

## **BT401 FINAL TERM OBJECTIVE AND SUBJECTIVE NOTES**

1. Dolphin is a **Mammal**.
2. Ramsar convention came into the **21st December 1975**
3. **21 %** out of 5,488 Mammal species and 12% out of 9,990 bird species are considered to be endangered.
4. WCPA stands for **World commission on protected areas**.
5. In Europe, one estimate put the value of “marketed non wood goods” from forests at **€2.3 billion**
6. Since the **1970**, the population of the Indus Dolphin has significantly increased here.
7. Largest national park of Pakistan **Hingol National Park**
8. If hunting is prohibited, a game reserve may be considered a **Nature Reserve**.
9. A sanctuary is a protected area which is reserved for the conservation of only animal and human activities like **harvesting of timber**
10. Bahawalpur Zoo covers **25 acrs**
11. **Blackbuck** became virtually extinct in the Cholistan Desert but the species has been reintroduced in LalSuhanr
12. Hingol National Park declared reserved in **1988**
13. Natural geological and geo morphological features **waterfalls, cliffs, craters, caves**
14. Seaweeds population is **13000**
15. Snow leopard population left in Pakistan is **200**
16. Report on fish sperm cryopreservation was published in by **blaxter in 1953**
17. Cryopreservation in liquid nitrogen **at -196 degree**
18. Cartagena protocol was adopted on **June 2001** in Cartagena, Spain
19. Vegetative propagation is **tissue culture**
20. Using microarray analysis, detected that up to **113** genes were significantly induced by drought in two Mediterranean pine species.
21. large natural areas comes into **Category VI**
22. In 2013, Ramsar sites has been declared in Pakistan. **19**
23. In the game reserves the major focus is specifically the **animals**
24. Climate has direct effect on **FGR**
25. There are **two types** of genome transfer.
26. **5000 rupees** will be fine for cutting tree in 1992 act
27. Convention on biological diversity, **1992**
28. FAO stands for **Food and Agriculture Organization**
29. GEWIS stands for **Genome wide interaction scan**
30. **Sympatric speciation** often result of Reproductive isolation

31. Light intensity for most plant cultures require **50–200  $\mu\text{mol S}^{-1} \text{m}^{-2}$**
32. **Category V protected areas act as a buffer**
33. Cartagena protocols not cover **Products derived from LMOs**
34. Cartagena protocols deals with. **biosafety**
35. Chashma and Taunsa Barrage declared Wildlife Sanctuaries by the **Punjab government**
36. Land race also called **local variety of domesticated plants**
37. **Obsolete varieties** are varieties developed since the advent of scientific agriculture in the late nineteenth century.
38. **Acacia nilotica** is easily regenerated from seed.
39. Anthropogenic impact is apparent in the **coastal zone**
40. Mild inbreeding is type of **Inbreeding**
41. **National monuments** are small sites they focus on more prominent natural features.
42. IBPGR stands for **International Board of Plant Genetic Resources**
43. In **2014** the food and agriculture organisation of UN published the first State of Worlds FGR.
44. The Wild Birds and Animals Protection Act **1912**
45. The Pakistan Animal Quarantine **1979**
46. PGRFA stands for **Plant Genetic Resource for Food and Agriculture**
47. NCCP stand for. **National cultural collection of Pakistan**
48. Peste des petitis ruminants also called **sheep & goat plague**
49. According to FAO species of mollusks are **85000**
50. GSPC was found in **1999**
51. Which disease was spread by consuming mercury poisoned fish **MINAMTA disease**
52. Genetic stocks can be divided into **3 groups**
53. Pakistan is the **6<sup>th</sup> largest** producer of Kinow and oranges in world...
54. A **polygenic approach** can be taken to analyze G cross E interactions.
55. Sterculia khasians is endemic tree of then **Khasi hills**
56. OHSS stands for **Ovarian hyper stimulation syndrome**
57. Genetic resource is sometime called **first resource**
58. Cryopreservation in liquid nitrogen. **-196C**
59. Phenylketonuria caused by **Mutations**
60. Which specie has been reintroduced in Lal Suhanra National Park? **Black buck**
61. If the advantageous gene is removed then the effect is Called **Genetic Drift**
62. Crow follow migration. **Daily.**
63. Darwin finches is example of **Adaptive radiation**

