaque**
- Gene bank is a type of -----, \_\_\_\_\_ **Ex situ conservatio**
- Conservation of plant genetic resources is necessary for -----, **Food security and agrobiodiversity** \_\_\_\_\_ **both A & B**

**MUHAMMAD IMRAN**

**BT401 - Genetic Resources & Conservation**

**Lesson No (97 to 107)**

**QUIZ NO 2**

**39 MCQs**

**100% Repeat**

- Climate change-related traits including \_\_\_\_\_ **All given**
- Hybridisation may also introduce the new genetic variation required by trees to adapt to \_\_\_\_\_ **novel environments**
- some insects use tree terpenes as precursors for their communication ..... or incorporate them into their own defense systems. \_\_\_\_\_ **pheromones**
- invertebrates accounts for ..... % of the animals on earth \_\_\_\_\_ **95**
- ....help to maintain soil structure and the availability of water throughout the soil profile. \_\_\_\_\_ **earthworms**
- The lack of genetic diversity may inhibit the ability of the population to respond to ..... change \_\_\_\_\_ **climate**
- The ability of one genotype to produce more than one phenotypes when exposed to different environment conditions without genetic change is called \_\_\_\_\_ **phenotypic plasticity**

**MUHAMMAD IMRAN**

**24**

8. the capacity of ecosystems to adapt is diminished when biodiversity of ..... is lost\_\_\_\_\_ **invertebrate**
9. .... are needed to be able to cope with changing climatic conditions, and increasing demands for food and retain the capacity to adapt to potential changes in the types of crops grown\_\_\_\_\_ **Pollinator populations**
10. natural selection favours genotypes with \_\_\_\_\_ **ALL given**
11. forest trees are known for showing great ..... in their response to climate changes\_\_\_\_\_ **plasticity**
12. forests are important due to \_\_\_\_\_ **all given**
13. Changes in climate also make it possible for ..... and diseases to invade new areas, destroying the forests there \_\_\_\_\_ **pests**
14. The most important causes of extinction of animals and plants is \_\_\_\_\_ **habitat loss**
15. a situation where two (or more) species reciprocally affect each other's evolution is describes as \_\_\_\_\_ **Co-evolution**
16. Tree populations rely on three interplaying mechanisms to respond to environmental change\_\_\_\_\_ **All given**
17. .... Factor/factors can affect the services of invertebrates to the environment.\_\_\_\_\_ **ALL Given**
18. forests majorly remove .....from the atmosphere and produce oxygen.  
\_\_\_\_\_ **carbon dioxide**
19. Seed orchards, clone banks and clonal archives are examples of .....conservation units  
\_\_\_\_\_ **static ex situ**
20. ....ensures the success of species in environments that are highly variable and subject to change.\_\_\_\_\_ **Genetic diversity**
21. Candidate genes for drought tolerance include those involved in\_\_\_\_\_ **All given**
22. Some larger soil-dwelling invertebrates, such as earthworms, ants and termites help maintain the chemical fertility needed for \_\_\_\_\_ **plant growth**

23. . . . .have created barriers to the migration of invertebrate species\_\_\_\_\_ **Human activities**
24. Forest genetic resources or tree genetic resources are . . . . .of shrub and tree species of actual or future value\_\_\_\_\_ **genetic material**
25. The adaptive capacity of ecosystem is more likely to dependent on \_\_\_\_\_ **invertebrate biodiversity**
26. Forest help in driving\_\_\_\_\_ **Climate Change**
27. The act of moving plants by human to different habitat to experience different environment conditions is term as \_\_\_\_\_ **Assisted Migration**
28. Tree mortality in ecosystem increase due to change in \_\_\_\_\_ **All given**
29. Most invertebrates are expected to change their geographical distribution \_\_\_\_\_ **in response to climate change**
30. Diversity of forest genetic resources enables the species to adapt to \_\_\_\_\_ **All given**
31. Perhaps the most neglected group of all in research, in farming practices, and in policies and strategies for agriculture and biodiversity are the soil-dwelling \_\_\_\_\_ **invertebrates**
32. Some larger soil-dwelling invertebrates, such as earthworms, ants and termites, have been described as “ecosystem\_\_\_\_\_ **engineers**
33. . . . .is defined as the capacity of a particular genotype to express different phenotypes under different environmental conditions\_\_\_\_\_ **phenotypic plasticity**
34. It has been estimated that at least \_\_\_\_\_percent of world food production comes from crops that are dependent on insect pollination.\_\_\_\_\_ **35**
35. Almost 35 % of world food production comes from crops that are dependent on\_\_\_\_\_ **Insect pollination**
36. Studies have shown that the presence of invertebrates, such as earthworms can help to \_\_\_\_\_ the effect of drought on crops production.\_\_\_\_\_ **Alleviate**
37. \_\_\_\_\_ organisms are described as engineers of ecosystem. \_\_\_\_\_ **Earthworms**
38. Considering the better studied mammals and birds, 100% of the currently described species have been evaluated for their conservation statues and, out of these, \_\_\_\_\_ out of

9990 bird species are considered to be endangered. \_\_\_\_\_ **12%**

**39.** Assisted migration may be undertaken \_\_\_\_\_ **All given**

## Lesson no 86 to 96

## QUIZ NO 02

1. Sarus crane is one of ..... Species at Runn of Kutch Wildlife sanctuary. \_\_\_\_\_ **Threatened**
2. .... is not generally seen in biodiversity hotspots \_\_\_\_\_ **Lesser interspecific competition**
3. .... Is an example of an ex-situ conservation \_\_\_\_\_ **seed bank**
4. The type of coiling in DNA is \_\_\_\_\_ **right-handed**
5. .... is defined as the number of species represented in a specific region landscape or an ecological community \_\_\_\_\_ **Species richness**
6. Which of the following statement truly describe the biosphere reserve \_\_\_\_\_ **All of given**
7. 7. DNA Banks are used for the storage of those species that cannot be conserved in .... process of conservation \_\_\_\_\_ **In situ**
8. The natural protected area for the conservation of genetic diversity is called \_\_\_\_\_ **Gene Sanctuaries**
9. Gene sanctuaries are the type of \_\_\_\_\_ **In situ conservation**
8. Suitable light intensity range must of the plant culture is ....  $\mu\text{mol}$  \_\_\_\_\_ **10 to 1000**
9. If hunting is prohibited, a particular area may be considered a \_\_\_\_\_ **"Nature Reserve"**
10. Gene bank are also known as \_\_\_\_\_ **All given**
11. Ex-suito conservation is also known as \_\_\_\_\_ **Static conservation**
12. Endemic species are \_\_\_\_\_ **Species localized in a specific region**
13. During tissue culture growth room temperature range from ..... depending on species requirements \_\_\_\_\_ **22°C to 28°C**
14. Desert wolf is ..... in Cholistan Wildlife Sanctuary \_\_\_\_\_ **Rare**
15. an International Board for Plant Genetic Resource (IBPGR) was established in \_\_\_\_\_ **1972**
18. plant are totipotent because \_\_\_\_\_ **A single cell could become a complete plant**
19. what is the characteristic of the DNA that is used for the construction of library \_\_\_\_\_ **Naked DNA**
20. In...., conservation of habitats rich in genetic diversity was recommended in the UN conference \_\_\_\_\_ **1972**

21. A .....is a large area of land where wild animals live safely or are hunted in a controlled way for sport. \_\_\_\_\_ **game reserve**
22. Germplasm conservation is important to conserve the ..... plant \_\_\_\_\_ **Wild**
23. Tissue Culture Conservation is an alternative to \_\_\_\_\_ **Vegetative propagation**
24. In plant tissue culture what is the term ORGANOGENESIS means \_\_\_\_\_ **Formation of root and shoot from callus culture**
25. Gene sanctuaries are the type of \_\_\_\_\_ **In situ conservation**
26. DNA of plant can be preserved by rapid drying of plant samples with the help of ..... material \_\_\_\_\_ **silica gel**
27. What is callus \_\_\_\_\_ **An unorganised actively dividing the mass of cells maintained in a culture**
28. Germplasm conservation under natural condition is called \_\_\_\_\_ **Gene bank**
29. Field gene bank also called plant gene banks area of land in which ..... collections of growing plants are assembled \_\_\_\_\_ **Germplasm**
30. Ex-cuito conservation includes \_\_\_\_\_ **All given**
31. Threatened species of Rann of Kutch is \_\_\_\_\_ **all of above**
32. In 1984 gene sanctuaries for conservation of wild relatives of coffee was setup in \_\_\_\_\_ **Ethiopia**
33. The Buler's Fruit bat is listed as ..... on the IUCN red list \_\_\_\_\_ **Critically Endangered**
34. that the usefulness of the specimen for PCR-based assays is greater than 4 years when stored at \_\_\_\_\_ **-18 C°**
35. how long a seed remains viable is known as its \_\_\_\_\_ **Viability**
36. .... is the secure long term storage of an individuals genetic material. \_\_\_\_\_ **DNA banking**
37. an area wherein controlled hunting and shooting is permitted on permit basis" is known as \_\_\_\_\_ **game reserve**

38. the IUCN has listed Great Indian Bustard as ..... in 2011 \_\_\_\_\_ **critically Endangered**
39. Which of the following statement is correct about the sanctuary \_\_\_\_\_ **A reserved area meant for preservation and development of endangered species**
40. Gene sanctuaries not only preserve the existing genetic diversity present in a population due to which new ----- combination would appear with time. \_\_\_\_\_ **Allele and gene**  
The sum total of all the gene present in a crop and its related species constitutes its \_\_\_\_\_ **Germplasm**
42. Gene sanctuary is generally establish in the center of \_\_\_\_\_ **Diversity**
43. ----- can be considered complementary conservation. \_\_\_\_\_ **DNA banks**
44. Cryopreservation is storage of materials at ----- temperature. \_\_\_\_\_ **Low**
45. Threatened species of Runn of kutch is \_\_\_\_\_ **all of above**
46. Plant seeds are stored in \_\_\_\_\_ for long term storage. \_\_\_\_\_ **In-vivo Gene Bank**
47. The removal of the medium and transfer of cells from its previous culture into fresh growth medium for further propagation of the cell is called \_\_\_\_\_ **Subculturing**
48. The first genomic libraries were cloned in \_\_\_\_\_. **Plasmid**
49. The bulmers fruit bat is listed as ----- on the IUCN RED LIST. \_\_\_\_\_ **Endangered**
50. Madagascar Pochard die at young age due to \_\_\_\_\_ **All of them**
51. High humidity increase the ----- growth. \_\_\_\_\_ **Fungus**
52. What is Dimethyl sulfoxide used for ----- . \_\_\_\_\_ **Chelating agent**
53. In the ----- major focus is animals \_\_\_\_\_. **Game reserve**
54. There are two main drawbacks of gene sanctuary one of which is that. \_\_\_\_\_ **It cannot be easily maintained**
55. Lyophilisation during DNA storage process helps to ----- the DNA. \_\_\_\_\_ **Preserve**
56. Runn of Kutch wildlife sanctuary is part of the ----- . \_\_\_\_\_ **Thar desert**



## Quiz 2

1. The main objective of category v is -----  
**To main a balanced interaction of nature and culture**
2. Hingol national park was declared reserved in -----  
**1988**
3. Which species has been introduced in Lal Suhanra national park ----  
**Black buck**
4. Some larger soil dwelling invertebrates such as earthworm ants and termites has been described as -----  
**Ecosystem engineers**
5. Perhaps the most neglected group of all in research in farming practices and in polices and stretegies for agriculture and biodiversity are the soil dwelling --  
**Invertebrates**
6. The useful of the specimen for PCR based assays is graeter than 4 years when stored at -----  
**-80°C**
7. Tissue culture conservation is an alternative to -----  
**Vegative propagation**
8. Which category areas areas are not necessary associated with human presence and intervention. -----  
**Category IV**
9. Considering the better studied mammals and birds 100% of the currently described species have been evaluated for their conservation statuses and out of these ----- out of 9990 birds species are considered to be endangered. -----  
**12%**
10. During tissue culture growth room temperature range from ----- depending on species requirements. -----  
**22-28 °C**

## FINAL TERM

- Darwin finches classical example of -----  
**genetic drift**
- bottleneck effect elephant seal -----  
**over hunting**
- population has more chances of survival -----  
**large gene pool**
4. .... services generally more efficient -----  
**decentralized quarantine**
- Since ..... insitu conservation has received high priority to the world -----  
**1980**
6. the cutting of tree act -----  
**1992**
- Genetic stocks can be divided into ----- Cytological stocks, Mutant stocks, Germplasm set- -----  
**all**
- Genetic diversity is the variation of individuals in ----- Genes, Alleles, cells, -----  
**both a & b**
- Northern areas of Pakistan are serving as -----  
**habitat for many species.**

MUHAMMAD IMRAN

- 
- 
10. In 19th century only.....individuals of Elephant whales were present -----  
**20**
  11. wildebeest are the part of -----  
**sardine run migration**
  12. Largest migration was observed in -----  
**Artic term bird**
  13. Species that are threatened are sometime characterized by ----- Population dynamics, Measure of critical dispensation, A mathematical measure of bio mass. -----  
**All of above**

14. Encourage the conservation of agro biodiversity and aquatic biodiversity ----- **Proteted land sea scape**
15. ----- as a mass of complimentary conservation----- . **DNA Bank**
16. Tree population rely on .....interplaying mechanisms to respond to environmental change **3**
17. Nagoya protocol ratified by .....parties. **97**
18. Climate change may however cause range expansion is **herbivore insects**
19. Thermal gradient can induce \_\_\_\_\_ due to uneven expansion or contraction in the biochemical system. **mechanical stress**
20. \_\_\_\_\_ are preserved by cryopreservation method **Genetic material**
21. Which one of the following is culturally influenced in natural reserve **cave dwelling**
22. Genetic resources for food, agriculture and forestry include **Both wild and domesticated species**
23. Earthworms, ants and termites, have been described as **ecosystem engineers**
24. Anthropogenic climate change leading to future large-scale dieback in **Amazonian rain forest.**
25. National park spreading in an area of ----- **100 SQ. KM. TO 500 SQ. KM.**
26. Pollinator are \_\_\_\_\_ major group of invertebrates. ----- **SECOND**
27. Insects pollinate how much plant species **35%**
28. Dolphin is a **mammal**
29. Ramsar convention came into **21 december 1975**
30. 30. ----- % of 5488 mammal species and 12 out of 9.990 bird species are considered to be change **21%**
31. WCPA stands for **world commission on protected areas**
31. 32. In Europe one estimate put the role of value marketed \_\_\_\_\_ non wood goods from forest at **2.3 billions**
33. Since the \_\_\_\_\_ the population of indus has significantly increased here. **1970**
34. Largest national park of Pakistan **Hingol National Park**
35. If hunting is prohibited a game reserve may be considered **nature reserve**
36. 36. A sanctuary is protected area which is reserved for the conservation of only animals and human activities like **harvesting of timber**
37. Bahawalpur zoo covers **25 acres**
37. 38. **Black buck** became virtually extinct in the cholistan desert but the species has been reintroduced to **Lal Suhanra.**
39. Hingol national park declared reserved in **1988**
40. Natural goeological and geo morphological features **waterfalls, cliffs , clatters, caves).**
41. Seaweeds population is **13000**
42. Snow leopard population in pakistan left **200**
43. Report on fish sperm cryopreservation published in \_\_\_\_\_ by **blaxter 1953**
44. Cryopreservation in liquid in **-196degrees**
45. Cartagena protocol was adopted on **june 2001**, at Cartagena-Spain
46. Vegetative propagation is ----- **tissue culture**
47. 47. Using micro-array analysis, detected that up to **113** genes, were significantly induced by drought into Mediterranean pine tissues.
48. Large natural areas comes into **category VI**
49. In 2013,rasmer sites has been declared in Pakistan ----- **19**
50. In the game reserve the major focus is specifically ----- **the animals**
51. 51. Climate has direct effect on ----- **FGR.**
52. There are ----- **types** of genome transfer **two**
53. ----- will be fine for cutting tree in 1992 act **5000 rupees**

54. Convention on biological diversity ----- 1992
55. FAO stands for ----- food agriculture organization
56. GEWIS stands for ----- genome wide interaction scan
57. -----often result of reproductive isolation ----- Sympatric speciation
58. Light intensity for most plants culture require ----- 50-200 umol-S-1-m-2
59. ----- protected areas act as buffer ----- Category V
60. Cartagena protocols not cover products derived for m ----- LMOs
61. Cartagena protocols deals with ----- biosafety
62. 62. Chashma and Tuansa barrage declared wild life sanctuaries by ----- Punjab government
63. Land race also called local variety of ----- domesticated plants
64. -----are varieties developed as since the advent of scientific agriculture in the late nineteenth century ----- Obsolete varieties
65. ----- is easily generated from seed ----- Acacia Nilotic
66. Anthropogenic impact is apparent in the ----- -Coastal Zone
67. Mild breeding is type of ----- inbreeding
68. 68. ----are small sites they focus on more\_\_ prominent natural features ----- National monuments
69. IBPGR stand for ----- international board of plant genetic resource
70. In ---- the food and agriculture organization of UN published the first state of FGR ----- 2014
71. The wild birds abd animal protection act ----- 1912
72. Pakistan animal quarantine ----- 1979
73. NCCP stands for ----- national culture collection for Pakistan
74. Peste des petetis ruminants are called ----- sheep and goat plaque
75. 76. Which disease is spread by consuming mercury poisoned fish ----- MINAMTA disease
77. Pakistan is the -----producer of kinows oranges in the world. \_ sixth largest
78. A ----- can be taken to analyses G across E interactions ----- polygenic approach
79. SterculiaKhasia is endemic tree of the ----- Khasi Hills
80. OHSS stand for ----- ovarian hyper stimulation syndrome
81. Genetic resource is sometimes called ----- first resource
82. 82. Phenyl Ketonuria caused by----- mutation.
83. 83. When species has been reintroduced in Lalsuhanra national park? ----- Black buck
84. If the advantage gene is removed then the effect is called ----- genetic effect
85. Crow flow migration ----- daily
86. Darwin finches is is example of ----- adaptive radiation
87. -----produce by dart poison frog ----- toxins
88. Hiamalyan brown bear ----- 15-200
89. Special care unit ----- ex-situ
90. Closely related individuals ----- inbreeding
91. Micro-organisms are ----- more-diverse
92. National strategy for PGRFA may help ----- country
93. Crustacaens migrate for ----- breeding
94. Genetic strong drift mat effect on storage in ----- small population
95. Coral reefs are also threatened reef for home \_\_\_\_ of marine animals \_\_ 25%
96. Earliest modern protected areas ----- yellow stone national park
97. 97. The main objective of category V is ----- maintain a balance interaction of nature and culture
98. Which category area are not associated with presence and intervention ----- category- IV
99. Main objective of habitat species management area A. to maintain species, B to conserve species,3. to conserve species and maintain habitat) ----- all of these.

100. Sir Saqiq Muhammad Khan established \_\_\_\_\_ bahawalpur Zo
101. WCPA stand for ----- world commission on protected areas
102. Which of the following category encourage biodiversity aquatic biodiversity  
\_\_\_\_\_ category-V
103. Tigers for migration \_\_\_\_\_ all of these
104. -----are link for generation to generation for all living matters \_\_\_\_\_ Genes
105. 105. IABGR stands for \_\_\_\_\_  
institute of agriculture biotechnology and genetic resources
106. -----by sexual and asexual reproduction \_\_\_\_\_ Vertical gene transfer
107. More genetic variation in populations \_\_\_\_\_ natural selection
108. ----- is an example allopatric speciation. \_\_\_\_\_ Darwin finches
109. 109. Animal genetic resource Animal genetic resource, Animal genetic resource for food and agriculture, 3.farm animal genetic resource. \_\_\_\_\_ all of these
110. 110. Which of the following category encourage the conservation of aquatic biodiversity \_\_\_\_\_ category V
111. 111. Gene bank is a type of -----, \_\_\_\_\_ Ex situ conservation
112. Calyha rubrinerv is belong to family -----, \_\_\_\_\_ Euphorbiaceae

113. Number of laboratories in plant genetic resource in Pakistan\_\_\_\_\_ **six-6**
114. Areas of great genetic diversity are protected from human interface \_\_\_\_\_**gene sanctuary**
115. Sheep were domesticated by humans around\_\_\_\_\_ **10.000BC**
116. Plant diversity is urgently and effectively conserved is an objective of \_\_\_\_\_ **GSPC.**
119. Woody plants like trees have ----genetic diversity than vascular plants like grass \_\_\_\_\_ **Higher**
- 120 .Conversion of plant genetic resource is necessary for food security, agro bio diversity, commercial use \_\_\_\_\_ **both a & b**
121. The problem in strict nature reserves is (a disease b, climate change, air pollution \_\_\_\_\_ **Both B & C**
122. ----- can be used to introduce species that left an area. \_\_ **Ex-situ conversion**
123. Rasmar conversion was negotiated in -----by countries and NGOs \_\_\_\_\_ **1960**
124. Greater efforts are needed to estimate the full value of -----**----PGRFA**
125. Species that are threatened are sometimes characterized by (a, population dynamics, critical dispersion, c. mathematical measure of biomass \_\_\_\_\_ **all of these**
126. Gene sanctuaries provide way to preserve (a. wild species, natural ecosystem. Natural habitat \_\_\_\_\_ **all of these**
127. Key focus for regulating many of bio chemical process \_\_\_\_\_ **temperature**
128. Category VI is not designed to accommodate \_\_\_\_\_ **large scale industrial harvest**
129. It is cheep method for conversion broad range of germ-plasma \_\_\_\_\_ **seed storage**
130. To date one of the most extensive programmers to develop trees with resistance to insect pests in temperature regions is in \_\_\_\_\_ **British Columbia**
131. Houghten and Godenlrod typically grows on (moist sandy beaches, shallow depressions .clow sand ridges \_\_\_\_\_ **all**
132. Quit small protected area and high visitor value Category III \_\_\_\_\_ **national monuments features**
133. -----is a category wherein samples of animals genetic are preserved cryogenically. \_\_\_\_\_ **Animals genetic resources**
134. Genetic variation are the variation due to genes allele) \_\_\_\_\_ **Both A & B**
135. Habitat management work \_\_\_\_\_ **all of the above**

**BEST OF LUCK**

### 1. Different between Wild from and Wild Relative Crops?

**Wild** forms are wild species from which crop species are directly derived. They are easy to cross with the concerned crop species.

The **wild relatives** include all other species. Which are related to the crop species by descent during their evolution.

### 2. Different method of cryopreservation? Types of cryopreservation?

There are various methods of storage :

1. Cryopreservation - generally involves storage in liquid nitrogen.
2. Cold storage - it involves storage in low and non freezing temperature.
3. Low pressure – it involves partially reducing the atmospheric pressure of surrounding.
4. Low oxygen storage - it involves reducing the oxygen level but maintaining the pressure.

### 3. What is genetic material?

Genetic materials that are typically cryogenically preserved include sperm, oocytes, embryos and somatic cells.

### 4. Local migration?

Local migration occurs because of heavy rain, flood, excessive cold & hot. Return to that area when crisis is over. Flowering of certain plants and ripening of fruits also cause local migration

### 5. How extinct is affected medical?

Many different species have unique bodily processes that can cure human diseases. e.g. the toxins produced by dartpoison frogs in the rain forest have yielded information about how alkaloid compounds behave in living organisms. Scientists also study bears for clues about how they recycle blood toxins during hibernation to find potential solutions to kidney disorders. Plants from forests are useful for medicinal purposes.

### 6. National animal of Pakistan?

The **markhor** is the national animal of Pakistan.

### 7. Advantage and Disadvantage of out breeding?

**Advantages of Out breeding:** • Out breeding often produces offspring of superior quality because it increases homozygosity (the occurrence of two alleles for the same trait at corresponding positions on homologous chromosomes) • Sharply reduce the risk of deleterious recessive genes being expressed • One of the benefits of out breeding is less chance of genetic abnormalities • The ability to make a breed stronger

**Disadvantages of Out breeding:** **outbreeding** species. 3 Can destroy well-adapted genotypes because the offspring (genotypes) from sexual reproduction are not guaranteed to be viable, as is the case with selfing.

### 8. Difference between policy and strategies?

**Policy** is a set of common rules and regulations, which forms as a base to take day to day decisions

**Strategy** is a plan of action while the **policy** is a principle of action

### 9. Strategy of plant conservation?

The Global Strategy for Plant Conservation (GSPC) is a program of the UN's Convention on Biological Diversity founded in 1999. It is a Plan to Save the World's Plant Species - grew out of the Convention on Biological Diversity and is being fed into government policy around the world.

### 10. What Antibiotics?

"Antibiotic is chemical substance produced by microorganisms that can kill or inhibit the growth of other microorganisms"

### 11. Genetics resources for food and agriculture?



**Genetic resources.** Genetic resources for food and agriculture are the raw materials upon which the world relies to improve the productivity and quality of domesticated plant and animal populations, as well as to maintain healthy populations of wild species, including those used in forestry and fisheries.

## 12. Gene flow and gene drift?

**Gene Flow:** "The introduction of genetic material (by interbreeding) from one population of a species to another" **Genetic Drift:** "Random changes in gene frequency especially in small populations when leading to preservation or extinction of particular genes"

## 13. Richness of microorganism and total no?

- Numbers of species described and currently accepted in most groups of microorganisms worldwide are respectively 143,000 & 18,500
- 120 new species of bacteria and 1,500 new species of fungi are added to science each year • This clearly demonstrates that knowledge of these groups is grossly inadequate

## 14. Gene Bank?

Gene bank refers to a place or organization where germplasm can be conserved in living state. Gene banks are also known as germplasm banks.

## 15. Cause of extent?

There are five major **causes of extinction**: habitat loss, an introduced species, pollution, population growth, and overconsumption. Through the activity, students will create a list of reasons why animals can become **extinct**.

## 16. Cause of migration?

Causes of Migration

- Shortage of food supply on the breeding ground
- Environmental factors
- Internal factors
- Photoperiodism
- Fat deposition

## 17. Gene Environment interaction?

Gene–environment interaction (or genotype–environment interaction or G×E) is when two different genotypes respond to environmental variation in different ways.

There are two different conceptions of gene–environment interaction. • biometric and developmental interaction

## 18. National strategy for PGRFA?

A National Strategy for PGRFA is the blueprint for the management of a country's PGRFA as a continuum of interventions in order to achieve clearly defined time bound goals.

## 19. What Allopatric speciation?

Gene flow blocked by physical barriers results in Allopatric speciation

## 20. Factor of genetic diversity?

- Mutations • Speciation • Errors in Meiosis

## 21. How extinct species cause destruction of ecosystem?

Species of animals cannot live away from each other. They work together to form an ecosystem. Extinction of one species can affect other by affecting food chain. They depend upon each other and their environment to survive. So in this way it can destroy whole ecosystem

## Long 5 Marks

## 22. Discuss global strategy for plant conservation?

The Global Strategy for Plant Conservation (GSPC) is a program of the UN's Convention on Biological Diversity founded in 1999. It is a Plan to Save the World's Plant Species - grew out of the Convention on Biological Diversity and is being fed into government policy around the world.



The GSPC highlights the importance of plants and the ecosystem services they provide for all life on earth, and aims to ensure their conservation.

The GSPC has 5 main objectives:

1. Plant diversity is well understood, documented and recognized
2. Plant diversity is urgently and effectively conserved
3. Plant diversity is used in a sustainable and equitable manner
4. Plant diversity is used in a sustainable and equitable manner
5. The capacities and public engagement necessary to implement the strategy have been developed.

23. Step of Conserve the plant genetics resource?

Plant genetic diversity is vulnerable to “genetic erosion”, the loss of individual alleles/**genes** and of combinations of alleles/**genes**, such as those found in locally adapted landraces. ... PGR, the only source of **plant genetic** diversity, provides valuable traits needed for meeting the challenges of adapting crop varieties.

24. Method of horizontal gene transfer in bacteria?

**Vertical Gene transfer:** “The transfer of genes from parents to offspring.”

**Horizontal gene transfer:** **horizontal gene transmission** among **bacteria**, especially from a donor **bacterial** species to different recipient species, is conjugation

25. Threat Angr?

- Despite the importance of animal genetic resources and their diversity, their diversity has been continually decreasing over time.
- One of the greatest threats to livestock diversity is pressure from large-scale commercial production systems to maintain only high-output breeds.
- Changes in climate will have an impact on livestock and food production in many ways.
- Some major disease threats that livestock currently face include, rinderpest, foot and mouth disease, and Peste des petits ruminants (PPR), also known as sheep and goat plague.

26. Inbreeding types?

- Close inbreeding • Mild inbreeding • Line inbreeding

27. Freezing method?

**Freezing.** **Freezing**, in food processing, **method** of preserving food by lowering the temperature to inhibit microorganism growth. The **method** has been used for centuries in cold regions, and a patent was issued in Britain as early as 1842 for **freezing** food by immersion in an ice and salt brine.

28.CHARACTERISTICS OF gene pool. 3

It includes all the variants or alleles of every gene. • It includes all the genes present in the population. • In most cases, the population includes individuals of the same species. • A gene pool includes even those genes whose effects are not visible in an individual.

29.Threats to AnGR 5

Despite the importance of animal genetic resources and their diversity, their diversity has been continually decreasing over time.

One of the greatest threats to livestock diversity is pressure from large-scale commercial production systems to maintain only high-output breeds.

Changes in climate will have an impact on livestock and food production in many ways.

Some major disease threats that livestock currently face include, rinderpest, foot and mouth disease, and Peste des petits ruminants (PPR), also known as sheep and goat plague

30. type of wild plant 2

- Some of the common wild plant genetic resources are as follow;
- Prickly Acacia/Keekar • Coral Tree • Deodar Cedar • Dalbergia Sissoo /Sheesham Tree • Calotropis procera/Giant milkweed • Alovera • Marijuana

### 31. when founder effect occurs?2

In population genetics, the founder effect is the loss of genetic variation that occurs when a new population is established by a very small number of individuals from a larger population.

### 32. type of genetic stocks(3)

Genetic stocks,;

broadly defined as plants or populations generated and/or selected for genetic studies, represent a unique and growing class of extremely valuable germplasm which, depending on crop, type of genetic stock and user community may represent genetic resources of either transient or long-lasting value

#### Genetic stocks:

Genetic stocks can be divided into three general groups

cytological stocks mutants stock

Germplasm set

### 33. reason for grading up(3)

Grading up □ Breeding of animals of two different breeds where the animals of an indigenous breed/genetic group is mated by an improved pure breed for several generations towards attaining the superior traits of the improved breed

□ Grading up is continuous use of purebred sires of the same breed in a grade herd. By fifth generation, the graded animals may reach almost purebred levels.

### 34. how animals figure out that where they are going (5)

Scientists aren't really sure exactly how some animals figure out how to get to where they are going. They think that: □

- Some animals use landmarks like rivers and streams to find their way.
- Some animals may navigate by the position of the sun and stars.
- Some animals use smell to figure out where they are going.
- Some species that may use the Earth's magnetic field to navigate.

### 35. What is outbreeding

#### Out-breeding:

Out-breeding is the mating of animals of the same breed but which have no closer relationship than at least 4 to 6 generations. Out breeding is the recommended breeding practice for most purebred sheep breeders.

### 36. Why do we need to conserve plant genetic resources

□ Conservation of plant genetic resources is necessary for food security and agrobiodiversity  
□ Biodiversity provides a valuable source of compounds to the medical, food and crop protection industries. Maintenance of ecosystem Genetic resources need to be conserved so that they may be used in crop research and be used as sources of genes for crop improvement.

### 37. Effect of bottleneck effect on alleles frequency

- Allele frequencies in a group may be very different from those of the population prior to the event,.
- Even some alleles may be missing entirely.
- The smaller population will also be more susceptible to the effects of genetic drift for generations (until its numbers return to normal).

- Effect potentially causing even more alleles to be lost. In human evolution

It is theorized, based on genetic evidence, that a few tens of thousands of years ago the population of Homo sapiens was reduced for a period to a few thousand or tens of thousands of people. Such a bottleneck would explain the extremely low level of genetic diversity found within our species, when contrasted with others, such as Chimps

## Cheetah

All Cheetah shared a small number of alleles □ Less than 1% diversity □ As if all cheetahs are identical twins

### Bottleneck effect

10,000 years ago □ Ice age □ Last 100 years □ Poaching and loss of habitat

## 38. types of ex situ conservation

### Gene Bank

Gene bank refers to a place or organization where germplasm can be conserved in living state. Gene banks are also known as germplasm banks.

#### Seed Gene Bank

A place where germplasm is conserved in the form of seeds is called seed gene bank. Seeds are very convenient for storage because they occupy smaller space than whole plants.

#### Field Gene Bank

Field gene banks also called plant gene banks are areas of land in which germplasm collections of growing plants are assembled.

#### Botanical Garden

A botanical garden or botanic garden is a garden dedicated to the collection, cultivation and display of a wide range of plants labeled with their botanical names

## 39. Difference between gene flow and genetic Draft 5

Gene flow “The introduction of genetic material (by interbreeding) from one population of a species to another

Genetic drift is the phenomenon of change in the frequency of alleles (variants of a gene) in a population of organisms due to chance or random events

## 40. What is Threatend of species 3

Threatened species are any species (including animals, plants, fungi, etc.) which are vulnerable to endangerment in the near future. Species that are threatened are sometimes characterized by the population dynamics measure of critical dispensation, a mathematical measure of biomass related to population growth rate.

## 41. What is demosticate plant 2

- Some domesticated plant resources in Pakistan are as follow; • Fruit Trees • Citrus Fruits • Nut Trees • Legumes • Cereals • Vegetables • Herbs and Shurbs etc

## 42. Difference between close breeding and linear breeding

Close Inbreeding □ Animals are very closely related and can be traced back to more than one common ancestor. Closest form of inbreeding in domestic animals involves mating between full brothers and sisters (full siblings) Second closest form of inbreeding involves mating between grand-parents and grand-offspring, half brothers and sisters (half siblings)

Line Breeding □ Mating animals that are more distantly related which can be traced back to one common ancestor.

- e.g. Cousins Grandparents to grand offspring, Half-brother to half-sister.

- Line breeding increases genetic purity amongst the animals of progeny generations.

### 43. What is mild breeding

Mild Inbreeding

Mating of relatives beyond 2nd generation and upto 6th generation.

### 44. What is domesticate plant

“Plant domestication is the process whereby wild plants have been evolved into crop plants through artificial selection.”

### 45. When bubal hartebeest are extinct (2)

The animals were hunted to extinction and the last known Bubal hartebeest was killed in Algeria sometime between 1945 and 1954, according to the International Union for Conservation of Nature

### 46. What are the reason of migration to be triggered (3)

The trigger for the migration may be:

1. local climate
2. local availability of food
3. The season of the year
4. For mating reasons

### 47. Give one example of gene environment interaction in plant (5)

In Drosophila

Mean bristle number on Drosophila could vary with changing temperatures.

In plants

Seven genetically distinct yarrow plants were collected and three cuttings taken from each plant. One cutting of each genotype was planted at low, medium, and high elevations, respectively. When the plants matured, no one genotype grew best at all altitudes, and at each altitude the seven genotypes fared differently. For example, one genotype grew the tallest at the medium elevation but attained only middling height at the other two elevations. The best growers at low and high elevation grew poorly at medium elevation. The medium altitude produced the worst overall results, but still yielded one tall and two medium-tall samples. Altitude had an effect on each genotype, but not to the same degree nor in the same way

Phenylketonuria (PKU)

It is a human genetic condition caused by mutations to a gene coding for a particular liver enzyme. In the absence of this enzyme, an amino acid known as phenylalanine does not get converted into the next amino acid in a biochemical pathway, and therefore too much phenylalanine passes into the blood and other tissues. Change in environment (lowering Phenylalanine consumption) can affect the phenotype of a particular trait, demonstrating a gene-environment interaction.

### 48. Gene sanctuary:

- A gene sanctuary is an area where plants are conserved. It includes both biosphere reserves as well as national parks. India has set up its first gene sanctuary in the Garo Hills of Meghalaya for wild relatives of citrus. Efforts are also being made to set up gene sanctuaries for banana, sugarcane, rice and mango.

#### 49. Hungton disorder

Huntington's disease (aka Huntington's chorea) is a genetic disorder which results in slowly progressing brain cell death. there are two distinct populations in which the disorder occurs much more often.

1. The first group is the Afrikaner population of South Africa.
2. The second group is the residents of the Lake Maracaibo region of Venezuela.

#### 50. Sympatric speciation

Sympatric speciation is speciation that occurs when two groups of the same species live in the same geographic location, but they evolve differently until they can no longer interbreed and are considered different species. This is often result of Reproductive isolation

#### 51. One example gene interaction in plants?

Seven genetically distinct yarrow plants were collected and three cuttings taken from each plant. One cutting of each genotype was planted at low, medium, and high elevations, respectively. When the plants matured, no one genotype grew best at all altitudes, and at each altitude the seven genotypes fared differently. For example, one genotype grew the tallest at the medium elevation but attained only middling height at the other two elevations. The best growers at low and high elevation grew poorly at medium elevation. The medium altitude produced the worst overall results, but still yielded one tall and two medium-tall samples. Altitude had an effect on each genotype, but not to the same degree nor in the same way

#### 52. Differ b/w outbreed and inbreed?

"The intentional breeding of distantly related or unrelated individuals for the purpose of producing offspring of superior quality."

There are three types of outbreeding

- Cross breeding
- Grading up
- Species cross

"Inbreeding, the mating of individuals or organisms that are closely related through common ancestry."

- Inbreeding is useful in the retention of desirable characteristics or the elimination of undesirable one's

It also results in decreased vigour, size, and fertility of the offspring due to combined effect of harmful genes that were recessive in both parents

- There are 3 types of Inbreeding;
  - Close inbreeding
  - Mild inbreeding
  - Line inbreeding

#### 53. Genetic resources of micro-organisms

Genetic resources of micro-organisms means genetic material of actual or potential value from micro-organisms.

1. Invertebrates Genetic Resources

**Invertebrates** include a great number of species that perform valuable functions in agro-ecosystems.

#### 54. When west african black rhinoceroses were they extinct?

##### West African Black Rhinoceros :

The West African black rhinoceros (*Diceros bicornis longipes*) was a subspecies of the black rhino that was declared extinct in 2011.

#### 55. What is Article 6 of agriculture genetic resources?

##### Article 6: Sustainable Use of Plant Genetic Resources:

The Contracting parties shall develop and maintain appropriate policy and legal measures that promote the sustainable use of plant genetic resources for food and agriculture.

#### 56. What is cryopreservation?

##### Cryopreservation:

Cryo is Greek word. (kryos – frost).

It literally means preservation in “frozen state.”

It is a process where tissues, organelles, cells, extracellular matrix, organs or any other biological constructs susceptible to damage caused by unregulated chemical kinetics are preserved by cooling to very low temp (typically -80 degree Celsius using solid carbon dioxide or -196 degree Celsius using liquid nitrogen).

#### 57. How many ways can bacteria transfer their DNA horizontally?

“Horizontal gene transfer is known to occur between different species, such as between prokaryotes and eukaryotes, between the three DNA-containing organelles of eukaryotes, the nucleus, the mitochondrion and the chloroplast.”

- Horizontal gene transfer is basically the transfer of genes between organisms via methods other than asexual or sexual reproduction.
- Genes and the characteristics they code for are passed down from parent to progeny.
- There are three ways for bacteria to transfer their DNA horizontally
- **Conjugation**
- The transfer of DNA directly from one cell to another through cell-cell contact often involving **plasmids**
- **Transformation**
- Bacteria are capable of taking up DNA directly from their environment and incorporating it into their genomes known as **natural transformation**
- **Transduction**
- Transduction is the transfer of DNA from one cell to another by a virus

#### 58. Migration with example?

##### Migration

“**Migration** is the relatively long-distance movement of individuals, usually on a seasonal basis.”

e.g. Some crustaceans migrate for breeding



## 59. Founder effect with example?

### Founder Effect :

In population genetics, the founder effect is the loss of genetic variation that occurs when a new population is established by a very small number of individuals from a larger population. **The Amish People**

Around 200 German immigrants settled in Pennsylvania

Within community marriages

Developed syndrome named Ellis-van Creveld syndrome

Common symptoms are;

Haemophilia

Dwarfism (1/14 carry the gene)

Still births/infant deaths

Physical deformities

## 60. Quarantine regulations

Plant quarantine regulations are promulgated by the national and the state governments to prevent the introduction and spread of harmful pests and pathogens. Plant quarantine will be justified only when the pest has no natural means of spread and when they are based on biological considerations only, i.e., pest/pathogen introduction risks and the available safeguards.

In general, risks are more with the introduction of vegetative propagules than with true seed. In case of true seed, risks are more with deep-seated infections than with the surface borne contamination of pests/pathogens. Again, risks are far greater with pathogens like viruses, downy mildews, smuts and many bacteria carried inside the seed without any external symptoms. When vegetative propagules are introduced, rooted plants, and other underground plant parts like rhizomes, suckers, runners, etc. carry higher risks than budwood, scions and unrooted cuttings. In any case, bulk introductions are always risky as thorough examination and treatment in such cases is very difficult and planting area is far too large to prevent the establishment and spread of the introduced pest/disease.

## 61. What is Genetic Resources?

Genetic resources are sometimes called the "first resource" of the natural resources on this planet - the others being land, air, and water.