64. \_\_\_\_ produced by dart-poison frog. **Toxins**
65. Himalayan brown bear **150-200**
66. Special care unit. **Ex-situ**
67. Closely related individuals. **inbreeding**
68. Microorganisms are \_\_\_\_ **More diverse**
69. National strategy of PGRFA may help. **Country**
70. Crustaceans migrate for **breeding**
71. Genetic drift effects on storage in **small population**
72. Coral reefs are also threatened Reefs are home to **25%** of marine animal
73. Earliest modern protected areas **Yellowstone National Park**
74. The main objective of Category V is **maintain a balanced interaction of nature & culture.**
75. Which Category area are not necessarily associated with presence and intervention **Category-IV**
76. Main objective of Habitat-Species Management Area is (a.to maintain species b. to conserve species c. to conserve & maintain habitat) **d. all of these**
77. Sir Saqiq Muhammad Khan Abassi established **Bahawalpur Zoo**
78. WCPA stands for **World Commission on Protected Areas**
79. Which of the following category encourage the conservation of aquatic biodiversity **Category-V**
80. Trigger for migration **all of these**
  - a. local climate b. local availability of food c. for mating reasons d. all of these
81. **Genes** are the link from generation to generation of all living matter
82. IABGR stands for **Institute of Agricultural Biotechnology and Genetic Resources**
83. **Vertical gene transfer** be through sexual or asexual reproduction.
84. More genetic variations in population **Natural selection**
85. **Darwin finches** is an example of Allopatric speciation.
86. Animal Genetic resources (a. animal genetic resources for food & agriculture b. farm animal genetic resources c. livestock biodiversity ) **d. all of these**
87. Calypha rubrinerv is belongs to family **Euphorbiaceae**
88. Number of laboratories on plant genetic resources in Pakistan. **6(Six)**
89. Gene bank is a type of **Ex-situ Conservation**
90. : Areas of great genetic diversity are protected from human interference **Gene sanctuary**
91. Sheep were domesticated by humans around. **10,000 BC.**
92. Plant diversity is urgently and effectively conserved is an objective of **GSPC**
93. Woody plants like trees have **Higher** Genetic diversity than vascular plants like grasses

94. Conservation of plant genetic resources is necessary for( a. food security b. Agro biodiversity c. Commercial use) **d. both a & b**
95. The problem in Strict Nature reserve is (a. Disease b. climate change c. air pollution) **d. both b & c**
96. **Ex-situ** conservation can be used to reintroduce species that left an area.
97. Ramsar convention was negotiated in **1960s** by countries and NGO's.
98. Greater efforts are needed to estimate the full value of **PGRFA**
99. Species that are threatened are sometime characterized by( a. population dynamics b. Critical dispensation c. Mathematical measures of Biomass) **d. All of above**
100. Gene sanctuaries provide way to preserve (a. Wild species b. Natural Ecosystems d. All Above) **c. Natural habitats**
101. key factors for regulating many of biochemical process **Temperature**
102. Category VI is not designed to accommodate **large scale industrial harvest**
103. It is cheap method for conservation broad range of germplasm.. **Seed storage**
104. To date, one of the most extensive programmers to develop trees with resistance to insect pests in temperate regions is in **British Columbia.**
105. Houghton's Goldenrod typically grows on (a. Moist Sandy beaches b. Shallow depressions c. low sand ridges )**d. All of above**
106. Quite small protected area and high visitor value **Category III: National Monument-Feature**
107. **Animal genetic resources** is a strategy wherein samples of animal genetic materials are preserved cryogenically
108. Genetic variations are the variations due to Genes. Alleles. **Both a and b.** none
109. habitat management work **( all of the given)**

Join

### 2marks short questions

**1. 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.

**2. Describe purpose of panel code.**

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. What is location of cholistan wildlife sanctuary?**

It is part of the Cholistan desert in the south eastern portion of the province of Punjab. Some of the rare animals of this region are Desert wolf (rare), Indian fox, Red fox, Jackal, Small Indian civet, Small Indian mongoose, Jungle cat and Caracal cat.

**4. Define forest genetic resources?**

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.

**5. Historical background of CBD?**

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.

**6. Define 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.

**7. Define Protected Landscape-Seascape area?**

**Definition:** A protected area where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value.

**8. Plant genetic resources institute names?**

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      |

### 9. Define strict nature reserve?

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.

### 10. Role of earthworm in soil?

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.

### 11. Second largest national park?

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

### 12. when and which city 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.

### 13. Mission of Ramsar convention?

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."

### 14. Type of gene bank?

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

### 15. Effect of climate on invertebrates?

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 glaciations and interglacial periods of the Quaternary Period.

### 16. What is phenylketonuria?

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.

### 17. Define threatened species?

Threatened species are any species (including animals, plants, fungi, etc.) which are vulnerable to endangerment in the near future

### 18. State 2 quarantine principle?

1. 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.
2. Decentralized quarantine services are generally more efficient because they enfold a wider range of expertise in germplasm assessment.

### 19. Define extinction?

“A species becomes extinct when the last existing member of that species dies.”

Extinction occurs when species are diminished because of

- Environmental forces
- Evolutionary changes in their members

### 20. Define phenotypic plasticity.

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

### 21. What are game reserves?

**Definition:** “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.

### 22. Define zoological park?

A zoological park is a location where animals are kept in captivity for study and viewing.

Some of famous zoological parks in Pakistan are listed below;

- Bahawalpur Zoo
- Changa Manga Wildlife Park
- Hyderabad Zoo
- Jallo Wildlife Park
- Karachi Safari Park
- Walkthrough Aviary
- Clifton Fish Aquarium
- Islamabad Zoo
- Jungle World
- Karachi Zoo
- Lahore Zoo
- Lahore

### 23. Define co evolution?

Co evolution describes a situation where two or more species reciprocally affect each other's evolution. Such as the classic case of host-pathogen interaction. Further important examples of co-evolution in trees include interactions with herbivores and pollinators.

### 24. Who established Bahawalpur zoo?

Nawab of former state Bahawalpur, Sir Sadiq Muhammad Khan Abbasi, established Bahawalpur Zoo in 1942.

### 25. Germplasm conservation?

Germplasm or plant genetic resource has to be maintained in such a state that minimize the risk of loss and allows either is direct planting in the field or its preparation of planting with relative ease this is called plant genetic resources conservation or germplasm conservation.



## 26. Threats to FGR?

- Forests are under threat, chiefly as a result of human activities, including climate change.
- On a continent-wide scale, changes in rainfall patterns and temperature mean that some tree species will be unable to survive in their current locations. Others may be able to colonize new areas.
- Changes in climate also make it possible for pests and diseases to invade new areas, destroying the forests there.

## 27. Effect of climate on FGR?

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 dry-season 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

## 28. What do you know about clonal repository?

Clonal repository is field Gene bank 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.

## 29. What are Habitat species management areas?

**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.

## 30. Distinguish features of protected landscape-seascape?

### Distinguishing features

- Landscape and/or coastal and island seascape of high and/or distinct scenic quality and with significant associated habitats, flora and fauna and associated cultural features
- A balanced interaction between people and nature
- Unique or traditional land-use pattern

## 31. On how many interplaying mechanisms rely for response to environmental condition?

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

1. adaptation
2. Migration
3. phenotypic plasticity

## 32. What is EEZ?

Exclusive Economic Zone

## 33. Conservation status of hingol national park?



Hingol National Park spread over an area of about 1,650 square km along the Makran Coast, Baluchistan

### 34. Critical Endangered Species?

Following are the Critically Endangered Animals are:

- |                       |                           |
|-----------------------|---------------------------|
| 1. Bulmer's Fruit Bat | 2. Great Indian Bustard   |
| 3. Madagascar Pochard | 4. Pygmy Three-Toed Sloth |

### 35. What is Cholistan protected area name?

Cholistan wildlife Sanctuary

### 36. for which type of material DNA Bank is useful?

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

### 37. Name physical method for storage?

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

### 38. Legislation?

The process of making or enacting laws.