□ The diversity of genetic resources for food and agriculture (i.e. plants/crops, animals, aquatic resources, forests, micro-organisms and invertebrates) plays a crucial role in meeting basic human food and nutritional needs

## 62. What is Gene Pool?

The combination of all the genes present in a given population is called the gene pool of that population."

It includes all the variants or alleles of every gene.

It includes all the genes present in the population.

In most cases, the population includes individuals of the same species.

- A gene pool includes even those genes whose effects are not visible in an individual. A number of animal species, such as mountain lions in the Americas, and leopards in South Africa, are threatened by human activities.
- Their habitat has been divided into fragments, surrounded by towns and farmlands.
- This results in interbreeding among smaller populations,



- The small gene pool makes them susceptible to diseases.

### 63.What is importance of domestic animal Resources?

“Animals that are not wild and is kept as a pet or to produce food”

For example;

- Dog
- Buffalo
- Goat
- Sheep
- Cattle
- Cat

Importance of Domestic Animal Resources:

Domesticated animal resources are important as follow;

- Animals provide milk
- Hair from goat and sheep is used for making woolen clothing, shawls and blankets
- Some drugs are especially obtained from animals. Ex. Heparin an anticoagulant is used to control clots in blood, is obtained from ox lungs and pig intestines
- Animal's meat is the part our of diet
- Animals are a great source of leather which is used for making foot wear, belts, wallets bags, furniture

### 64.Ecosystem is facing massive destruction extinction species. How?

- There are following major causes of extinction;
  - Climate change
  - Habitat destruction
  - lack of genetic diversity
  - Better-adaptive condition
  - Pollution
  - Human over-population
  - Poaching and hunting

Climate Change

- Almost half of plant and animal species have experienced local extinctions due to climate change
- Global warming could trigger not just local but global extinctions of animals and plants
- Species already threatened by habitat destruction, pollution, alien invasion and overhunting are more vulnerable to climate change
- Diversity of species in any one ecosystem could be affected by rises in average temperatures or a shift of climate regime

### 65.Inbreeding ? (2 marks)

“Inbreeding, the mating of individuals or organisms that are closely related through common ancestry.”

- Inbreeding is useful in the retention of desirable characteristics or the elimination of undesirable one's
- It also results in decreased vigour, size, and fertility of the offspring due to combined effect of harmful genes that were recessive in both parents.

### 66.Endangered species with example (2)

“A species of plant or animal that is in immediate danger of becoming extinct and needs protection to survive.”

- Endangered species are like fire alarms. They tell us about problems in our home we call Earth.

Endangered species must be protected for better health of earth and ecosystem balancing.

○ Some most endangered species in Pakistan are as follow;

- The Indus River dolphin
- Markhor
- Asian Black Bear
- Snow Leopard

### 67. Method of storage ? 3 marks

The maintenance of the frozen cells or material at specific temperature is very important.

In general the temperature is kept -70 to -196 degree.

Prolong storage is done at temperature of -196 degree in liquid nitrogen.

To prevent damage, continuous supply of nitrogen is done.

### 68. Breeding in details and it's type ?

A breed is a group of domestic animals with a homogeneous appearance, behavior, and other characteristics that distinguish it from other animals.

Pure-breeding

Inbreeding

Out-breeding

Line breeding

Crossbreeding

**Pure-breeding:**

Pure-breeding is the mating of males and females of the same breed or type.

purebred flock can be managed as a single flock because all animals are of the same breed.

The goal of purebred sheep production is to provide superior genetics (seed stock) to the commercial sheep industry.

**Inbreeding:**

Inbreeding is a system of breeding in which closely related animals are mated.

Technically, inbreeding is defined as the mating of animals more closely related than the average relationship within the breed or population concerned.

The primary genetic consequence of inbreeding is to increase the frequency of pairing of similar genes.

**Out-breeding:**

Out-breeding is the mating of animals of the same breed but which have no closer relationship than at least 4 to 6 generations. Out breeding is the recommended breeding practice for most purebred sheep breeders.

**Crossbreeding:**

Crossbreeding is the mating of animals of different breed compositions or types.

However, it does not denote indiscriminate mixing of breeds, but rather is a systematic utilization of different breed resources to produce crossbred progeny of a specific type.

Crossbreeding is used extensively in the commercial sheep industry and the majority of slaughter lambs are crossbred.

### 69. Nagoya protocol?

**Nagoya Protocol**

The *Nagoya Protocol* focuses on the equitable sharing of genetic material (plant, animal, microbial, other) including the traditional knowledge associated with the genetic resources, and the benefits that arise from their use.

### 70. Bottleneck effect?

**Bottleneck Effect**

“The bottleneck effect is a sharp lowering of a population's gene pool because of an environmental, or human-caused, change.”

**Founder Effect**

“The effect on the resulting gene pool that occurs when a new isolated population is founded by a small number of individuals possessing limited genetic variation relative to the larger population from which they have migrated”

## 71. Names of nut trees?

### Nut Trees

Nut Trees in Pakistan are as follow;

- Almonds
- Walnut
- Tree Nuts
- Almonds
  
- Almonds fall in the family of peaches, plums and nectarines.
- Seeds of these plants are edible as Almonds
- Almond plants blossom into beautiful pink flowers in spring in addition to yielding fruits in summer.

## 72. What is cryopreservation?

Until two decades ago the genetic resources were getting depleted owing to the continuous depredation by man.

It was imperative therefore that many of the elite, economically important and endangered species are preserved to make them available when needed.

Many methodologies have been devised for long term preservation of material.

There are various methods of storage :

1. **Cryopreservation** - generally involves storage in liquid nitrogen.
2. **Cold storage** - it involves storage in low and non freezing temperature.
3. **Low pressure** – it involves partially reducing the atmospheric pressure of surrounding.
4. **Low oxygen storage** - it involves reducing the oxygen level but maintaining the pressure.
5. Cryo is Greek word. (kayos – frost).
6. It literally means preservation in “frozen state.”

It is a process where tissues, organelles, cells, extracellular matrix, organs or any other biological constructs susceptible to damage caused by unregulated chemical kinetics are preserved by cooling to very low temp (typically -80 degree Celsius using solid carbon dioxide or -196 degree Celsius using liquid nitrogen).

The objective of cryopreservation is to minimize damage to biological materials, including tissues, mammalian cells, bacteria, fungi, plant cells, and viruses, during low temperature freezing and storage.

Cryopreservation can be done at

- Over solid carbon dioxide (at -79 degree)
- Low temperature deep freezer (at -80 degree)
- In vapor phase nitrogen ( at -150 degree)
- In liquid nitrogen (at -196 degree) ➤ Examples include:
- Semen in semen cryopreservation

- Blood
- Special cells for transfusion
- Stem cells. It is optimal in high concentration of synthetic serum, stepwise equilibration and slow cooling.
- Umbilical cord blood
- Tissue samples like tumors and histological cross sections
- Eggs (oocytes) in oocyte cryopreservation
- Embryos at cleavage stage (that are 2, 4 or 8 cells) or at blastocyst stage, in embryo cryopreservation
- Ovarian tissue in ovarian tissue cryopreservation
- Plant seeds or shoots may be cryopreserved for conservation purposes.

### 73. Different steps of Allopatric speciation?

1. A geographic change separates members of a population into more than one group.
2. Different gene mutations occur and build up in the different populations over time.
3. The populations become so different that members of the different populations can no longer breed with each other anymore if were they to be in the same habitat in the same time. If this is the case, allopatric speciation has occurred.

### 74. Domesticated Animal Resources

“Animals that are not wild and is kept as a pet or to produce food”

e.g. Dog, Buffalo, Goat, Sheep, Cattle

### 75. mild breeding 2marks

**Mild Inbreeding**

**Mild Inbreeding**

- Mating of relatives beyond 2nd generation and upto 6th generation.

### 76. disadvantage of inbreeding 3marks

**Disadvantages of Inbreeding:**

- An increase in the prevalence of inherited disorders
- A decrease in viability
- A decrease in reproductive ability, and
- The loss of genetic diversity (i.e. decrease in genetic variation).
- Developmental disruption, higher infant mortality and a shorter life span
- Reduction of immune system function.

### 77. uses of sheesham 3marks

Dalbergia Sissoo /Sheesham Tree

- Dalbergia Sissoo, also known as Indian Rosewood, is the source of Sheesham wood.

- The tree is native to India and Pakistan and grows all over the SubHimalayan Regions
- Its leaves are compound, and produces pink-white flowers that resemble a pea flower.
- It gives a dry fruit that is a thin and papery pale brown pod.
- The tree mainly offers timber

## 78. MGRP how work in Pakistan 5 marks

- In ecosystems, microorganisms are important as;
  - Symbionts (endophytes, mycorrhizae, and in insect guts),
  - In nitrogen fixation (rhizobia, cyanobacteria, cyanobacteria-containing lichens),
  - In the biodegradation of dead animal and plant material,
  - In controlling the size of populations of plants and insects through natural bio-control

Importance of MGR:

- Antibiotic is chemical substance produced by microorganisms that can kill or inhibit the growth of other microorganisms
- Antibiotics kill or inhibit other organisms by interfering the metabolic process in the bacterium that is not found in the host.
- Plant growth promotion through soil microorganisms,
- In the understanding and surveillance of microbial plant pathogens
- Biological control,
- beneficial symbiosis in the guts of ruminant livestock,
- Production of chemicals of direct benefit to agriculture

Workhorses in agro-industrial processes.

Role of Micro organism in food production system:

- Fermentation,
- Probiotics,
- Production of chemicals of benefit to food production,
- Understanding and surveillance of health hazardous microorganisms such as food toxins and food borne pathogens.

Microbial Genetic Resources Program:

- To establish a long term microbial preservation facility as “National Culture Collection of Pakistan (NCCP)” for collection and preservation of microbial genetic resources from Pakistani ecology for basic and applied microbiology and biotechnology research following the Best Practice Guidelines of OECD (2001).
- To distribute the economically important strains to scientific community, institutions and industry on commercial basis for research or utilization in industrial processes as a regular activity of the NCCP by following national and international laws and regulations.

## 79. What is Aquatic genetic resources?

Aquatic genetic resources include all genetic resources living in water

➤ It include;

- Fish
- Cyclostomes
- Mussels
- Decapods
- Marine mammals
- Aquatic plants
- All other water dwelling organisms

There is a huge diversity of aquatic species in the world's water bodies

## 80. Types Of Breed

Now, there are about 340 breeds recognized by the Fédération Cynologique Internationale (FCI), the world governing body of dog breeds, sometimes known as the World Canine Organization. But the standards for breed recognition vary from country to country – the American Kennel Club currently recognizes only 167 breeds.

## 81. Genetic Drift

### Genetic Drift

“Random changes in gene frequency especially in small populations when leading to preservation or extinction of particular genes.

## 82. What is allele?

An **allele** is a variant form of a given gene. Sometimes, different **alleles** can result in different

## 83. What is indigenous breed 2

originating in and characteristic of a particular region or country; native (often followed by to): the plants **indigenous** to Canada; the **indigenous** peoples of southern Africa. innate; inherent; natural (usually followed by to): feelings **indigenous** to human beings.

## 84. Define species.

a group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding. The species is the principal natural taxonomic unit, ranking below a genus and denoted by a Latin binomial, e.g. *Homo sapiens*

## 85. What is environment gene interactions

**Gene–environment interaction** (or genotype–**environment interaction** or G×E) is when two different genotypes respond to **environmental** variation in different ways. A norm of reaction is a graph that shows the relationship between **genes** and **environmental** factors when phenotypic differences are continuous.

## 86. Forest genetic resources 2

**Forest genetic resources** (FGR) are the heritable materials maintained within and among tree and other woody plant species that are of actual or potential economic, environmental, scientific or societal value.

## 87. Inbreeding depression 2

**Inbreeding depression** is the reduced biological fitness in a given population as a result of **inbreeding**, or breeding of related individuals.

## 88. Component

- Access to Genetic resources
- Sharing of benefits

## 89. How overhunting cause to extinction of animals 3

Human hunters are responsible for wiping out the population of large animals. Researchers found that most of the animals that time died because of increased hunting. Horn of Rhino ivory of elephants, the fur and organs of tigers, the deliciousness of tuna and the supposedly medicinal effect of shark’s fin etc are some reasons for over-hunting.

## 90. CAUSES OF EXTINCTION

The causes of extinction are as follows

1. Climate change
2. Habitat destruction
3. lack of genetic diversity
4. Better-adaptive condition
5. Pollution
6. Human over-population

## 91. Threats on AnGR 5

- Despite the importance of animal genetic resources and their diversity, their diversity has been continually decreasing over time.
- One of the greatest threats to livestock diversity is pressure from large-scale commercial production systems to maintain only high-output breeds.
- Changes in climate will have an impact on livestock and food production in many ways.
- Some major disease threats that livestock currently face include, rinderpest, foot and mouth disease, and Peste des petits ruminants (PPR), also known as sheep and goat plague.

## 92. Different freezing methods in Cryopreservation 5

- Slow freezing and thawing
- Rapid freezing and thawing
- Vitrification
- Ultrarapid freezing

## 93. Slow Freezing- Slow thawing

With this method organs are labeled into vials after equilibration with a cryoprotectant solution and then cooled at rate of 0.5-2 °C per minute down to -1 °C. Seeding is then induced and a holding period of 5 to 15 minutes allows equilibration of the temperature. Thereafter embryos are cooled to -60°C or lower at a rate of 0.3 to 0.5°C per minute before being transfer to liquid nitrogen. Frozen embryos must be slowly thawed at a rate of less than 25°C per minute to prevent osmotic shock

## 94. Rapid cooling and rapid thawing

In this technique, however cooling is terminated at -30 to -40 °C and embryos are then plunged into liquid nitrogen for rapid cooling to -196°C. Thawing is therefore performed rapidly (200 to 500°C per minute) to prevent recrystallization

## 95. Vitrification

Vitrification is the process of cooling where the water in the tissue becomes glass rather than crystals. Glass is a liquid that is too cold (too viscous) to flow. In other words vitrification is solidification due to increased viscosity rather than crystallization.

## 96. Ultra rapid Freezing

In this technique serial equilibration of embryos in high concentration of DMSO (3-5 M) supplemented with sucrose (0.3 to 0.5 M). The embryos are then plunged into liquid Nitrogen. Thawing is then done with warm water bath (approximately 500°C per minute).

## 97. Which are the causes of loss of genetic diversity... 2 marks

### Anthropogenic activities effecting Genetic Diversity:

Any change in the environment, natural or human induced causes a selection of events that only the fittest survive. Anthropogenic impact is apparent in the coastal zone. Man made activities increases the number of changes occurring to individual and populations. Such pressure is exerted by:

- Artificial selection (harvesting, aquaculture)
- Degradation of habitats
- The release of farmed fish into the wild.

Anthropogenic activities reduce the sum of genes available. It leaves behind a population that is less capable of tolerating any further natural or anthropogenic ally caused changes in environment.

## 98. Enlist Extinct animals of Pakistan.. 3 marks



- |                                  |                       |
|----------------------------------|-----------------------|
| 1. West African Black Rhinoceros | 8. Tecopa Pupfish     |
| 2. Pyrenean Ibex                 | 9. Great Auk          |
| 3. Passenger Pigeon              | 10. Javan Tiger       |
| 4. Quagga                        | 11. Bubal Hartebeest  |
| 5. Caribbean Monk Seal           | 12. Steller's sea cow |
| 6. Seamink                       | 13. Dodo              |
| 7. Tasmanian Tiger               |                       |

## 99. Difference between allopatric and sympatric speciation.. 3 marks

"Gene flow blocked by physical barriers results in Allopatric speciation"

- It is geographical isolation that doesn't allow population of the same species to exchange genetic material
- Physical barriers to gene flow both "natural" and "artificial"
- Natural physical barriers include mountain ranges, oceans or vast deserts
- Artificial physical barriers are man-made barriers such as "The Great China Wall", barrages or dams etc

**Example: Darwin finches (adaptive radiation).**

## 100. Sympatric Speciation

Sympatric speciation is speciation that occurs when two groups of the same species live in the same geographic location, but they evolve differently until they can no longer interbreed and are considered different species.

This is often result of Reproductive isolation

Examples of Sympatric Speciation: In Apple Maggot Flies

## 101. Types Reproductive isolation

- ☐ Pre-zygotic isolation
- ☐ Post-zygotic isolation

## 102. How do allopatric and sympatric speciation differ

Allopatric speciation is speciation that results when a population is separated by a physical barrier. It is also referred to as geographic speciation. Sympatric speciation is speciation that occurs without physical separation of members of the population.

## 103. Biometric Gene environment interaction.. 5 marks..

- The biometric (or statistical) conception has its origins in research programs that seek to measure the relative proportions of genetic and environmental contributions to phenotypic variation within populations.
- Biometric gene–environment interaction has particular currency in population genetics and behavioral genetics. Any interaction results in the breakdown of the additivity of the main effects of heredity and environment, but whether such interactions are present in particular settings are an empirical question.
- Biometric interaction is relevant in the context of research on individual differences rather than in the context of the development of a particular organism.

## 104. Migration with example?

"**Migration** is the relatively long-distance movement of individuals, usually on a seasonal basis."

**e.g.** Some crustaceans migrate for breeding

**Animal migration** is the relatively long-distance movement of individuals, usually on a seasonal basis. It is found in all major animal groups, including birds, mammals, fish, reptiles, amphibians, insects, and crustaceans. Migration is a behavioral adaptation that helps animal's survival.

## 105. Trigger for the migration

The trigger for the migration may be:

- |                               |                           |
|-------------------------------|---------------------------|
| 1. local climate              | 3. the season of the year |
| 2. local availability of food | 4. for mating reasons     |

### 106.Steps of alloptic speciation?

1. A geographic change separates members of a population into more than one group.
2. Different gene mutations occur and build up in the different populations over time.
3. The populations become so different that members of the different populations can no longer breed with each other anymore if were they to be in the same habitat in the same time. If this is the case, allopatric speciation has occurred. **Example: Darwin finches (adaptive radiation).**

### 107.Founder effect with example?

In population genetics, the founder effect is the loss of genetic variation that occurs when a new population is established by a very small number of individuals from a larger population.

A founder effect occurs when a new colony is started by a few members of the original population. This small population size means that the colony may have:

- Reduced genetic variation from the original population.
- A non-random sample of the genes in the original population.

### 108.Quarantine regulation?

Quarantine practices in most countries have at least three common functions.

1. The first is exclusion or regulatory actions to prevent or reduce the risk of entry of exotic pathogens, pests, or parasites along artificial pathways.
2. Second is the containment, suppression, or eradication of pests or pathogens that have been recently introduced.
3. Third is the assisting of exporters to meet the quarantine requirements of importing countries.

### 109.What is special about agricultural genetic resources?

- To feed the world, we all need these resources.
- Agricultural resources have been shared and exchanged over thousands of years. Mostly it is impossible to identify a single country of origin.
- Countries and regions are “interdependent”: they all depend for their food and agriculture on crops that originated elsewhere.

### 110.Write demerits o in sito and ex sito conservation? 3 marks

#### In-situ Conservation

- Genetic diversity may have already been dramatically decreased
- Conditions that threatened the organisms in the area may still be present, e.g. disease or interspecific competition
- Poachers and Eco tourists may see the thriving area as an opportunity and may cause damage

#### Ex situ Conservation

- Usually only a small number of individuals can be cared for.
- It can be difficult and expensive to create and sustain the right environment.
- The animals that are habituated (used to) human contact may be less likely to exhibit natural behaviors and may be more likely to catch a disease from humans.
- This type of conservation is usually less successful as many species can't breed successfully in captivity or don't adapt to their new environment when moved to a new location.

### 111.Some most endangered species in Pakistan are as follow;

- The Indus River dolphin • Markhor • Mountain Weasel • Asian Black Bear • Snow Leopard

### 112.Mild inbreeding 2marks

Mating of relatives beyond 2nd generation and upto 6th generation

### 113. Disadvantage of inbreeding 3marks

- An increase in the prevalence of inherited disorders
- A decrease in viability
- A decrease in reproductive ability, and

- The loss of genetic diversity (i.e. decrease in genetic variation).
- Developmental disruption, higher infant mortality and a shorter life span □ Reduction of immune system function

#### 114. What is special about Agricultural genetic resources? (2 marks)

- To feed the world, we all need these resources.
- Agricultural resources have been shared and exchanged over thousands of years. Mostly it is impossible to identify a single country of origin.
- Countries and regions are interdependent: they all depend for their food and agriculture on crops that originated elsewhere.

#### 115. Bottleneck effect?

It is a sharp lowering of population's gene pool because of environmental or human caused change.

#### 116. Gene sanctuary:

- A gene sanctuary is an area where plants are conserved. It includes both biosphere reserves as well as national parks. India has set up its first gene sanctuary in the Garo Hills of Meghalaya for wild relatives of citrus. Efforts are also being made to set up gene sanctuaries for banana, sugarcane, rice and mango.

#### 117. Huntington disorder

Huntington's disease (aka Huntington's chorea) is a genetic disorder which results in slowly progressing brain cell death. There are two distinct populations in which the disorder occurs much more often.

1. The first group is the Afrikaner population of South Africa.
2. The second group is the residents of the Lake Maracaibo region of Venezuela.

#### 118. One example gene interaction in plants?

Seven genetically distinct yarrow plants were collected and three cuttings taken from each plant. One cutting of each genotype was planted at low, medium, and high elevations, respectively. When the plants matured, no one genotype grew best at all altitudes, and at each altitude the seven genotypes fared differently. For example, one genotype grew the tallest at the medium elevation but attained only middling height at the other two elevations. The best growers at low and high elevation grew poorly at medium elevation. The medium altitude produced the worst overall results, but still yielded one tall and two medium-tall samples. Altitude had an effect on each genotype, but not to the same degree nor in the same way.

#### 119. Why Hart's Tongue Ferns threatened? 3 marks

##### Appearance

Hart's Tongue Fern is a rare treat for the eyes; it is so green, glossy, and large that it defies reality.

##### Habitat

This fern is found in close association with outcrops of dolomitic limestone, in coulees, gorges and in cool limestone sinkholes in mature hardwood forests.

##### Why It's Threatened?

Quarrying, recreation and residential development have all destroyed these plants and their habitat. Canadian populations are threatened by lumbering and the development of land for ski resorts and country estates, among other activities.

#### 120. Different steps of Allopatric speciation?

1. A geographic change separates members of a population into more than one group.
2. Different gene mutations occur and build up in the different populations over time.
3. The populations become so different that members of the different populations can no longer breed with each other anymore if they were to be in the same habitat in the same time. If this is the case, allopatric speciation has occurred.

## Breeding

“The activity of keeping animals or plants in order to produce animals or plants that have particular qualities”

## Inbreeding

“**Inbreeding**, the mating of individuals or organisms that are closely related through common ancestry.”

### 121. What is the major objective of cryopreservation? 2M

Cryo is Greek word. (kayos – frost). It literally means preservation in “frozen state.” It is a process where tissues, organelles, cells, extracellular matrix, organs or any other biological constructs susceptible to damage caused by unregulated chemical kinetics are preserved by cooling to very low temperature.

### 122. What is the criteria for any National Park? 3Marks

National park is an area which is strictly reserved for the betterment of the wildlife & biodiversity, and where activities like developmental, forestry, poaching, hunting and grazing on cultivation are not permitted.

- In these parks private ownership rights are not allowed.
- Their boundaries are well marked and circumscribed.
- They are usually small reserves spreading in an area of 100 sq. km. to 500 sq. km.
- In national parks, the emphasis is on the preservation of a single floral or faunal species.

### 123. What is horizontal gene transfer? 3M

**Ans:** “Horizontal gene transfer is known to occur between different species, such as between prokaryotes and eukaryotes, between the three DNA-containing organelles of eukaryotes, the nucleus, the mitochondrion and the chloroplast.”

### 124. Differentiate between Out breeding and in breeding? 5M

“**Inbreeding**, the mating of individuals or organisms that are closely related through common ancestry.”

“**Outbreeding**, the intentional breeding of distantly related or unrelated individuals for the purpose of producing offspring of superior quality.”

### 125. Difference between gene pool and genetic drift.

**Ans:** The combination of all the genes present in a given population is called the gene pool of that population.

Genetic drift is the phenomenon of change in the frequency of alleles (variants of a gene) in a population of organisms due to chance or random events

### 126. Three main wild animal genetic resources

1. Zoological garden
2. Wildlife Sanctuaries
3. Game reserve

### 127. Facts about passenger pigeon

**Ans:** The passenger pigeon may have once constituted 25 to 40 percent of the bird population.

The 19th century brought widespread hunting and trapping of the birds, which severely diminished their populations.

The last passenger pigeon, named “**Martha**” died at age 29 at the Cincinnati Zoo in 1914.

### 128. Biosphere reserve

**Ans:** Biosphere reserves are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use.

They are internationally recognized, nominated by national governments and remain under sovereign jurisdiction of the states where they are located.

## 129. Reproductive isolation .5

**Ans:** Sympatric speciation is speciation that occurs when two groups of the same species live in the same geographic location, but they evolve differently until they can no longer interbreed and are considered different species. This is often result of Reproductive isolation.

The mechanisms of reproductive isolation are a collection of evolutionary mechanisms, behaviors and physiological processes critical for speciation. They prevent members of different species from producing offspring, or ensure that any offspring are sterile.

These barriers maintain the integrity of a species by reducing gene flow between related Species

### Types Reproductive isolation

- Pre-zygotic isolation
- Post-zygotic isolation

## 130. Why we use precautionary measures to save genetic resources?

**Ans:** attention to genetic resources means attention to the vast diversity among and between species of animals, plants, and microorganisms.

Genetic resources must be maintained as an investment for the future.

Genetic resources are of tremendous practical and historical significance for human life from daily survival to generating the wealth of nations, yet their crucial role in supporting human society is frequently overlooked and undervalued.

Genetic conservation is an integral part of a much broader activity concerned with protecting the many plants, animals, microorganisms, and communities of organisms that help to mold and stabilize the environment and maintain the quality of air, water, and soil.

Conservation ensures that future generations will benefit from earth's biological resources.

Conserving genetic resources is a means of safeguarding the living materials exploited by agriculture, industry, forestry, and aquaculture to provide food, feed, medicines, fiber for clothing and furnishing, fuel for cooking and heating, and the food and industrial products of microbial activity.

## 131. Types of cryoprotectants

There are two types of cryoprotectants:

- Membrane permeating which can freely diffuse the membrane such as glycerol (G), ethylene glycol (EG) and dimethyl sulfoxide (DMSO);
- Non membrane permeating which cannot permeate the cell membrane such as sugars

## 132. Varieties of cultivation 2

**Ans:** Varieties in cultivation are the easiest to use in the breeding program. And they form a major part of working collections. They are good source of gene for yield, quality etc. they can be introduced in a new area and directly released for cultivation.

## 133. Natural selection

A natural process that results in the survival and reproductive success of individuals or groups

## 134. Antibiotics with exapmle 3

**Ans:** Antibiotic is chemical substance produced by microorganisms that can kill or inhibit the growth of other microorganisms

Antibiotics kill or inhibit other organisms by interfering the metabolic process in the bacterium that is not found in the host.

**Example:** Penicillins, Tetracyclines

### 135. Advantages and disadvantages of ex situ conservation 5

**Ans: Merits**

- It can be used to protect individual animals in a controlled environment. This means that issues such as predation and hunting can be monitored and managed more easily.
- It can be used to reintroduce species that have left an area.

**Demerits**

- Usually only a small number of individuals can be cared for.
- It can be difficult and expensive to create and sustain the right environment.
- The animals that are habituated (used to) human contact may be less likely to exhibit natural behaviors and may be more likely to catch a disease from humans.
- This type of conservation is usually less successful as many species can't breed successfully in captivity or don't adapt to their new environment when moved to a new location.

### 136. Why national strategy of PGRFA needed 5

In practical terms, a National Strategy for PGRFA may help a country in setting priorities, assigning budgetary and other resources, building capacity, and designing the seamless dovetailing of all aspects of national PGRFA management in service of its own goals.

As a result, a country will be in a position to safeguard its PGRFA assets; facilitate access to needed genetic materials and govern the sharing of the accruing benefits; add value to them through crop improvement; and sustainably intensify crop production as may be needed.

### 137. Huntington disorder 3

**Ans:** Huntington's disease (aka Huntington's chorea) is a genetic disorder which results in slowly progressing brain cell death. There are two distinct populations in which the disorder occurs much more often.

### 138. Ratio of vegetables in Pakistan 3

- Pakistan covering 75% of the total area under vegetables, accounting for 74% of the total production.
- The major share in the production is of Punjab (63%) followed by Sindh (14%), Baluchistan (12%) and KPK (11%).
- Maximum area is grown under potatoes and about 88 % occurs in Punjab.
- About 46% of onion is cultivated in Sindh and 25% in Punjab.
- Chili is at the third position of which 84% is cultivated in Sindh.

### 139. What special about agriculture genetic resources?

Agricultural resources have been shared and exchanged over thousands of years. Mostly it is impossible to identify a single country of origin.

Countries and regions are "interdependent": they all depend for their food and agriculture on crops that originated elsewhere. conservation and sustainable use, fair and equitable benefit-sharing, for sustainable agriculture and food security

### 140. What the term of animal genetic resource of food and agriculture?

The term "animal genetic resources for food and agriculture" is often shortened to "farm animal genetic resources" or simply "animal genetic resources" and sometimes referred to as "livestock biodiversity" or simply "livestock diversity".

### 141. Enlist causes of migration?

The trigger for the migration may be:

- local climate
- local availability of food
- The season of the year
- For mating reasons

Some animals travel relatively short distances to find food or more favorable living or breeding conditions.



#### 142. Write two types of ex situ conservation?

Gene bank

Botanical garden

#### 143. Write about special of wildebeest for migration?

The Great Migration isn't called great by chance. Every year in the Great Rift Valley of Tanzania and Kenya, which are located in Africa, more than 1.5 million wildebeest migrate northwest across the grassy plains of the Serengeti. Zebras and other grazing animals also take part in this migration. These animals are constantly on the search for food, following the grasses that flourish during the rainy season.

#### 144. define progenitor

**Ans:** Progenitor of the horse as we know it no longer exists in the wild, though it likely resembled the related przewalski's horse.

#### 145. Why *Acalypha rubrinervis* tree is said to be a string tree?

**Ans:** *calypha rubrinervis* (string tree or stringwood) is an extinct plant in the spurge family (Euphorbiaceae), from the island of Saint Helena in the South Atlantic Ocean. It was called string tree on account of the thin pendulous inflorescences which resembled red strings.

#### 146. Danger of aquatic pollution on aquatic species

- Pollution caused by industrial effluents and wastewater of private households has severely damaged the habitats of many fish species
- Nutrient input through farming has resulted in algal blooms
- Oil tanker disasters causing oil spills destroyed entire coastal areas
- Above issues can cause a loss of general fitness of the animals, remain stunted in growth and become less fertile
- Famous example of effect of aquatic pollution is "MINAMATA Disease." This disease was spread due to consuming mercury poisoned fishes by people

#### 147. Define microbial genetic resources programs working in Pakistan 5

To establish a long term microbial preservation facility as "National Culture Collection of Pakistan (NCCP)" for collection and preservation of microbial genetic resources from Pakistani ecology for basic and applied microbiology and biotechnology research following the Best Practice Guidelines of OECD (2001).

To distribute the economically important strains to scientific community, institutions and industry on commercial basis for research or utilization in industrial processes as a regular activity of the NCCP by following national and international laws and regulations.

#### 148. Advantages and disadvantages of outbreeding

**Advantages:**

- Out breeding often produces offspring of superior quality because it increases homozygosity (the occurrence of two alleles for the same trait at corresponding positions on homologous chromosomes)
- Sharply reduce the risk of deleterious recessive genes being expressed
- One of the benefits of out breeding is less chance of genetic abnormalities
- The ability to make a breed stronger

**Disadvantages:**

- Introduction of new genes into population
- Animal discomfort accidentally produce traits that are damaging to the health of the animal

#### 149. What happen when population of moths of white colour migrate to another population brown colored moths and mate? (2)

**Ans:** A population of moths that are white in color migrate to a population of brown colored moths and successfully mate to give rise to viable offspring. Here, we can say that there is a change in the allele frequency. Over time, the number of these white moths will increase.

#### 150. Write any five types of genetic resources? 5

**Ans:** Types of Genetic Resources

- 1) Plant Genetic Resources



- 2) Animal Genetic Resources
- 3) Forest Genetic Resources
- 4) Aquatic Genetic Resources
- 5) Genetic Resources of Microorganism
- 6) Invertebrates Genetic Resources

- 1) **Plant Genetic Resources** for Food and Agriculture (PGRFA) are the raw material that farmers and plant breeders use to improve the quality and productivity of crops. They can be defined as any genetic material of plant origin of actual or potential value for food and agriculture, e.g. seeds, tubers, mature plants etc.
- 2) **Animal genetic resources (AnGR)** is used to include all animal species, breeds and strains that are of economic, scientific and cultural interest to humankind in terms of food and agricultural production for the present or the future.
- 3) **Forest genetic resources (FGR)** are the heritable materials maintained within and among tree and other woody plant species that are of actual or potential economic, environmental, scientific or societal value.
- 4) **Aquatic genetic resources** also comprise all water-dwelling genetic resources.
- 5) **Genetic resources of micro-organisms** means genetic material of actual or potential value from micro-organisms.

### 151. Write note on the indus dolphin?

- The Indus River dolphin is one of the world's rarest mammals
- It is second most endangered freshwater river dolphin
- Approximately 1,100 specimens of this species exist today in a small fraction of their former range
- Population of this species has gradually declined due to various factors e.g. water pollution, poaching, fragmentation of habitat due to barrages and dolphin stranding in the irrigation canals

**1. Mission of Ramsar conservation? 2**

Mission: The Convention's mission is "The conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world.

**2. Which type of material DNA bank are useful?**

Most DNA provided by DNA banks is used for studies to attempt to develop more productive or more environmentally friendly agricultural species. Some DNA banks also store the DNA of rare or endangered species to ensure their survival. The DNA bank can be used to compare and analyze DNA samples.

**3. What is legislation? 2**

The process of making or enacting laws.

**4. Who is responsible for botanical garden?**

Botanical gardens are often run by universities or other scientific research organizations, and often have associated herbaria and research programmers in plant taxonomy or some other aspect of botanical science.

**5. Give different variant of gene variant?**

the phenomenon of change in the frequency of alleles (variants of a gene) in a population of organisms due to chance or random events.

**7. Historical Background of CBD?**

The Convention on Biological Diversity, was opened for signature at the Earth Summit in Rio de Janeiro, Brazil, on June 5, 1992 and by the end of July 1993, 165 countries had signed the treaty. ... The initial sessions were referred to as meetings of the "Ad Hoc Working Group of Experts on Biological Diversity."

**8. Name of botanical institute of Pakistan?**

- Abdul Wali Khan University Botanical Garden, Mardan • Botanical Garden, Governor's House, Lahore • Botanical Garden, Govt Zamindar College, Gujrat • Danishmandan Botanic Garden, Lahore • Botanical Garden, University of the Punjab, Quaid-e-Azam Campus, Lahore • Faisalabad Botanical Gardens (part of Gatwala Wildlife Park), Faisalabad • Forman Christian College Botanic Garden, Lahore • Government College University Botanic Garden of GCU, Lahore

**9. Effect of climate changes on invertebrate?**

Most invertebrates are expected to change their geographical distribution in response to climate change so as to remain in areas to which they are well adapted. This view is strongly supported by sub-fossil evidence of insect distribution during the glacial and interglacial periods of the Quaternary Period.

## 10. Sanctuaries and national parks?

National Parks:

• Hingol National Park • Hazarganji Chiltan National Park • Kirthar National Park • Lal Suhanra National Park • Margalla Hills National Park • Ayubia National Park • Deosai National Park • Chitral Gol National Park • Khunjerab National Park • Machiara National Park.

Wildlife Sanctuaries of Pakistan are; • Astor Wildlife Sanctuary • Baltistan Wildlife Sanctuary • Chasma and Taunsa Barrage Dolphin Sanctuary • Cholistan Wildlife Sanctuary • Hab Dam Wildlife Sanctuary • Kargah Wildlife Sanctuary

## 11. Habitat of species that affect climate change?

Global warming resulting from human emissions of greenhouse gases. The consequences include habitat loss; shifts in climatic conditions and in habitats that surpass migrational capabilities; altered competitive relationships.

## 12. How plant cope changes climate?

Maintaining insect species that can provide pollination services for a wide range of crops is also vital to the future of agriculture in the face of climate change. Pollinator populations not only need to be able to cope with changing climatic conditions, they must also be able to provide the pollination services needed to meet increasing demands for food and retain the capacity to adapt to potential changes in the types of crops grown.

## 13. Treaty?

“Treaty, a binding formal agreement, contract, or other written instrument that establishes obligations between two or more subjects of international law” • Treaties do not need to follow any special form. • A treaty often takes the form of a contract, but it may be a joint declaration or an exchange of notes.

## 14. Strict nature reserve?

Category Ia: Strict Nature Reserve Primary objective To conserve Regionally, Nationally, Globally outstanding ecosystems, Species (occurrences or aggregations), Geo diversity features  
Other Objectives To preserve ecosystems, To secure examples of the natural environment for scientific studies, To minimize disturbance through careful planning, To conserve cultural and spiritual values associated with nature.

Distinguishing features The area should generally: • Have a largely complete set of expected native species. • Be capable of being managed to ensure minimal disturbance. • Be free of significant direct intervention by modern humans. • Have a full set of expected native ecosystems,

largely intact with intact ecological processes, or processes capable of being restored with minimal management intervention.

#### 15. Two applications of Germplasm conservation?

In fact cryopreservation has been successfully applied for germplasm conservation. Plant species e.g. rice, wheat, peanut, sugarcane, coconut. ... Any tissue from a plant can be used for cryopreservation e.g. meristems, embryos, endosperm, ovules, seeds, culture plants.

#### 16. Threatened species of Rann Kutch?

The site supports many locally and globally threatened species, including the great Indian bustard, houbara bustard, sarus crane, and striped hyena and supports more than 1% of the biogeographical population of flamingos.

#### 17. Impact of climate change on IGR?

Invertebrates Genetic Resources Invertebrates include a great number of species that perform valuable functions in agro-ecosystems

#### 18. Threat of FGR?

Forest genetic resources (FGR) are the heritable materials maintained within and among tree and other woody plant species that are of actual or potential economic, environmental, scientific or societal value.

#### 19. Category three define?

: Category III: National Monument-Feature

Definition: Protected areas set aside to protect a specific natural monument. They are generally quite small protected areas and often have high visitor value.

Primary objective To protect specific outstanding natural features. Their associated biodiversity and habitats

#### 20. Ramsar sites of Punjab?

There are three Ramsar sites (wetlands of International importance) in the state- Harike, Kanjli and Ropar. These wetlands are important habitats for waterfowl, fish and diversity of other flora and fauna including endangered and vulnerable species. Two other wetlands- Ranjit Sagar and Nangal are National wetlands.

#### 21. When Nagoya protocol adopted?

The protocol was adopted on 29 October 2010 in Nagoya, Japan, and entered into force on 12 October 2014. It has been ratified by 97 parties, which includes 96 UN member states and the European Union. It is the second protocol to the CBD; the first is the 2000 Cartagena Protocol on Biosafety

#### 22. Issue should not strict nature reserve?

### Category Ia: Strict Nature Reserve

Issues for consideration • There are few areas not under some kind of legal or at least traditional ownership, so that finding places that exclude human activity is often problematic. • Most apparent problem is with climate and air pollution • New and emerging diseases. • In an increasingly modified ecology, it may become increasingly difficult to maintain pristine areas through non-intervention.

### 23. Application storage technique germplasm?

Germplasm are living genetic resources such as seeds or tissues that are maintained for the purpose of animal and plant breeding, preservation, and other research uses. ... Germplasm collections can range from collections of wild species to elite, domesticated breeding lines that have undergone extensive human selection.

### 24. What is botanical garden?

It is a garden dedicated to the collection, cultivation and display of a wide range of plants labeled with their botanical names. It may contain specialist plant collections such as tropical plants, or other species of plants.

### Long 5 Marks

### 25. Social Cluster value of national monument?

Category III areas are likely to hold socio-cultural values as they may have features such as sacred groves, springs, waterfalls, mountains, sea coves etc. of importance to one or more faith groups. These areas are often of significant tourism value and can be managed with the objective of promoting sustainable tourism.

### 26. Explain method processing of sampling in DNA Bank? Method processing sample in DNA bank?

Processing of samples: DNA preserved in DNA banks will be stored either within cells and extracted upon retrieval from storage or extracted from cells and purified before storage. The quality of the DNA is expressed through yield, purity, molecular weight, amplification efficiency and authenticity of sequences. The quality of DNA extracted from plant specimens is dependent on the condition of the specimen before storage, the storage environment and the duration of storage. Rapid drying of plant samples with silica gel or lyophilisation helps to preserve the DNA.

### 27. Conservation role of botanical garden?

The first role of botanical gardens in plant conservation is the horticulture and cultivation functions towards the plants. ... With the better growth of plant, our environment also can become better because plants helps to absorb the carbon dioxide when undergo photosynthesis process.

### 28. Cartagena protocol?

Cartagena protocol was adopted on June 2001 in Cartagena, Spain. It entered into force on September 11th; 2003. Pakistan signed the Cartagena protocol in June 200. Pakistan has ratified it in May 2009

#### Objectives of Cartagena Protocol on Biosafety

• Contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, • It takes into account risks to human health, and specifically focusing on transboundary movements. • It seeks to protect biodiversity from the potential risks of living modified organisms (LMOs) resulting from modern biotechnology.