### 39. What is Quagga?

The quagga was a plain zebra that lived in south Africa until becoming extinct late in the 19th century. It was long thought to be a distinct species, but early genetic studies have supported it being a subspecies of plains zebra

### 3marks short questions

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

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.

#### 2. How to check viability of cryopreservation?

There is possibility of death of cells due to storage stress. Thus viability can be found at any stage. It is calculated by formula :

$$\left( \frac{\text{No of cells growing}}{\text{No of cells thawed}} \right) \times 100$$

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

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.

### 4. Define seed storage?

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.

### 5. Write the objectives of Monument features?

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

**Other objectives**

- To provide biodiversity protection in landscapes or seascapes that have otherwise undergone major changes
- To conserve traditional spiritual and cultural values of the site

### 6. Primary objectives of national park?

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

### 7. 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.

### 8. Name of Botanical gardens in Pakistan.

- |                                |                               |
|--------------------------------|-------------------------------|
| 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.        |                               |

### 9. 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.”

#### 10. Disadvantage 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.

#### 11. Function of quarantine protocol?

**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

#### 12. Distinguishing features of habitat species management area?

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

#### 13. Objectives of habitat and species management area?

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

**Other objectives**

- To protect vegetation patterns.
- To protect fragments of habitats as components of landscape or seascape-scale conservation strategies.
- To develop public education and appreciation of the species or habitat

#### 14. Main objective of forest genetic resources?

- These resources are also the basis for large-scale wood production in planted forests to satisfy the worldwide need for timber and paper.
- 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.

#### 15. Define tertiary gene pool?

**Tertiary Gene Pool (GP3):** The genetic material which leads to production of sterile hybrids on crossing with primary gene pool is termed as tertiary gene pool or gene pool three (GP3). It includes material which can be crossed with GP1, but the hybrids are sterile. Transfer of gene from such material to primary gene pool is possible with the help of special techniques.

#### 16. 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.

#### **17. What is low oxygen and low pressure 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

#### **18. What are molecular markers?**

Molecular markers are fragments of DNA which are associated with a particular region of the genome. Marker molecules can take the form of short DNA sequences, such as a sequence surrounding a single nucleotide polymorphism, where a single base-pair change occurs. It is also known as genetic marker.

#### **19. What are three common function of quarantine?**

- 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.

#### **20. Briefly explain historical background of Ramsar convention?**

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 21st December 1975

#### **21. Why do forest genetic resources matter?**

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.

#### **22. Write role of pollinators?**

A second major group of invertebrate providers of ecosystem services are the pollinators. It has been estimated that at least 35 percent of world food production comes from crops that are dependent on insect pollination. Pollinating insects include wild species spilling over from natural or semi-natural habitats close to crop fields, and managed pollinators (usually honey bees) that can be brought in by farmers specifically

to provide pollination

### **23. Advantages of tissue culture?**

#### **Advantages of tissue culture conservation**

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

### **24. 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.

### **25. Advantage of gene sanctuary?**

1. Gene sanctuaries not only preserve the existing genetic diversity present in a population, it also allows evolution to continue. As a result new allele and gene combination would appear with time.
2. Gene sanctuary is a very good method of In situ conservation it protects the loss of genetic diversity caused by human intervention. It allows natural selection and evolution to operate.
3. It is a very good method of In Situ Conservation.

### **26. How FGR important?**

- Forests provide human beings with drinkable water, food, medicines, an environment to enjoy and fuelwood for energy, among other goods.
- They help to regulate the local climate.
- They bind soil on steep hillsides, preventing flooding and erosion further down river valleys.
- Globally, forests remove carbon dioxide from the atmosphere and produce oxygen.

### **27. Role of cryoprotectant in cryopreservation?**

They are chemical which prevent cryo-destruction. These are sucrose, alcohols, glycols, some amino acid (proline), DMSO (dimethyl sulfoxide). Generally two Cryo protective agents should be used together instead of single one as they are more effective. Two common cryoprotective agents are dimethyl sulfoxide (DMSO) and glycerol. Glycerol is used primarily for cryoprotection of red blood cells, and DMSO is used for protection of most other cells and tissues .