### 29. Why do forest genetics resources matter?

Diversity of forest genetic resources enables the potential for a species (or a population) to adapt to climatic changes and related future challenges such as temperature changes, drought, pests, diseases and forest fires.

### 30. Name lab of plant genetic resources?

Plant Genetic Resources Institute hosts the sole National Genebank of Pakistan for conservation of plant genetic resources and six labs including

1. germplasm exploration lab
2. seed preservation lab
3. in vitro conservation lab
4. germplasm evaluation lab
5. plant introduction and seed health lab
6. Data management lab

### 31. Limitation of germplasm conservation?

The germplasm conservation through the conventional methods has several limitations such as short-lived seeds, seed dormancy, seed-borne diseases, and high inputs of cost and labour. The techniques of cryopreservation (freezing cells and tissues at -196°C) and using cold storages help us to overcome these problems.

### 32. The services provided by PEPA?

Pakistan Environmental Protection Act, 1997

- Protection
- Conservation,
- Rehabilitation and
- Improvement of the environment;
- PEPA provide framework for prevention and control of pollution
- Helps in protection of sustainable development.

### 33. Impact of Climate changes on FGR? And Climate effect organisms which are changes associate with tree?

Climate change may also result in high variability in temperature and precipitation, with an increase in incidence of extreme events, such as flooding, late frosts and intensive summer droughts, amongst other events. In some areas, such as the Mediterranean and the Neo-tropics, an increase in seasonality is also expected. Under such conditions, natural selection may not result in efficient adaptation because selection pressures are multi-directional, involving traits that may be inversely correlated at the gene level. The standing genetic variation in populations may then not be large enough to create the rare new genotypic combinations that are required. Ecosystems affected by abrupt change may sustain rapid and widespread transformation as ecological tipping points are exceeded. Given the pivotal role of trees in ecosystem function, abrupt climate change impacts on them may thus have profound consequences for forests as a whole. Irreversible loss of ecosystem integrity and function may follow, with replacement by new nonendemic ecosystems.

Effects of changing climate on organisms associated with trees

In particular, changes in the biology of insect pests and diseases may make ecosystems more susceptible to tree mortality. Because of improved environmental conditions for the pest and reduced tree resistance due to increased stress, pests may react to climate change with range expansions and/or increases in attack severity.

### 34. Briefly explain state of world's forest genetic resources. 3

In 2014, the Food and Agriculture Organization of the United Nations published the first State of the World's Forest Genetic Resources. The publication addressed the conservation, management and sustainable use of forest tree and other woody plant genetic resources of actual and potential value for human well-being in the broad range of management systems.

### 35. What are three pillars of Ramsar Convention? 5

Ramsar is one of the global inter-governmental environmental agreements. The treaty was negotiated in 1960s by countries and NGOs. To avoid the increasing loss and degradation of wetland habitat for migratory water birds. In an 18 nations meeting it was adopted in the Iranian city of Ramsar On 2nd February 1971. Came into force in 21<sup>st</sup> December 1975

**The "three pillars" of the convention**

The Contracting Parties (160) commit to:

- Work towards the wise use of all their wetlands.
- Designate suitable wetlands for the list of Wetlands of International Importance.
- Cooperate internationally on transboundary wetlands, shared wetland systems and shared species.



### 36. What is the extreme weather effect on invertebrate's genetic resources? 5

Because of the many ecosystem services that they provide, invertebrates have a key role to play in adapting agriculture to the effects of climate change. The extent to which the individual services provided by invertebrates will be enhanced or impeded by climate change is difficult to predict. However, if invertebrate biodiversity is lost, the capacity of ecosystems to adapt is likely to diminish.

□□Healthy soils – and healthy, diverse soil invertebrate communities – will be vital to climate change adaptation. For example, earthworms help to maintain soil structure and the availability of water throughout the soil profile. Studies have shown that the presence of these animals can help to alleviate the effects of drought on crop Production. Studies have also revealed the remarkable.

ability of diverse soil invertebrate communities to restore the structure of degraded soil. The potential for managing soil invertebrates to enhance their beneficial roles has been little explored. Few if any deliberate attempts have been made to introduce soil invertebrates into new countries or ecosystems. Given the potential for such species to become invasive, it is inadvisable to attempt any such introductions until soil ecology is much better understood than it is today. However, every effort should be made to avoid agricultural practices that disrupt resident soil invertebrate communities and the services they provide.

It is likely that some pests, as they move into new areas in response to climate change, will at least temporarily “escape” from their natural enemies. This is likely to increase demand for classical biological control agents, especially in places where the newly established pest population is separated from its original home by a physical barrier such as the sea or a mountain range. For this reason, access to new classical biological control agents is likely to be particularly important for island countries

### 37. Discuss the impact of climate change on FGR. Also discuss how this changing climate effect organism which is associated with trees? 10

Forest genetic resources are essential for forest-dependent communities who rely for a substantial part of their livelihoods on timber and non-timber forest products (for example fruits, gums and resins) for food security, domestic use and income generation.

#### Forest genetic resources and climate change

Diversity of forest genetic resources enables the potential for a species (or a population) to adapt to climatic changes and related future challenges such as temperature changes, drought, pests, diseases and forest fires. Though forest trees are known for showing great plasticity in their response to climate changes, not all species are naturally capable to adapt at the pace necessary.

Climate change may also result in high variability in temperature and precipitation, with an increase in incidence of extreme events, such as flooding, late frosts and intensive summer

droughts, amongst other events. In some areas, such as the Mediterranean and the Neotropics, an increase in seasonality is also expected. Under such conditions, natural selection may not result in efficient adaptation because selection pressures are multi-directional, involving traits that may be inversely correlated at the gene level. The standing genetic variation in populations may then not be large enough to create the rare new genotypic combinations that are required. Ecosystems affected by abrupt change may sustain rapid and widespread transformation as ecological tipping points are exceeded. Given the pivotal role of trees in ecosystem function, abrupt climate change impacts on them may thus have profound consequences for forests as a whole. Irreversible loss of ecosystem integrity and function may follow, with replacement by new nonendemic ecosystems.

#### Direct impacts of climate change

These include high tree mortality through extreme climatic events, particularly drought in combination with widespread regeneration failure, for example, examined the evidence for anthropogenic climate change leading to future large-scale “dieback” in Amazonian rain forest. Analysis suggested that dryseason water stress is likely to increase in eastern Amazonia over the 21st century, with the region tending toward a climate more appropriate to seasonal forests.

#### Effects of changing climate on organisms associated with trees

In particular, changes in the biology of insect pests and diseases may make ecosystems more susceptible to tree mortality. Because of improved environmental conditions for the pest and reduced tree resistance due to increased stress, pests may react to climate change with range expansions and/or increases in attack severity.

Changes in abiotic disturbance regimes:

These include changes in fire regimes, flooding, landslides and/or hurricanes. Fire and climate are closely linked and are also associated with changes in land use. Coupled climate and fire-risk models suggest not only an increase in the frequency of fires but also in fire size and length of the fire-risk season, with some areas subject to risk that were not before. Malhi et al. (2009) considered how tipping points may be reached in Amazonian rainforest by a combination of increased dryness and an increased incidence of fire events

#### Invasion by organisms foreign to local ecosystems

This includes the increased risk of establishment by invasive species which accidentally arrive into ports of entry, through globalized commerce. By making new niches available, climate change will facilitate the survival of mammals, insects, diseases and/or weeds foreign to endemic ecosystems.

### 38. What areas are covered by Cartagena protocol?

#### The Bio safety (Protocol to CBD) deals with;

Safe handling, Storage Trans-boundary movement of the Genetically Modified Organisms (GMO).
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Cartagena protocol was adopted on June 2001 in Cartagena, Spain. It entered into force on September 11th; 2003. Pakistan signed the Cartagena protocol in June 200. Pakistan has ratified it in May 2009

### Objectives of Cartagena Protocol on Biosafety

The Protocol states that it aims to;

- Contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity,
- It takes into account risks to human health, and specifically focusing on transboundary movements.
- It seeks to protect biodiversity from the potential risks of living modified organisms (LMOs) resulting from modern biotechnology.
- Cartagena Protocol areas
- The Protocol covers:
- Transboundary movement, transit, handling and use of all living modified organisms that may

have adverse effects on the conservation and sustainable use of biological diversity, taking into account risks to human health. It does not cover:

- Products derived from LMOs (e.g. paper from GM trees)
- LMOs, which are pharmaceuticals for humans that are addressed by other relevant international agreements or organizations

### 39. Briefly explain historical background of Ramsar convention. 3

History: Ramsar is one of the global inter-governmental environmental agreements. The treaty was negotiated in 1960s by countries and NGOs. To avoid the increasing loss and degradation of wetland habitat for migratory water birds. In an 18 nations meeting it was adopted in the Iranian city of Ramsar

On 2nd February 1971. Came into force in 21<sup>st</sup> December 1975

### 40. Describe purpose of panel code. 2

The polluter of the environment can be punished under this code for certain types of pollution. These punishment are of following types;

- Punishment for water pollution
- Punishment for atmospheric pollution
- Punishments for general pollution

### 41. What is location of cholistan wildlife sanctuary? 2

It is part of the Cholistan desert in the south eastern portion of the province of Punjab. It contains some of the most rare and interesting wildlife in Pakistan. Some of the rare animals of this region are Desert wolf (rare), Indian fox, Red fox, Jackal, Small Indian civet, Small Indian mongoose, Indian grey mongoose, Indian desert cat, Jungle cat, Caracal cat, Saker falcon, Black backed vulture, Indian cobra, Monitor lizard, Saw scaled viper and Russells viper.

#### 42. Mission of Ramsar convention.

"The conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world.

#### 43. What is botanical garden? (2)

It is a garden dedicated to the collection, cultivation and display of a wide range of plants labeled with their botanical names. It may contain specialist plant collections such as tropical plants, or other species of plants.

Types of plants in botanical gardens 1.

cacti and succulent plants.

2. herb gardens.

3. greenhouses, shade houses

#### 44. Define forest genetic resources? (2)

Forest genetic resources are essential for forest-dependent communities who rely for a substantial part of their livelihoods on timber and non-timber forest products (for example fruits, gums and resins) for food security, domestic use and income generation.

#### 45. On how many tinypoly tress rely on maintain the climate? (2)

Tree populations rely on three interplaying mechanisms to respond to environmental change:

1. adaptation

2. Migration

3. phenotypic plasticity

#### 46. Write the variations in variation gene? (3)

There are three primary sources of genetic variation, which we will learn more about:

- Mutations are changes in the DNA. ... □ Gene flow is any movement of genes from one population to another and is an important source of genetic variation.

- Sex can introduce new gene combinations into a population.

#### 47. Define seed storage? (3)

Storage of seed is indispensable to most of plantation forestry, and the practice should not be dismissed too readily as a basic tool in maintaining genetic diversity. Conventional seed storage offers several advantages:

1. Seeds of many valuable species can survive long-term storage ('longterm' is defined as spanning a period of time longer than one rotation)
2. Good storage facilities are now available in most of the world, and they are used extensively for tree seed storage for various regeneration purposes;
3. Seed storage is a relatively cheap method for conserving a broad range of germplasm
4. Large land areas are not tied up in conservation
5. International exchange of genetic material is facilitated by seed storage.

#### 48. Write note on convention of botanical garden? (5)

A botanical garden or botanic garden is a garden dedicated to the collection, cultivation and display of a wide range of plants labeled with their botanical names.

Types of plants in botanical gardens 1.

cacti and succulent plants.

2. herb gardens.

3. greenhouses, shade houses.

4. tropical plants.

5. Medicinal Plants.

6. aromatic or textile plants

7. other exotic plants.

science.

**Importance of Botanical garden 1- Enjoyment 2- Economic 3- Scientific research**

Botanic gardens contain collections of plants for education, scientific purposes and display; they can be: taxonomically-based - collections of a particular family, genus or group of cultivars; or collections of native plants; or useful species such as medicinal, aromatic or textile plants.

#### **4- Conservation**

Conservation of rare and threatened plants. The conservation of plant diversity is critical for sustainable development and botanic gardens are playing a key role as centers of conservation action. Botanical gardens can promote diversity. Because they include many species of plant.

## 5- Climate Change

Plants can alter the temperature of the Earth's atmosphere. Through the process of photosynthesis, plants use energy from the sun to draw down carbon dioxide from the atmosphere and then use it to create the carbohydrates they need to grow. Since carbon dioxide is one of the most abundant greenhouse gases, the removal of the gas from the atmosphere may temper the warming of our planet as a whole. \*transpiration in plants can increase water vapor in the atmosphere, causing more precipitation and cloud cover in an area. The additional cloud cover often reinforces the cooling by blocking sunlight. \*Contribute to soil fertility and prevent soil erosion.

### 49. What is cold storage. Discuss? (5)

Cold storage - it involves storage in low and non freezing temperature.

#### Slow Freezing- Slow thawing

With this method organs are labeled into vials after equilibration with a cryoprotectant solution and then cooled at rate of 0.5-2 °C per minute down to -1 °C. Seeding is then induced and a holding period of 5 to 15 minutes allows equilibration of the temperature. Thereafter embryos are cooled to -60 °C or lower at a rate of 0.3 to 0.5 °C per minute before being transfer to liquid nitrogen. Frozen embryos must be slowly thawed at a rate of less than 25 °C per minute to prevent osmotic shock

#### 2. Rapid cooling and rapid thawing

In this technique , however cooling is terminated at -30 to -40 °C and embryos are then plunged into liquid nitrogen for rapid cooling to -196 °C. Thawing is therefore performed rapidly (200 to 500 °C per minute) to prevent recrystallization

#### 3. Vitrification

Vitrification is the process of cooling where the water in the tissue becomes glass rather than crystals. Glass is a liquid that is too cold (too viscous) to flow. In other words vitrification is solidification due to increased viscosity rather than crystallization.

#### 4. Ultrarapid Freezing

In this technique serial equilibration of embryos in high concentration of DMSO (3-5 M) supplemented with sucrose (0.3 to 0.5 M). The embryos are then plunged into liquid Nitrogen. Thawing is then done with warm water bath ( approximately 500 °C per minute).

### 50. name physical method for storage

There are various methods of storage :

1. Cryopreservation - generally involves storage in liquid nitrogen.
2. Cold storage - it involves storage in low and non freezing temperature.
3. Low pressure - it involves partially reducing the atmospheric pressure of surrounding.

4. Low oxygen storage - it involves reducing the oxygen level but maintaining the pressure.

## 51. primary objectives of national park

Primary objective

To protect natural biodiversity along with its underlying ecological structure.

*Other objectives*

- To manage the area in order to perpetuate, in as natural a state as possible.
- To maintain viable and ecologically functional populations.
- To contribute to local economies through tourism.
- To manage visitor use for inspirational, educational recreational purposes.

## 52. Rann of Kutch wildlife sanctuary

*Rann of Kutch Wildlife Sanctuary*

It spread over 566,375 ha is part of the great Thar desert and comprises. Rann of Kutch across the frontier with India, which includes permanent saline marshes, coastal brackish lagoons, tidal mudflats, and estuarine habitats. The site supports many locally and globally threatened species, Threatened species include the Great Indian bustard, Houbara bustard, Sarus crane this area used to have the only population of the Indian Wild Ass or Onager in Pakistan.

## 53. phenotypic plasticity

*The role of phenotypic plasticity*

Phenotypic plasticity is defined as the capacity of a particular genotype to express different phenotypes under different environmental conditions. The concept is often extended to populations and species. With plastic trees those with flexible morphology and physiology that grow at least reasonably well under a range of different environmental stresses without genetic change. A degree of phenotypic plasticity is found in most trees, but varies substantially amongst and within species. Even in species with very little genetic diversity, such as *Pinus pinea*, strong phenotypic plasticity is expressed for growth-related traits, which may have helped the species colonise new environments. At least in the short term, high plasticity is likely to favour tree survival under changing environmental conditions, although trade-offs between traits can be expected. Since phenotypic plasticity has a heritable basis and may be selected for under changing environments, complex interactions between traits are possible, depending on the magnitude and structure of change.

## 54. Write two derived resources 2

2. Derived Genetic Resources

- Obsolete varieties



- Breeding lines with particular genes and performances
- Advanced cultivars
- Parents of hybrid varieties
- Cytogenetic stocks/ tester ➤ Mutants

#### 54. What are the needs of genetic preservation 2

A genetic preservation is the first step in the cloning process, allowing you to produce an identical genetic twin or clone, which will be born at a later place in time.

A genetic preservation serves as an insurance policy for breeders and owners of valuable cattle by enabling them to extend and develop a specific bloodline when additional production is needed or untimely losses or reproductive inabilities occur.

The DNA, cryogenically preserved from the tissue sample, can permanently store the genotype of the elite donor animal, providing a genetic blueprint to recreate that cow, bull, heifer - or even a steer - at any time in the future.

#### 55. Define tertiary gene pool 3

Tertiary gene pool

- Members of this gene pool are more distantly related to the members of the primary gene pool. The primary and tertiary gene pools can be intermated, but gene transfer between them is impossible without the use of "rather extreme or radical measures" such as:
- Embryo rescue (or embryo culture, a form of plant organ culture)
- Induced polyploidy (chromosome doubling)
- Bridging crosses (e.g., with members of the secondary gene pool)

#### 56. What is pakistan animal resource management program 3

Pakistan is endowed with diverse livestock genetic resources. In fact, it is postulated that one of the centers of animal domestication lies in this part of the world. Pakistan has nearly 50 million goats. Goats are kept for milk and meat production and contribute significantly to the income of the rural farmers.

Snow Leopard	
□□	Alpine Markhors

The primary objectives<sup>5</sup> of the Roundtable were to:

- provide a forum for senior livestock scientists and developers for the exchange of views and experiences; and

- raise the level of awareness of a far wider and influential audience with regard to the potential and the constraints facing animal agriculture in low income countries.

<sup>5</sup> This sections draws on the initial presentation of Simeon Ehui, who was the principal organizer of the Roundtable at ILRI

#### Specific immediate objectives

The immediate objectives of the Roundtable were to:

- review the contribution and potential of livestock to increase sustainable food production, and contribute to income generation in low income countries with a forward perspective to 2020 ("The Global 2020 Vision for Livestock");
- identify major social, economic, technical and institutional constraints limiting livestock's contribution to achieving food security and economic development; and
- define appropriate strategies to alleviate these constraints and propose a framework for international action to enhance animal productivity in its broadest sense.

#### Expected outputs

The expected outputs of the Roundtable were:

- an analysis of past and present trends in livestock productivity and consumption of livestock products which would be used in part as an input to a "2020 Vision" paper to be further developed after the meeting;
- a statement of a defined set of objectives within the time frame specified and a related description of the constraints that must be overcome for the objectives to be achieved; and
- formulation of the set of measures ("a framework for action") or strategies needed for increasing livestock productivity in low income countries and securing better management of the natural resource base from the present to the end of the second decade of the 21st century.

## 57. What is phenylketonuria? 2

### Phenylketonuria (PKU)

It is a human genetic condition caused by mutations to a gene coding for a particular liver enzyme. In the absence of this enzyme, an amino acid known as phenylalanine does not get converted into the next

amino acid in a biochemical pathway, and therefore too much phenylalanine passes into the blood and other tissues. Change in environment (lowering Phenylalanine consumption) can affect the phenotype of a particular trait, demonstrating a gene-environment interaction

Define threatened species? 2

Threatened species are any species (including animals, plants, fungi, etc.) which are vulnerable to endangerment in the near future. Species that are threatened are sometimes characterized by the population dynamics measure of critical dispensation, a mathematical measure of biomass related to population growth rate

State 2 quarantine principle? 2

Isolation and quarantine help protect the public by preventing exposure to people who have or may have a contagious disease. ... Quarantine separates and restricts the movement of people who were exposed to a contagious disease to see if they become sick

Modern quarantine does not have to be absolute to be effective

- Even partial or “leaky” quarantine can reduce disease spread
- Partial quarantine can be an effective supplement to vaccination

## 58. Explain habitat loss cause of extinction? 3

Habitat destruction is the process in which natural habitat is rendered unable to support the species present. In this process, the organisms that previously used the site are displaced or destroyed, reducing biodiversity. ... Habitat destruction is currently ranked as the primary cause of species extinction worldwide.

## 59. What are molecular markers? 3

In genetics, a molecular marker (identified as genetic marker) is a fragment of DNA that is associated with a certain location within the genome. Molecular markers are used in molecular biology and biotechnology to identify a particular sequence of DNA in a pool of unknown DNA.

RFLP (or Restriction fragment length polymorphism)

SSLP (or Simple sequence length polymorphism)

AFLP (or Amplified fragment length polymorphism)

- 
- 
- RAPD (or Random amplification of polymorphic DNA)
- VNTR (or Variable number tandem repeat)

## 60. What are three common functions of quarantine? 3

Quarantine practices in most countries have at least three common functions.

- a. The first is exclusion or regulatory actions to prevent or reduce the risk of entry of exotic pathogens, pests, or parasites along artificial pathways.
- b. Second is the containment, suppression, or eradication of pests or pathogens that have been recently introduced.
- c. Third is the assisting of exporters to meet the quarantine requirements of importing countries.

## 61. What are mechanism of cryopreservation name steps? 5

Until two decades ago the genetic resources were getting depleted owing to the continuous depredation by man. It was imperative therefore that many of the elite, economically important and endangered species are preserved to make them available when needed. Many methodologies have been devised for long term preservation of material.

**Cryo-preservation**

Cryo is Greek word. (krayos – frost). It literally means preservation in “frozen state.”

Cryo-preservation or cryo-conservation is a process where organelles, cells, tissues, extracellular matrix, organs or any other biological constructs susceptible to damage caused by unregulated chemical kinetics are preserved by cooling to very low temperatures (typically -80 °C using solid carbon dioxide or -196 °C using liquid nitrogen)

Cryopreservation can be done at

Over solid carbon dioxide (at -79 degree) Low temperature deep freezer (at -80 degree)

In vapor phase nitrogen ( at -150 degree)

In liquid nitrogen (at -196 degree)

## 62. DNA Bank. 5

DNA banks can now be considered as a means of complimentary conservation. DNA storage is particularly useful for those species that cannot be conserved in traditional seed or field genebanks and nor conserved in situ due to high risk in that area.

**Advantages**

DNA banking is an efficient, simple and long-term method to conserve the genetic information.

**Disadvantages**

There are problems with subsequent gene isolation, cloning and transfer of DNA back to a plant and it currently does not allow the regeneration of the same genotype as the original sample. **Storage strategy**

Determining what to store and for how long is an important consideration, used to determine sample size, capacity of the DNA bank, preparation of samples and documentation. Long-term needs and expected volume and number of samples to be stored will determine organization and repository design.

**Processing of samples**

DNA preserved in DNA banks will be stored either within cells and extracted upon retrieval from storage or extracted from cells and purified before storage. The quality of the DNA is expressed through yield, purity, molecular weight, amplification efficiency and authenticity of sequences. The quality of DNA extracted from plant specimens is dependent on the condition of the

specimen before storage, the storage environment and the duration of storage. Rapid drying of plant samples with silica gel or lyophilisation helps to preserve the DNA. Storage  
Once extracted DNA is a stable biomolecule, although it can easily be degraded during extraction and storage. Quality declines within days in hydrated samples held at room temperature or in refrigerators. Drying the sample or storing it in freezers or liquid nitrogen achieves better preservation of DNA molecular size. For this reason, DNA is better conserved in a form that is close to the original state and most DNA banks store cells or tissues and extract DNA upon request.

There is little information on the long-term stability of extracted DNA during frozen storage, but most repositories consider several years to decades as realistic. Information on the stability of purified DNA dissolved in buffer suggests that the overall fragment size decreases with storage time, and that the usefulness of the specimen for PCR-based assays may be 1–2 years when stored at 4 °C, 4–7 years when stored at -18 °C and greater than 4 years when stored at -80 °C (Madisen et al. 1987; Visvikis et al. 1998).

The choice of temperature usually depends on the moisture level within the sample

### 63. Difference b/w in breeding and out breeding. 5

Inbreeding:

“Inbreeding, the mating of individuals or organisms that are closely related through common ancestry.”

Outbreeding:

“The intentional breeding of distantly related or unrelated individuals for the purpose of producing offspring of superior quality.”

### 64. Biological diversity. 2

Biodiversity, a portmanteau of biological (life) and diversity, generally refers to the variety and variability of life on Earth. According to the United Nations Environment Programme (UNEP), biodiversity typically measures variation at the genetic, species, and ecosystem level.

### 65. Define extinction?

“A species becomes extinct when the last existing member of that species dies.”  
Extinction, in biology the dying out or termination of a species.

### 66. Germplasm Conservation 10

In 1972, conservation of habitats rich in genetic diversity was recommended in the UN conference. Then an International Board for Plant Genetic Resource (IBPGR) was established. This board has objectives to provide necessary support for collection, conservation and utilization of plant genetic resources from anywhere in the world. (a) In situ Conservation:

Since 1980, in situ conservation has received high priority in the world conservation strategy. The method of conservation is to preserve land races with wild relatives in which genetic diversity exists. (b) Ex situ Conservation

It is the chief mode of conservation of genetic resources including both cultivated and wild ones. Under suitable conditions genetic resources are conserved for a long term as gene bank. Such gene bank is of two types:

o In vivo Gene Bank o In vitro

Gene Bank (i) In vivo Gene Bank:

Generally plant seeds, vegetative propagules are used for storage for long time. The whole plants are preserved. This type of conservation strategy is called in vivo gene bank. In this approach, conservation method of storage is used for preservation of plant genetic resources (ii) In vitro Gene Bank:

3. This approach includes the conservation of genetic resources by non-conventional methods. In this approach explants are grown on medium.

Methods of Preservation

Free Preservation or Cryopreservation:

Cryopreservation (Latin Kuos means frost) means storage of materials at very low temperature. Plant cells and tissue cultures are brought to zero state of metabolism by subjecting them to ultra-low temperature i.e.  $-196^{\circ}\text{C}$ . It is done by using liquid nitrogen which provides approximately  $-496^{\circ}\text{C}$ . Cryoprotectants (e.g. glycerol, proline, mannitol, dimethylsulfoxide, sorbitol) are also used to protect the viable cells from the damage during freezing and thawing (to become unfrozen or warm). Germplasm of some plants (in the form of shoot tips, nodal or meristem explant culture) are stored at low and nonfreezing temperature ( $1-9^{\circ}\text{C}$ ). At low temperature, growth of plant material is slow down but not completely stopped as in cryo-preservation. In cold storage there is no risk of cold injuries.

Low-pressure and Low-oxygen Storage:

For conservation of cultured plant materials low-pressure storage (LPS) and low-oxygen storage (LOS) have been developed. These are alternative methods of cryopreservation and cold storage.

## 67. Germplasm Exploration Laboratory 5

### Germplasm Exploration Laboratory:

Plant exploration is the avenue to germplasm for crop improvement, which cannot be obtained by exchange. The spread of improved varieties has resulted in the loss of indigenous crop genetic diversity. Whereas, industrialization and urbanization has seriously damaged the natural environment of crop plants. Human population is rapidly eroding the reservoir of genetic diversity. Habitats are disappearing at an alarming rate as forests are cleared, roads and cities expand, grasslands are plowed, burned and overgrazed, land is inundated by lakes impounded

by new dams and new lands are irrigated for increased production of modern cultivars. The face of the earth is changing at an accelerating and alarming rate; and as it changes, more genetic diversity is lost forever. The Plant Exploration Laboratory has organized more than hundred expeditions in different agro-ecological regions of Pakistan to collect the targeted plant species. The main emphasis is to collect the major crops and their wild relatives as these species are under threat

## 68. Gene flow 5

Gene Flow:

“The introduction of genetic material (by interbreeding) from one population of a species to another” Vertical Gene transfer: “The transfer of genes from parents to offspring.” Horizontal gene transfer:

“Horizontal gene transfer is known to occur between different species, such as between prokaryotes and eukaryotes, between the three DNA-containing organelles of eukaryotes, the nucleus, the mitochondrion and the chloroplast.

## 69. Steps for conservation of plant genetic resources 5

The Global Strategy for Plant Conservation

The Global Strategy for Plant Conservation (GSPC) is a program of the UN's Convention on Biological Diversity founded in 1999. It is a Plan to Save the World's Plant Species - grew out of the Convention on Biological Diversity and is being fed into government policy around the world. Vision of GSPC:-

“Without plants, there is no life. The functioning of the planet, and our survival, depends on plants. The Strategy seeks to halt the continuing loss of plant diversity”

Objectives:

The GSPC highlights the importance of plants and the ecosystem services they provide for all life on earth, and aims to ensure their conservation. The GSPC has 5 main objectives:

1. Plant diversity is well understood, documented and recognized
2. Plant diversity is urgently and effectively conserved
3. Plant diversity is used in a sustainable and equitable manner
4. Plant diversity is used in a sustainable and equitable manner
5. The capacities and public engagement necessary to implement the strategy have been developed.

## 70. Critical Endangered Species.

A critically endangered (CR) species is one which has been categorized by the International Union for Conservation of Nature (IUCN) as facing an extremely high risk of extinction in the wild.



Examples:

Eastern Lowland Gorilla

Hawksbill Turtle

Javan Rhino

### 71. Game Reserve(2)

“A game reserve is an area wherein controlled hunting and shooting is permitted on permit basis”

- A game reserve (wildlife preserve) is a large area of land where wild animals live safely or are hunted in a controlled way for sport.
- In the game reserves the major focus is specifically the animals.

### 72. Name of second largest national park (2)

Kirthar National Park is the second largest national park of Pakistan spread over an area of 3000 square kilometers.

### 73. Define strict nature reserve.2 marks

Protected areas that are strictly set aside to protect biodiversity where human visitation, use and impacts are strictly controlled to ensure protection of the conservation values.

### 74. Define phenotypic plasticity.2 marks

Phenotypic plasticity is defined as the capacity of a particular genotype to express different phenotypes under different environmental conditions.

### 75. Assisted migration.2

Assisted migration involves human movement of tree seed and seedlings from current locations to sites modelled to experience analogous environmental conditions in the future. Assisted migration may be undertaken over long distances, or just beyond the current range limit of particular genotypes and populations, or within the existing range.

### 76. Central goal of zoo.2

Unfortunately not all zoos are scientific in nature, and extreme controversy has arisen regarding how the animals are treated. Suffice to say, regulation is necessary to ensure proper care. Conservation (not exploitation) should always be the central goal behind any legitimate zoo. Zoos provide the opportunity for people to see a glimpse of this side of nature. Zoo plays important role in conservation of many threatened/endangered species.

### 77. Role of earthworm in soil 2

earthworms help to maintain soil structure and the availability of water throughout the soil profile. Studies have shown that the presence of these animals can help to alleviate the effects of drought on crop Production. Studies have also revealed the remarkable ability of diverse soil invertebrate communities to restore the structure of degraded soil. The potential for managing soil invertebrates to enhance their beneficial roles has been little explored.

### 78. Types of gene bank(2)

Under suitable conditions genetic resources are conserved for a long term as gene bank. Such gene bank is of two types:

1. In vivo Gene Bank
2. In vitro Gene Bank

#### 11. Disadvantages of Dna bank?

There are problems with subsequent gene isolation, cloning and transfer of DNA back to a plant and it currently does not allow the regeneration of the same genotype as the original sample.

### 79. Clonal repository 2

Clonal repository is field Genebank where genetic resources of clonally propagated crops like fruits are preserved as living plants. Various institutions are involved in the capacity building to develop AnGR, in the country.

### 80. Two types of cryoprotectants 2

Membrane permitting which can freely diffuse the membrane such as glycerol (G), ethylene glycol (EG) and dimethyl sulfoxide (DMSO)

Non Membrane permitting which cannot permeate the cell membrane such as sugars

### 81. Maximum temp 4 cryopreservation 2

Maximum temperature of cryopreservation is -196°C.

3 marks;

### 82. Different variation of gene variation (3)

- Genetic refers to variation of genetic DNA origin, and variation of genes at different levels:
  1. variation between species,
  2. variation between populations within species
  3. variation between individual trees within populations. The largest variation is between species, and loss of whole species is therefore also the most dramatic loss of future options.
- Resources refers to the use of genetic variation—in the broad sense stated above—considered to be of potential value for humans at present or in the future.

### 83. Name of physical growth limitations in median term storage (3)

Physical growth limitation

- Low temperature
- Low light/restricted photoperiod
- Minimal containment
- Minimal O<sub>2</sub>
- Osmotic (water) stress

### 84. Objective of category 6(3)

Primary objective

- To protect natural ecosystems.
- Use natural resources sustainably, when conservation and sustainable use can be mutually beneficial.

### 85. Biodiversity of habitate- species managemt area.3 marks

Definition: IUCN Management Category IV (Habitat/Species Management Area) refers to areas that are managed to protect particular species or habitats. They are defined by IUCN as “protected areas aiming to protect particular species or habitats and management reflect this priority.

### 86. State of worlds forest genetic resources.3

In 2014, the Food and Agriculture Organization of the United Nations published the first State of the World's Forest Genetic Resources .The publication addressed the conservation, management and sustainable use of forest tree.

### 87. Ramsar sites of panjab.3

- Uchhali Complex
- Taunsa Barrage
- Chashma Barrage

### 88. Criteria of national park.3

Distinguishing features

- The area should contain representative examples of major natural regions, and biological and environmental features or scenery.
- It should be of sufficient size to maintain ecological processes.

- The composition, structure and function of biodiversity should be to a great degree in a “natural” state.

### 89. Role of national park in landscap and seascap(3)

- Protecting some of the earth's richness that will not survive outside.
- Protecting additional ecosystem services.
- Providing areas where ecosystems can be studied in as pristine an environment as possible.
- Protecting natural sites that are also of religious and cultural significance.

### 90. CBD history ?3

Cartagena protocol was adopted on June 2001 in Cartagena, Spain. It entered into force on September 11th; 2003. Pakistan signed the Cartagena protocol in June 200. Pakistan has ratified it in May 2009.

### 91. Three pillars of Ramsar site?

The “three pillars” of the convention  
The Contracting Parties (160) commit to:

- Work towards the wise use of all their wetlands. - Designate suitable wetlands for the list of Wetlands of International Importance.
- Cooperate internationally on transboundary wetlands, shared wetland systems and shared species.

### 92. Founder effect 3 examples 3

In population genetics, the founder effect is the loss of genetic variation that occurs when a new population is established by a very small number of individuals from a larger population

#### □ The Amish People

Around 200 German immigrants settled in Pennsylvania within community marriages. Developed syndrome named Ellis-van Creveld syndrome.

#### □ Sickle Cell Disease

For most of humanity's existence, sickle cell disease usually meant an early death, most likely as a young child. (It still does in underdeveloped nations.) In fact, the average life span for a sufferer in the US in 1973 was only 14 years. Now it's 40–60 years in the US. The cause of this disorder: genetic changes meant to protect against malaria. As a result, those who suffer from sickle cell disease overwhelmingly come from tropical areas or places where malaria is common.

## □ Huntington's Disease

Huntington's disease (aka Huntington's chorea) is a genetic disorder which results in slowly progressing brain cell death. There are two distinct populations in which the disorder occurs much more often.

1. The first group is the Afrikaner population of South Africa.
2. The second group is the residents of the Lake Maracaibo region of Venezuela.

### 93. 3 causes of extinction 3

#### □ Climate Change

Almost half of plant and animal species have experienced local extinctions due to climate change. Global warming could trigger not just local but global extinctions of animals and plants. Species already threatened by habitat destruction, pollution, alien invasion and overhunting are more vulnerable to climate change. Diversity of species in any one ecosystem could be affected by rises in average temperatures or a shift of climate regime □ Habitat destruction

Deforestation has killed off more species than we can count. Rainforest can disappear in the next 100 years if deforestation is not stopped. 13 million hectares of forest have been converted or destroyed Coral reefs are also threatened Reefs are home to 25% of marine animal. To date, 27% of coral reefs have been destroyed.

#### □ Lack of genetic diversity

When species starts dwindling in numbers, there's a smaller pool of available mates. Dwindling population of African cheetah's suffers from unusually low genetic diversity. Thus may lack the resiliency to survive another major environmental disruption.

### 94. Strategy of DNA banks 3

#### Storage strategy

Determining what to store and for how long is an important consideration, used to determine sample size, capacity of the DNA bank, preparation of samples and documentation. Long-term needs and expected volume and number of samples to be stored will determine organization and repository design.

### 95. Objectives of CBD

#### Objectives of CBD, 1992

The three inter-related objectives are:

- The conservation of biological diversity; □ The sustainable use of its components;
- The fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate
  - Access to genetic resources,
  - Transfer of

relevant technologies, -  
Funding.

### 96. Three botanical gardens

1. cacti and succulent plants.
2. herb gardens.
3. greenhouses, shade houses.

5 marks:

### 97. Application of cryopreservation

#### ☐ In Animal Husbandry

The introduction of cryopreservation technology leads a major breakthrough in animal husbandry. Since the 1st successful cryopreservation of bull semen has been used to propagate the rare and endangered species using assisted reproduction techniques.

#### ☐ In fishery science

The 1st report on fish sperm cryopreservation was published by Blaxter (1953). To date milt (semen) of over 200 species of fresh water and marine fish have been cryopreserved and have been adequated for the purpose of cryobanking(10,11,12) . In fish aquaculture the successful cryopreservation of gametes and embryos could offer new commercial possibilities, allowing the unlimited production of fry and potentially healthier and better conditioned fish as required

#### ☐ In medical science

Low temperature have been used in medicine and to prevent food spoilage since ancient time. Now- a- days it is used in fertility treatment the transport of human organs and the long- term storage of biological specimens, either for future or simply as a record of biodiversity.

#### ☐ Cryopreservation of testicular tissue

Cryopreservation of immature testicular tissue is a developing method to avail reproduction to young boys who need to have gonado toxic therapy

#### ☐ Embryo cryopreservation

Embryo cryopreservation is used most often to store goodquality excess embryos resulting from an IVF treatment cycle. Embryos can be stored for a patient who elects to have her eggs fertilized with donar sperms. Pregnancies have been reported from embryos stored for 16 years

### 98. Processing of sample in Dna bank?

DNA preserved in DNA banks will be stored either within cells and extracted upon retrieval from storage or extracted from cells and purified before storage. The quality of the DNA is expressed through yield, purity, molecular weight, amplification efficiency and authenticity of sequences. The quality of DNA extracted from plant specimens is dependent on the condition of the specimen before storage, the storage environment and the duration of storage. Rapid drying of plant samples with silica gel or lyophilisation helps to preserve the DNA.

### 99. Features of habitat species management area (5)

- ✓ Protection of particular species
- ✓ Protection of habitats
- ✓ Active management to maintain target species
- ✓ Active management of culturally-defined ecosystems

### 100. Link between climate change and botanical garden.5 marks

Plants can alter the temperature of the Earth's atmosphere. Through the process of photosynthesis, plants use energy from the sun to draw down carbon dioxide from the atmosphere and then use it to create the carbohydrates they need to grow. Since carbon dioxide is one of the most abundant greenhouse gases, the removal of the gas from the atmosphere may temper the warming of our planet as a whole. \*transpiration in plants can increase water vapor in the atmosphere, causing more precipitation and cloud cover in an area. The additional cloud cover often reinforces the cooling by blocking sunlight. \*Contribute to soil fertility and prevent soil erosion.

### 101. Pakistan terrestrial water and maritime zone act.5

It includes provisions for preservation, development and protection of marine environment

- This law controls marine pollution and exploration, development, conservation and management of living resources in Pakistan's Exclusive Economic Zone (EEZ)
- This law means that a ship carrying nuclear and hazardous substances will have to inform the Government of Pakistan.

### 102. Effect of climate change on invertebrate genetic resource

Extreme weather events such as heat waves, droughts and floods – which are predicted to increase in frequency due to climate change – are often followed by pest outbreaks. Among other contributing factors, these outbreaks can occur because the extreme event eliminates or weakens a pest's natural enemies.

### 103. Purpose of CBD 5

- CBD is about the conservation and wise use of different biological resources (plants and animals). □ It was adopted in 1992 at Rio De Janeiro, Brazil and entered force on January, □ 1993, which was 90 days after the 30th ratification.
- Pakistan signed it in June 1992 at United Nations Conference on Environment and Development held at Rio De Janeiro, Brazil
- Pakistan ratified it on 26th July 1994.
- The Convention on Biological Diversity covers biodiversity at all levels:
- Ecosystems,
- Species
- Genetic resources
- It also covers biotechnology, including through the Cartagena Protocol on Biosafety.



- In fact, it covers all possible domains that are directly or indirectly related to biodiversity and its role in development, ranging from science, politics and education to agriculture, business, culture and much more.

#### 104. Strategies followed by effective conservation of AnGR(05)

Following strategies should be followed for effective conservation and utilization of AnGR:

1. Formulating the National Livestock and wild-life Breeding Policies.
2. Encouraging the Formation of Breed Associations.
3. Developing Professional Human Resources.
4. Strengthening Research and Development Institutions
5. Developing Infrastructure for marketing International co-operation and assistance is needed in capacity building to remodel available livestock farms/research stations to conserve and develop genetic resources

#### 105. Future of cryopreservation (5)

Vitrification method of cryopreservation may bring new opportunities to research protocols. It is still an experimental procedure. There are two major concerns about vitrification - toxicity of high concentration of cryoprotectants used and microbial contamination of liquid nitrogen. Several IVF programs have adopted the vitrification method as the sole procedure for day-3 human embryos and for human blastocysts, with excellent survival and pregnancy rates. The challenge now is to find a protocol to successfully vitrify human oocytes for which the slow freezing method has yet to produce acceptable.

#### 106. Why do forest genetic resources matter?5

The high levels of genetic variation that are present within many tree species can be beneficially developed and used by foresters and tree growers. Whereas agricultural crop breeders and farmers often substantially modify the growing environment to suit a specific crop species or variety, tree growers commonly identify species and provenances which can provide some improved levels of the goods and services required even without intensive selection and improvement, or intense management requirements, or major modification of the external environment.

#### 107. Cryopreservation method?5

There are four different types of methods :

- 1 Slow freezing method- the tissue or plant material is slowly frozen at slow cooling rate. The advantage is the plant cells are partially dehydrated and survive better.
2. Rapid freezing method - it involves plunging the vials in liquid nitrogen. The temperature decreases from -300 to -1000 degree rapidly.

3. Combined freezing method - this is combination of both slow and rapid freezing method. The process is carried out in step wise like manner.
4. Dry freezing method - in this method dehydrated cells and seeds are stored.

### **108. Animals included in quarantine 5**

Animal and plant quarantine programs are intended to protect agriculture from the threat of entry of exotic hazardous organisms. In some countries this objective may be extended to the protection of natural domestic flora and fauna. Both types of programs regulate the importation of living individuals

The general concepts and objectives of plant and animal quarantine are similar; but differences in biology, agricultural production, marketing, exporting, and importing necessitate a variety of quarantine procedures. Animal and plant quarantine procedures. Animal and plant quarantine programs are intended to protect agriculture from the threat of entry of exotic hazardous organisms. In some countries this objective may be extended to the protection of natural domestic flora and fauna.

### **109. Laws of environmental resources 5**

Some major laws dealing with different resources present in environment are as follow;

- Pakistan Environmental Protection Act, 1997
- Pakistan Penal Code, 1860
- Forest Act, 1927
- Pakistan Terrestrial Water & Maritime Zones Act, 1976

#### **1. Pakistan Environmental Protection Act, 1997**

PEPA provides for;

- Protection,
- Conservation,
- Rehabilitation and
- Improvement of the environment;
- PEPA provide framework for prevention and control of pollution
- Helps in protection of sustainable development.

#### **2. Pakistan Penal Code, 1860**

The polluter of the environment can be punished under this code for certain types of pollution.

These punishment are of following types;

- Punishment for water pollution
- Punishment for atmospheric pollution
- Punishments for general pollution

### 3. Forest Act, 1927

- This law empowers provincial governments to manage forests under their area.
- The government can reserve the state-owned forest land, assume control of privately owned forest land and declare any government owned land in a protected area.
- It prohibits the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling.

### 4. Pakistan Terrestrial Water & Maritime Zones Act,1976;

- It includes provisions for preservation, development and protection of marine environment
- This law controls marine pollution and exploration, development, conservation and management of living resources in Pakistan's Exclusive Economic Zone (EEZ)
- This law means that a ship carrying nuclear and hazardous substances will have to inform the Government of Pakistan.

## 110. Quarantine principle?

One recent study (Plucknett and Smith, 1988) describes six principles of successful quarantine. They are summarized as follows

1. Sound scientific and technical principles should form the foundation of aquarantine program. Pests and pathogens should be ranked by quarantine services according to the potential danger they pose to crops and the potential for success in excluding them. For example, germplasm from centers of diversity should receive a high priority because of the potential for such accessions to harbor coevolved pests or pathogens.
2. Animal and plant quarantine regulations are similar in that they may:

Require import permits issued by the quarantine service of the importing country (these may require the exporting country to certify that specified conditions have been met prior to shipment);

- Specify things that are prohibited from entry;
- Grant exceptions to the prohibitions for scientific purposes;
- Require inspection of imported materials upon arrival;
- Require appropriate treatment, if warranted, as a condition of entry; and
- Require, after arrival, quarantine or isolation in an approved facility.

3. When germplasm must be planted and grown for the purposes of quarantine testing, it should be done in an area geographically and ecologically separated from the major growing areas for that crop, to prevent the establishment of crop-specific pests or pathogens.

4. When germplasm is endangered or the need for particular accessions is particularly urgent, some discretion should be possible on the part of quarantine officials in allowing exceptions for controlled entry, despite existing regulations to the contrary.
5. Decentralized quarantine services are generally more efficient because they enfold a wider range of expertise in germplasm assessment.
6. Because delays in transit can be detrimental for any germplasm accessions, access to good communication and transportation services is essential for quarantine.

#### **111. Hingol national park?**

- Hingol National Park spread over an area of about 1,650 square km along the Makran Coast, Balochistan
- It is the largest of National Parks of Pakistan
- The area was for the first time declared reserved in 1988.
- Hingol is known to support threatened invertebrates in addition to a variety of bird species
- The park is an excellent habitat to wild animals including over 3000 ibexes, and 1500 Urals and more than 1200 Chinkara
- A number of resident and migratory birds are supported by this park.

#### **112. Link between climate change and botanical garden? 5**

Ans: plants can alter the temperature of the Earth's atmosphere. Through the process of photosynthesis, plants use energy from the sun to draw down carbon dioxide from the atmosphere and then use it to create the carbohydrates they need to grow. Since carbon dioxide is one of the most abundant greenhouse gases, the removal of the gas from the atmosphere may temper the warming of our planet as a whole. \*transpiration in plants can increase water vapor in the atmosphere, causing more precipitation and cloud cover in an area. The additional cloud cover often reinforces the cooling by blocking sunlight. \*Contribute to soil fertility and prevent soil erosion

#### **113. Three pillars Ramsar site? 5**

Ans: The Contracting Parties(160)commit to: • Work towards the wise use of all their wetlands. • Designate suitable wetlands for the list of Wetlands of International Importance. • Cooperate internationally on transboundary wetlands, shared wetland systems and shared species

#### **114. Biodiversity of habitat species management area?**

Ans: Category IV areas are important for their role in 'plugging the gaps' in conservation strategies by protecting key species or habitats in ecosystems. It provides a management approach for areas that have already undergone substantial modification, necessitating protection of remaining fragments for identified target species with or without intervention.

#### **115. Define phenotypic plasticity?**

Ans: "Phenotypic plasticity is defined as the capacity of a particular genotype to express different phenotypes under different environmental conditions." A degree of phenotypic plasticity is found in most trees, but varies substantially amongst and within species. Even in species with very little genetic diversity, such as *Pinus pinea*L, strong phenotypic plasticity is expressed for growth related traits, which may have helped the species colonise new environments **Pakistan terrestrial water and maritime zone act?**

Ans: It includes provisions for preservation, development and protection of marine environment

It This law controls marine pollution and exploration, development, conservation and management of living resources in Pakistan's Exclusive Economic Zone (EEZ)

It This law means that a ship carrying nuclear and hazardous substances will have to inform the Government of Pakistan.

#### 116. Name the physical growth limitations in median term storage?

Ans: • Low temperature • Low light/restricted photoperiod • Minimal containment  
• Minimal O<sub>2</sub> • Osmotic (water) stress

#### 117. Objective of category 6?

Ans: Primary objective • To protect natural ecosystems • Use natural resources sustainably, when conservation and sustainable use can be mutually beneficial.

Other objectives To promote sustainable use of natural resources, considering ecological, economic and social dimensions; To promote social and economic benefits to local communities where relevant; To facilitate inter-generational security for local communities' livelihoods – therefore ensuring that such livelihoods are sustainable; To integrate other cultural approaches, belief systems and world-views within a range of social and economic approaches to nature conservation; To contribute to developing and/or maintaining a more balanced relationship between humans and the rest of nature;

#### 118. Name of second largest park?

Ans: Kirthar National Park is the the second largest national park of Pakistan spread over an area of 3000 square kilometres. Kirthar was designated a national park by the Sindh Wildlife Department in 1974, This is the first of Pakistan's parks to be included in the UN's listing of National Parks of 1975 This is natural haven for Urial sheep, Ibex, Chinkara gazelle, Jungle cats, desert cats, occasional leopard, desert wolf also prowl the park.

#### 119. Assisted migration ?

Ans: Assisted migration involves human movement of tree seed and seedlings from current locations to sites modelled to experience analogous environmental conditions in the future.

Assisted migration may be undertaken over long distances, or just beyond the current range limit of particular genotypes and populations, or within the existing range . A gradual form of assisted migration could consist of reforestation of harvested sites with seed from

adjacent locations likely to be better adapted to the planting site under future climate (e.g., in the Northern hemisphere, using seed from sources to the south; in mountainous regions using seed from lower elevations).

#### 120. Central goal of zoo?

Ans: The zoo originally evolved from the menageries of the ancient world, in which royalty would exhibit their collection of exotic pets. Unfortunately not all zoos are scientific in nature, and extreme controversy has arisen regarding how the animals are treated. Suffice to say, regulation is necessary to ensure proper care. Conservation (not exploitation) should always be the central goal behind any legitimate zoo.

#### 121. Ramser site of Punjab?

Ans: Punjab • Uchhali Complex • Taunsa Barrage • Chashma Barrage

**BEST OF LUCK**

**1. Name of second largest park? 2 marks**

Ans: Kirthar National Park is the the second largest national park of Pakistan spread over an area of 3000 square kilometres. Kirthar was designated a national park by the Sindh Wildlife Department in 1974, This is the first of Pakistan's parks to be included in the UN's listing of National Parks of 1975 This is natural haven for Urial sheep, Ibex, Chinkara gazelle, Jungle cats, desert cats, occasional leopard, desert wolf also prowl the park.

**2. Define forest genetic resources? (2) marks**

**Forest genetic resources** or **forest tree genetic resources** are genetic material of forest shrub and tree species of actual or future value. Forest genetic resources are essential for forest-dependent communities who rely for a substantial part of their livelihoods on [timber](#) and [non-timber forest products](#) (for example fruits, gums and resins) for food security, domestic use and income generation. These resources are also the basis for large-scale wood production in planted forests to satisfy the worldwide need for timber and paper. Genetic resources of several important timber, fruit and other non-timber tree species are conserved [ex situ](#) in gene banks or maintained in field collections

Forest genetic resources are the heritable materials maintained within and among tree and other woody plant species that are of actual or potential economic, environmental, scientific or societal value

**3. What is Aquatic genetic resources? 3 marks**

Aquatic genetic resources also comprise all water-dwelling genetic resources

Aquatic genetic resources include all genetic resources living in water

➤ It include;

- Fish
- Cyclostomes
- Mussels
- Decapods
- Marine mammals
- Aquatic plants
- All other water dwelling organisms

There is a huge diversity of aquatic species in the world's water bodies

**Aquatic genetic resources** (AqGR) for food and agriculture underpin production in both capture fisheries and aquaculture. ... They underpin the productivity and sustainability of world aquaculture and capture fisheries, and the essential services provided by **aquatic** ecosystems in marine, brackish and freshwaters.

**4. What is Phenylketonuria (PKU)**



It is a human genetic condition caused by mutations to a gene coding for a particular liver enzyme. In the absence of this enzyme, an amino acid known as phenylalanine does not get converted into the next

amino acid in a biochemical pathway, and therefore too much phenylalanine passes into the blood and other tissues. Change in environment (lowering Phenylalanine consumption) can affect the phenotype of a particular trait, demonstrating a gene-environment interaction

## 5. What is the second closest breeding of inbreeding

### 1. Close Inbreeding

Animals are very closely related and can be traced back to more than one common ancestor. Closest form of inbreeding in domestic animals involves mating between full brothers and sisters (full siblings). Second closest form of inbreeding involves mating between grand-parents and grand-offspring, half brothers and sisters (half siblings)

## 6. White moth agar brown moth waly area mein ja k breed kry r white moth produce hon toh kya hoga

### Gene flow in Moths

A population of moths that are white in color migrate to a population of brown-colored moths and successfully mate to give rise to viable offspring. Here, we can say that there is a change in the allele frequency. Over time, the number of these white moths will increase.

## 7. The services provided by PEPA? Features

Pakistan Environmental Protection Act, 1997

- Protection
- Conservation,
- Rehabilitation and
- Improvement of the environment;
- PEPA provide framework for prevention and control of pollution
- Helps in protection of sustainable development.

## 8. Reasons of extinction

The causes of extinction are as follows

1. Climate change
2. Habitat destruction
3. lack of genetic diversity
4. Better-adaptive condition
5. Pollution
6. Human over-population
7. Poaching and hunting

Objective of habitat species management area.

## Purpose of wildlife sanctuary.

Sanctuary is an area which is of adequate ecological, faunal, floral, Geo-morphological, natural or zoological significance.”

The Sanctuary is declared for the purpose of protecting, propagating or developing wildlife or its environment

## 9. Why do Salmon migrate.

### 2. Migration in Salmon

Salmon live out most of their lives at sea, however after sexually maturing, they migrate back upriver to spawn at the very same place where they were born. This migration can cover hundreds of miles in distance and is very difficult and dangerous for the fish as most of them are killed on the way or die soon after spawning

## 10. Advantages of tissue culture conservation

- Source of disease-free material.
- It is most appropriate for rapid multiplication purposes, dissemination and active collections.

## 11. Mass Extinction:

Extinction event (also known as a **mass extinction** or **biotic crisis**) is a widespread and rapid decrease in the biodiversity on Earth.”

Biologists suspect we're living through the sixth major mass extinction. Earth has witnessed five, when more than 75% of species disappeared. Paleontologists spot them when species go missing from the global fossil record.

“We don't always know what caused them extinct but most had something to do with rapid climate change”

## 12. Habitat-Species Management Area

**Definition:** IUCN Management Category IV (Habitat/Species Management Area) refers to areas that are managed to protect particular species or habitats. They are defined by IUCN as *“protected areas aiming to protect particular species or habitats and management reflect this priority.*

**Primary objective:** To maintain, conserve and restore species and habitats.

## 13. Social Cluster value of national monument? 2

Category III areas are likely to hold socio-cultural values as they may have features such as sacred groves, springs, waterfalls, mountains, sea coves etc. of importance to one or more faith groups. These areas are often of significant tourism value and can be managed with the objective of promoting sustainable tourism.

#### 14. Tissue culture conservative 5 marks

- Using this method, millions of genetically identical plants can be obtained from a single bud. This method has, therefore, become an alternative to vegetative propagation. Shoot tip propagation is exploited intensively in horticulture and the nurseries for rapid clonal propagation of many dicots, monocots and gymnosperms.
- Conservation in tissue culture in in vitro genebanks is often combined with cryopreservation. Cultures in the active genebank are maintained by successive subculturing allowing culture renewal and distribution. For medium term storage, sub-culture intervals are extended, reducing processing costs by arresting growth using cold treatments, adapted light conditions, culture medium modifications (osmotic active compounds, growth retardants). This increases efficient use of resources and staff time and offsets selection risks and contamination

##### Advantages of tissue culture conservation

- Source of disease-free material.
- It is most appropriate for rapid multiplication purposes, dissemination and active collections.

##### Tissue Culture Conservation

- labour intensive
- risk of losing valuable germplasm
- genetic instability

#### 15. define Line Breeding 2 marks

- Mating animals that are more distantly related which can be traced back to one common ancestor.
- e.g. Cousins Grandparents to grand offspring, Half-brother to half-sister. Line breeding increases genetic purity amongst the animals of progeny generations.

#### How conserve plant diversity

The conservation of plant diversity is critical for sustainable development and botanic gardens are playing a key role as centers of conservation action. Botanical gardens can promote diversity. Because they include many species of plant.

#### 16. Conservation role of botanical garden? 5 marks

The first **role of botanical gardens** in plant **conservation** is the horticulture and cultivation functions towards the plants. ... With the better growth of plant, our environment also can become better because plants helps to absorb the carbon dioxide when undergo photosynthesis process.

#### 17. What is cryoprotectant in cryopreservation 3 marks

A **cryoprotectant** is a substance used to protect biological tissue from freezing damage. Due to ice crystal formation cell membrane and cell integrity can ruptured. **cryoprotectants** are usually antifreeze compound.

##### **Types of Cryoprotectants:**

1. **Membrane permitting** which can freely diffuse the membrane such as **glycerol (G)**, **ethylene glycol (EG)** and **dimethyl sulfoxide (DMSO)**

2. **Non Membrane permitting** which cannot **permeate** the cell membrane such as **sugars**

### 18. Three botanical gardens

1. cacti and succulent plants.
2. herb gardens.
3. greenhouses, shade houses.

### 19. What is a botanical gardens?

4. It is a garden dedicated to the collection, cultivation and display of a wide range of plants labeled with their botanical names. It may contain specialist plant collections such as tropical plants, or other species of plants.

### 20. Close inbreeding and Line inbreeding

#### 2. Close Inbreeding

Animals are very closely related and can be traced back to more than one common ancestor. Closest form of inbreeding in domestic animals involves mating between full brothers and sisters (full siblings). Second closest form of inbreeding involves mating between grand-parents and grand-offspring, half brothers and sisters (half siblings)

#### Line Breeding

Mating animals that are more distantly related which can be traced back to one common ancestor.

e.g. Cousins Grandparents to grand offspring, Half-brother to half-sister. Line breeding increases genetic purity amongst the animals of progeny generations.

### 13. In Situ Conservation

This method involves protection of endangered species in their natural habitats. It helps in recovering populations in the surroundings where they have developed their distinct features.

**Example:** National Parks, Biosphere reserves, Gene sanctuaries etc.

### 21. Write 3 importance of botanical garden 3 marks

Importance of Botanical garden

- 1- **Enjoyment**
- 2- **Economic**
- 3- **Scientific research**

### 22. Pure breeding 2 marks

#### Pure-breeding

Pure-breeding is the mating of rams and ewes of the same breed or type. A purebred flock can be managed as a single flock because all ewes and rams are of the same breed. The goal of purebred sheep production is to provide superior genetics (seedstock) to the commercial sheep industry. Seedstock are marketed as rams and replacement ewes to other seedstock producers or to commercial sheep operations.

## 23. History of the messenger pigeon 3

### Passenger Pigeon

The passenger pigeon may have once constituted 25 to 40 percent of the bird population. The 19th century brought widespread hunting and trapping of the birds, which severely diminished their populations. The last passenger pigeon, named "**Martha**" died at age 29 at the Cincinnati Zoo in 1914.

## 24. Storage strategy of the cryopreservation 5

### 3. Storage

The maintenance of the frozen cells or material at specific temperature is very important. In general the temperature is kept -70 to -196 degree. Prolong storage is done at temperature of -196 degree in liquid nitrogen. To prevent damage, continuous supply of nitrogen is done.

## 25. Define plant genetic resource 2

### . Plant genetic resources

**Plant Genetic Resources** for Food and Agriculture (PGRFA) are the raw material that farmers and plant breeders use to improve the quality and productivity of crops. They can be defined as any genetic material of plant origin of actual or potential value for food and agriculture, e.g. seeds, tubers, mature plants etc.

## 26. The main objective of CBD 5marks

### Objectives of CBD, 1992

The three inter-related objectives are:

- The conservation of biological diversity;
- The sustainable use of its components;
- The fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate
- Access to genetic resources,
- Transfer of relevant technologies,
- Funding.

### Difference Between Genetic Drift and Gene Flow:

- **Gene flow** occurs via mixing of genes with other populations while **genetic drift** takes place when the allele frequency is changed between two generations of a population.
- **Genetic drift** takes place between two generations whereas **gene flow** takes place between two populations
- **Genetic drift** occurs in only one species while **gene flow** could take place between either two populations or two species.
- Physical barriers matter for the gene flow but not for the genetic drift.

## 27. history of Ramsar Convention

**History:** Ramsar is one of the global inter-governmental environmental agreements. The treaty was negotiated in 1960s by countries and NGOs. To avoid the increasing loss and degradation of wetland habitat for migratory water birds. In an 18 nations meeting it was adopted in the Iranian city of Ramsar On 2nd February 1971. Came into force in 21<sup>st</sup> December 1975

## 28. how human activities causes migration of invertebrates

The current world is very different from that of the early Quaternary Period. Human activities have created barriers to the migration of invertebrate species. These barriers are likely to affect species in natural ecosystems rather more severely than those associated with agro-ecosystems. The movement of the latter is likely to be facilitated rather than hindered by human-induced landscape changes. In situ adaptation of invertebrate species is expected to be most marked where movement is not an option (e.g. on low, isolated islands)

## 29. national animal of pakistan and its number

Markhor is the national animal of Pakistan. The total global population of Markhors is estimated to be 2,500. About 1,500 Markhors are found in Pakistan. This species is in high risk of extinction nowadays.

## 30. Obstacles of cryopreservation future of cryopreservation

### Obstacles

Upto 60% human body is composed of water. What's the issue then?

- Actually the freezing point of water is 0 degree centigrade while the cryoscopy temperature can be as low as -90 degree centigrade. • Very expensive Technique
- Ice formation can result in the needle shaped crystals resulting in the damage to cell membrane.
- Unequal distribution or over distribution of cryoprotectants.
- Moreover, thermal gradients can induce mechanical stress due to uneven expansion or contraction in the biomaterial.
- The cooling rate required for optimal survival varies by several orders of magnitude between different cell types. • Mass transfer limitations

## 31. why genetic diversity is important

The huge variety of different gene sets define an individual or a whole population's ability to tolerate stress from any given environmental factor. Some individuals might be able to tolerate an increased load of pollutants in their environment. Others carrying different genes might suffer from infertility or even die under the exact same environmental conditions.

## 32. Cryo-preservation

Cryo is Greek word. (krayos – frost). It literally means preservation in “frozen state.”

**Cryo-preservation** or **cryo-conservation** is a process where organelles, cells, tissues,

extracellular matrix, organs or any other biological constructs susceptible to damage caused by unregulated chemical kinetics are preserved by cooling to very low temperatures (typically -80 °C using solid carbon dioxide or -196 °C using liquid nitrogen)

### **Cryopreservation can be done at**

Over solid carbon dioxide (at -79 degree) Low temperature deep freezer (at -80 degree)

In vapor phase nitrogen ( at -150 degree)

In liquid nitrogen (at -196 degree)

## **33. Freezing step of cropreservation(5)**

### **Cryopreservation technique:**

- Slow freezing and thawing
- Rapid freezing and thawing
- Vitrification
- Ultrarapid freezing

#### *1. Slow Freezing- Slow thawing*

With this method organs are labeled into vials after equilibration with a cryoprotectant solution and then cooled at rate of 0.5-2 °C per minute down to -1 °C. Seeding is then induced and a holding period of 5 to 15 minutes allows equilibration of the temperature. Thereafter embryos are cooled to -60 °C or lower at a rate of 0.3 to 0.5 °C per minute before being transfer to liquid nitrogen. Frozen embryos must be slowly thawed at a rate of less than 25 °C per minute to prevent osmotic shock

#### *2. Rapid cooling and rapid thawing*

In this technique, however cooling is terminated at -30 to -40 °C and embryos are then plunged into liquid nitrogen for rapid cooling to -196 °C. Thawing is therefore performed rapidly (200 to 500 °C per minute) to prevent recrystallization

### **3. Vitrification**

Vitrification is the process of cooling where the water in the tissue becomes glass rather than crystals. Glass is a liquid that is too cold (too viscous) to flow. In other words vitrification is solidification due to increased viscosity rather than crystallization.

#### *4. Ultrarapid Freezing*

In this technique serial equilibration of embryos in high concentration of DMSO (3-5 M) supplemented with sucrose (0.3 to 0.5 M). The embryos are then plunged into liquid Nitrogen. Thawing is then done with warm water bath ( approximately 500 °C per minute).

Cryopreservation is based on the ability of certain small molecules to enter cells and prevent dehydration and formation of intracellular ice crystals, which can cause cell death and destruction of cell organelles during the freezing process.

The sensitivity of cells to low temperature depends on the plant species. There are four different types of methods :

1. **Slow freezing method** - the tissue or plant material is slowly frozen at slow cooling rate. The advantage is the plant cells are partially dehydrated and survive better.



2. **Rapid freezing method** - it involves plunging the vials in liquid nitrogen. The temperature decreases from -300 to -1000 degree rapidly.
3. **Combined freezing method** - this is combination of both slow and rapid freezing method. The process is carried out in step wise like manner.
4. **Dry freezing method** - in this method dehydrated cells and seeds are stored.

### 34. What is a National Strategy for PGRFA?

A National Strategy for PGRFA is the blueprint for the management of a country's PGRFA as a continuum of interventions in order to achieve clearly defined time bound goals.

### 35. Do microorganism live in hash conditions

### 36. Define phenotypic plasticity.2 marks

Phenotypic plasticity is defined as the capacity of a particular genotype to express different phenotypes under different environmental conditions.

### 37. Define phenotypic plasticity? 3

Ans: "Phenotypic plasticity is defined as the capacity of a particular genotype to express different phenotypes under different environmental conditions." A degree of phenotypic plasticity is found in most trees, but varies substantially amongst and within species.

Even in species with very little genetic diversity, such as *Pinus pinea*L, strong phenotypic plasticity is expressed for growth related traits, which may have helped the species colonise new environments **Pakistan terrestrial water and maritime zone act?**

Ans: 1 It includes provisions for preservation, development and protection of marine environment

2 This law controls marine pollution and exploration, development, conservation and management of living resources in Pakistan's Exclusive Economic Zone (EEZ)

3 This law means that a ship carrying nuclear and hazardous substances will have to inform the Government of Pakistan.

### 38. Habitat of species that affect climate change?

**Global warming** resulting from human emissions of greenhouse gases. The consequences include habitat loss; shifts in climatic conditions and in habitats that surpass migrational capabilities; altered competitive relationships.

### 39. Objectives of Cartagena Protocol on Biosafety 3

The Protocol states that it aims to;

- Contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity,
- It takes into account risks to human health, and specifically focusing on transboundary movements.
- It seeks to protect biodiversity from the potential risks of living modified organisms (LMOs) resulting from modern biotechnology.

### 40. Application of cryopreservation 5 marks

#### ☐ In Animal Husbandry

The introduction of cryopreservation technology leads a major breakthrough in animal husbandry .Since the 1st successful cryopreservation of bull semen has been used to propagate the rare and endangered species using assisted reproduction techniques.

#### ☐ In fishery science

The 1st report on fish sperm cryopreservation was published by Blaxter (1953). To date milt (semen) of over 200 species of fresh water and marine fish have been cryopreserved and have been adequated for the purpose of cryobanking(10,11,12) . In fish aquaculture the successful cryopreservation of gametes and embryos could offer new commercial possibilities, allowing the unlimited production of fry and potentially healthier and better conditioned fish as required

#### ☐ In medical science

Low temperature have been used in medicine and to prevent food spoilage since ancient time. Now- a- days it is used in fertility treatment the transport of human organs and the long- term storage of biological specimens, either for future or simply as a record of biodiversity.

#### ☐ Cryopreservation of testicular tissue

Cryopreservation of immature testicular tissue is a developing method to avail reproduction to young boys who need to have gonado toxic therapy

#### ☐ Embryo cryopreservation

Embryo cryopreservation is used most often to store goodquality excess embryos resulting from an IVF treatment cycle. Embryos can be stored for a patient who elects to have her eggs fertilized with donar sperms. Pregnancies have been reported from embryos stored for 16 years

### 41. Processing of sample in Dna bank? 5 marks

DNA preserved in DNA banks will be stored either within cells and extracted upon retrieval from storage or extracted from cells and purified before storage. The quality of the DNA is expressed through yield, purity, molecular weight, amplification efficiency and authenticity of sequences. The quality of DNA extracted from plant specimens is dependent on the condition of the specimen before storage, the storage environment and the duration of storage. Rapid drying of plant samples with silica gel or lyophilisation helps to preserve the DNA.

### 42. Storage capacity of DNA banks 3 marks

## 43. Difference between Laws & Legislation

### Laws

The system of rules which a particular country or community recognizes as regulating the actions of its members and which it may enforce by the impossible penalties.

- A person could be held guilty if he breaches Law

### Legislations

The process of making or enacting laws.

## 44. Treaty? 2 marks

“Treaty, a binding formal agreement, contract, or other written instrument that establishes obligations between two or more subjects of international law” • Treaties do not need to follow any special form. • A treaty often takes the form of a contract, but it may be a joint declaration or an exchange of notes.

## 45. Invasive species 2 marks

Alien invasive species have had severe impacts on local aquatic flora and fauna, and can upset the natural balance of an ecosystem. For example, the introduction of Nile perch to Lake Victoria has pushed many of the lake's native cichlid species to extinction.

## 46. What Allopatric speciation?

Gene flow blocked by physical barriers results in Allopatric speciation

## 47. Different steps of Allopatric speciation?

1. A geographic change separates members of a population into more than one group.
2. Different gene mutations occur and build up in the different populations over time.
3. The populations become so different that members of the different populations can no longer breed with each other anymore if were they to be in the same habitat in the same time. If this is the case, allopatric speciation has occurred.

## 47. How do allopatric and sympatric speciation differ

Allopatric speciation is speciation that results when a population is separated by a physical barrier. It is also referred to as geographic speciation. Sympatric speciation is speciation that occurs without physical separation

of members of the population.

## 48. Merits and Demerits of Ex situ Conservation 5 marks

## Merits:-

- It can be used to protect individual animals in a controlled environment. This means that issues such as predation and hunting can be monitored and managed more easily.
- It can be used to reintroduce species that have left an area.

## Demerits:-

- Usually only a small number of individuals can be cared for.
- It can be difficult and expensive to create and sustain the right environment.
- The animals that are habituated (used to) human contact may be less likely to exhibit natural behaviors and may be more likely to catch a disease from humans.
- This type of conservation is usually less successful as many species can't breed successfully in captivity or don't adapt to their new environment when moved to a new location.

### 49. What is the reason of twin candido goddi

. The reasoning: Candido Godoi has a twin rate nearly 1,000 percent higher than the rest of the world. However, more recent research has led people to point to a genetic founder effect as the real reason. The small town of around 6,000 was formed by a small number of families, specifically German immigrants.

Role of botanical garden in climate change research 5 marks

Plants can alter the temperature of the Earth's atmosphere. Through the process of photosynthesis, plants use energy from the sun to draw down carbon dioxide from the atmosphere and then use it to create the carbohydrates they need to grow. Since carbon dioxide is one of the most abundant greenhouse gases, the removal of the gas from the atmosphere may temper the warming of our planet as a whole. \*transpiration in plants can increase water vapor in the atmosphere, causing more precipitation and cloud cover in an area. The additional cloud cover often reinforces the cooling by blocking sunlight. \*Contribute to soil fertility and prevent soil erosion.

### 50. Name lab of plant genetic resources?

Plant Genetic Resources Institute hosts the sole National Genebank of Pakistan for conservation of plant genetic resources and six labs including

1. germplasm exploration lab
2. seed preservation lab
3. in vitro conservation lab
4. germplasm evaluation lab
5. plant introduction and seed health lab
6. Data management lab

### 51. Types of Ex Situ conservation

- Gene bank
- Botanical garden

#### 1. Gene Bank

Gene bank refers to a place or organization where germplasm can be conserved in living state. Gene banks are also known as germplasm banks.

#### Types of Seed Bank

##### Seed Gene Bank

A place where germplasm is conserved in the form of seeds is called seed gene bank. Seeds are very convenient for storage because they occupy smaller space than whole plants.

### Field Gene Bank

Field gene banks also called plant gene banks are areas of land in which germplasm collections of growing plants are assembled.

### 2. Botanical Garden

A botanical garden or botanic garden is a garden dedicated to the collection, cultivation and display of a wide range of plants labeled with their botanical names

## 52. Historical Background of CBD?

The **Convention on Biological Diversity**, was opened for signature at the Earth Summit in Rio de Janeiro, Brazil, on June 5, 1992 and by the end of July 1993, 165 countries had signed the treaty. ... The initial sessions were referred to as meetings of the "Ad Hoc Working Group of Experts on **Biological Diversity**."

## 53. Briefly explain historical background of Ramsar convention. 3

**History:** Ramsar is one of the global inter-governmental environmental agreements. The treaty was negotiated in 1960s by countries and NGOs. To avoid the increasing loss and degradation of wetland habitat for migratory water birds. In an 18 nations meeting it was adopted in the Iranian city of Ramsar

On 2nd February 1971. Came into force in 21<sup>st</sup> December 1975

## 54. Effect of Climate changes on FGR? And Climate effect organisms which are changes associate with tree? 10 marks

Climate change may also result in high variability in temperature and precipitation, with an increase in incidence of extreme events, such as flooding, late frosts and intensive summer droughts, amongst other events. In some areas, such as the Mediterranean and the Neo-tropics, an increase in seasonality is also expected. Under such conditions, natural selection may not result in efficient adaptation because selection pressures are multi-directional, involving traits that may be inversely correlated at the gene level. The standing genetic variation in populations may then not be large enough to create the rare new genotypic combinations that are required. Ecosystems affected by abrupt change may sustain rapid and widespread transformation as ecological tipping points are exceeded. Given the pivotal role of trees in ecosystem function, abrupt climate change impacts on them may thus have profound consequences for forests as a whole. Irreversible loss of ecosystem integrity and function may follow, with replacement by new nonendemic ecosystems.

موسمیاتی تبدیلی کے نتیجے میں درجہ حرارت اور بارش میں اعلیٰ تغیر پذیر ہو سکتی ہے، جس کے نتیجے میں انتہائی واقعات جیسے سیلاب، دیر سے بر فباری اور گرمی کے شدید قحط کے واقعات میں اضافہ ہوتا ہے۔ کچھ علاقوں میں، جیسے بحیرہ روم اور نواسٹنکبندی علاقوں میں، موسمیات میں بھی اضافے کی توقع ہے۔ اس طرح کے حالات میں، قدرتی انتخاب موثر موافقت کا نتیجہ نہیں بن سکتا ہے کیونکہ انتخاب کے دباؤ کثیر جہتی ہوتے ہیں، جس میں ایسے خصائل شامل ہوتے ہیں جن کا تعلق جین کی سطح پر الٹا سیدھا ہو سکتا ہے۔ آبادیوں میں کھڑی جینیاتی تغیرات اس وقت اتنے بڑے نہیں ہو سکتے ہیں کہ ضرورت کے مطابق نایاب نئے جینیاتی نوعیت کے امتزاج بنائیں۔ ایکولوجی نظام اچانک تبدیلی سے متاثر ہو سکتا ہے کیونکہ تیزی سے اور وسیع پیمانے پر تبدیلی برقرار رہ سکتی ہے کیونکہ

ماحولیاتی ٹینک پوائنٹس سے تجاوز ہو جاتا ہے۔ ماحولیاتی نظام میں درختوں کے اہم کردار کو دیکھتے ہوئے، ان پر موسمیاتی تبدیلیوں کا اچانک اثر پڑنے سے مجموعی طور پر جنگلات کے گہرے نتائج مرتب ہو سکتے ہیں۔ ماحولیاتی نظام کی سالمیت اور فنکشن کا ناقابل تلافی نقصان، اس کے نتیجے میں نئے نوڈیمک ماحولیاتی نظام کے ذریعہ تبدیل ہو سکتا ہے

### Direct impacts of climate change

These include high tree mortality through extreme climatic events, particularly drought in combination with widespread regeneration failure, for example, examined the evidence for anthropogenic climate change leading to future large-scale "dieback" in Amazonian rain forest. Analysis suggested that dryseason water stress is likely to increase in eastern Amazonia over the 21st century, with the region tending toward a climate more appropriate to seasonal forests.

ان میں انتہائی آب و ہوا کے واقعات کے ذریعہ اعلیٰ درختوں کی اموات شامل ہیں، خاص طور پر خشک سالی میں بڑے پیمانے پر نو تخلیق کی ناکامی کے ساتھ مل کر، مثال کے طور پر، امیتومون بارش کے جنگل میں مستقبل کے بڑے پیمانے پر "ڈائی بیک" کا باعث بننے والی انسانیت یابی آب و ہوا کی تبدیلی کے ثبوتوں کا جائزہ لیا گیا۔ تجزیہ کیا گیا ہے کہ 21 ویں صدی کے دوران مشرقی امیزونیا میں خشک موسم کے پانی کے تناؤ میں اضافہ ہونے کا امکان ہے، اس خطے کے ساتھ موسمی جنگلات کے ل to مناسب آب و ہوا کی طرف راغب ہونا ہے۔

### Effects of changing climate on organisms associated with trees

In particular, changes in the biology of insect pests and diseases may make ecosystems more susceptible to tree mortality. Because of improved environmental conditions for the pest and reduced tree resistance due to increased stress, pests may react to climate change with range expansions and/or increases in attack severity.

خاص طور پر، کیڑوں کے کیڑوں اور بیماریوں کی حیاتیات میں بدلاؤ ماحولیاتی نظام کو درختوں کی اموات کے ل to زیادہ حساس بنا سکتا ہے۔ بڑھتی ہوئی تناؤ کی وجہ سے کیڑوں کے لئے ماحولیاتی حالات بہتر اور درختوں کے خلاف مزاحمت میں کمی کی وجہ سے، کیڑوں میں حد کی توسیع اور / یا حملے کی شدت میں اضافے کے ساتھ آب و ہوا کی تبدیلی پر رد عمل ظاہر ہو سکتا ہے۔

### Changes in abiotic disturbance regimes

These include changes in fire regimes, flooding, landslides and/or hurricanes. Fire and climate are closely linked and are also associated with changes in land use. Coupled climate and fire-risk models suggest not only an increase in the frequency of fires but also in fire size and length of the fire-risk season, with some areas subject to risk that were not before. **Malhi et al. (2009)** considered how tipping points may be reached in Amazonian rainforest by a combination of increased dryness and an increased incidence of fire events

ان میں آگ کی حکومتوں، سیلاب، لینڈ سلائیڈنگ اور / یا سمندری طوفان میں تبدیلیاں شامل ہیں۔ آگ اور آب و ہوا کا آپس میں گہرا تعلق ہے اور زمین کے استعمال میں بدلاؤ سے بھی وابستہ ہیں۔ جوڑے ہوئے آب و ہوا اور آگ کے خطرے والے نمونے نہ صرف آگ کی فریکوئنسی میں اضافہ بتاتے ہیں بلکہ آگ کے خطرہ اور آگ



کے خطرے کے موسم کی لمبائی میں بھی، کچھ ایسے خطوں کے ساتھ جو پہلے نہیں تھے۔ ملیشی اللہ (2009) اس پر غور کیا گیا کہ کس طرح بڑھتی ہوئی سوجھاپن اور آگ کے واقعات کے بڑھتے ہوئے واقعات کے امتزاج سے امیزونیا کے بارشوں کے جنگل میں نوکری کے مقامات تک پہنچ جاسکتی ہے۔

### **Invasion by organisms foreign to local ecosystems**

This includes the increased risk of establishment by invasive species which accidentally arrive into ports of entry, through globalized commerce. By making new niches available, climate change will facilitate the survival of mammals, insects, diseases and/or weeds foreign to endemic ecosystems.

اس میں حملہ آور نسلوں کے ذریعہ اسٹیبلشمنٹ کا بڑھتا ہوا خطرہ بھی شامل ہے جو عالمی سطح پر تجارت کے ذریعہ حادثاتی طور پر داخلہ کی بندرگاہوں میں پہنچ جاتا ہے۔ نئی جگہوں کو دستیاب بنانے سے، آب و ہوا کی تبدیلی سے ستنداریوں، کیڑوں، بیماریوں اور / یا خارجی ماتی لباس کے ماحول کو خارجی ماحول سے بچنے میں مدد ملے گی

## **55. Responses of tree populations to environmental change 10 marks**

**Tree populations rely on three interplaying mechanisms to respond to environmental change:**

1. adaptation
2. Migration
3. phenotypic plasticity

### **1. Adaptation and standing genetic variation**

Genetic adaptations that make a population more suited for survival are achieved through gene frequency changes across generation. Many tree species have high genetic variability in adaptive traits and can therefore grow under a wide range of conditions. Indeed, phenotypic traits of adaptive importance, such as drought tolerance, cold-hardiness, resistance to pests and diseases, and flowering and fruiting period, have been shown to vary across ecological and geographic gradients to an extent that may be as important as the differences observed amongst species.

### **2. Migration via pollen and seed movement**

Pollen is known on occasions to travel very long distances, particularly in wind dispersed broadleaves and conifers, but also sometimes for animal-pollinated species. Pale ecological reconstructions of the decolonization of temperate zones during the Holocene have also suggested that seeds are capable of travelling long distances rapidly, in the range of several hundreds of meters per year. Landscape genetic approaches, macrofossil evidence and theoretical studies, however, indicate that cryptic refugia may have been overlooked, considerably reducing migration estimates. In addition, modern estimates of contemporary seed dispersal, although pointing to the existence of long distance dispersal events, generally indicate that median migration rates are in the range of a few tens of meters per year.

### **3. The role of phenotypic plasticity**

Phenotypic plasticity is defined as the capacity of a particular genotype to express different phenotypes under different environmental conditions. The concept is often extended to populations and species, with plastic trees those with flexible morphology and physiology that grow at least reasonably well under a range of different environmental stresses without genetic change. A degree of phenotypic plasticity is found in most trees, but varies substantially amongst and within species. Even in species with very little genetic diversity, such as *Pinus pinea* L., strong phenotypic plasticity is expressed for growth related traits, which may have helped the species colonise new environments. At least in the short term, high plasticity is likely to favour tree survival under



changing environmental conditions, although trade-offs between traits can be expected. Since phenotypic plasticity has a heritable basis and may be selected for under changing environments, complex interactions between traits are possible, depending on the magnitude and structure of change.