### **28. List of Ramsar site in Punjab?**

- Uchhali Complex
- Taunsa Barrage
- Chashma Barrage

### **29. Primary objective of Category VI?**

#### **Primary objective**

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

**30. Name of 3 research based botanical gardens?**

- i. Karachi University Botanic Garden of Karachi University, Karachi
- ii. Lahore Botanical Gardens, Lahore
- iii. Quaid-i-Azam University Botanical Garden, Islamabad

**31. Four main mechanism of evolution?**

Mutation, gene flow, genetic drift, and natural selection

**32. Explain habitat loss cause of extinction?**

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.

**33. Most important reservoir for biology control agent species?**

In the case of classical biological control agents, the genetic diversity of introduced populations may be relatively low because the introduction was based on a small founder population. This lack of diversity may inhibit the ability of the population to respond to climate change

**5 marks long questions**

**1. What are three pillars of Ramsar Convention?**

**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.

**2. What is the extreme weather effect on invertebrate's genetic resources?**

Climate change is expected to affect all three of the main groups of invertebrate ecosystem-service providers as well as invertebrate pests.

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.

**3. What types of services are provided by PEPA?**

**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.

#### 4. Write the objective of Socio cultural value of national monument features?

According to IUNC there are six (6) protected area management categories that define the area according to their management. National Monument-Feature are the category III protected area. It is define as

“Protected areas set aside to protect a specific natural 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.

#### 5. Objectives of Cartagena Protocol on Biosafety?

##### 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.

#### 6. Strategies of Animal genetic resources?

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

#### 7. Different freezing methods in Cryopreservation? 5marks

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.

#### 8. DNA Bank?

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 gene banks 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

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

Outbreeding	Inbreeding
“The intentional breeding of distantly related or unrelated individuals for the purpose of producing offspring of superior quality.”	“Inbreeding, the mating of individuals or organisms that are closely related through common ancestry.”
There are 3 types of out breeding. 1. Cross breeding 2. Grading up 3. Species cross	There are 3 types of inbreeding 1. Close inbreeding 2. Mild inbreeding 3. Line inbreeding

#### 10. What are mechanism of cryopreservation name steps ?

#### 11. Steps for conservation of plant genetic resources?

The cryopreservation technique followed by the regeneration of plants involves following steps :

- Selection of material.
- Freezing.
- Thawing.
- Measurement of viability.
- Addition of cryoprotectant.
- Storage in liquid nitrogen.
- Washing and re-culturing.
- Regeneration of plants

#### 12. Limitation of germplasm preservation 5

1. Seeds of many important tree species cannot adequately survive long-term storage;
2. Seeds of many tropical hardwoods cannot survive even a year of conventional seed storage;
3. Some genetic damage or change in gene frequencies may occur during seed storage.

Cryogenic storage at its current level of technology offers great promise for long-term storage of true orthodox and sub-orthodox seeds. It has potential for application to recalcitrant species, but much more research and development will be required.

#### 13. link b/w botanical garden and climate change. 5

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.

#### 14. Institutes of PGR. 5

Plant Genetic Resources Institute hosts the sole Nation 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

#### 15. Extreme weather effects on invertebrate's genetic resources?

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.

#### 16. What are the advantages of germplasm storage?

1. Seeds of many valuable species can survive long term storage ('long term' 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.

#### 17. Conservation of FGR?

Safeguarding the genetic variety of forest trees is an important part of biodiversity conservation. Genetic diversity ensures the success of species in environments that are highly variable and subject to change. For most forest tree species, management plans for the conservation units allow silvicultural interventions directed towards the support of and quantity of regenerating material. Applying given critical values for the number and density of seed trees, shortening of the regeneration time, regulating competition by other tree species and controlling invasive species should also be taken into consideration. A good level of genetic diversity and reduced consanguinity in the regenerated seedlings should be a management objective. Natural regeneration should be the preferred means but if this fails to occur, assisted regeneration can be carried out using local seed lots to maintain local phenotypic identity natural regeneration both in terms of quality.

#### 18. Write features of Cartagena protocol?

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.

#### 19. West Pakistan ordinance 1961?

- It is an ordinance to amend and consolidate the law relating to fisheries in the West Pakistan.
- It says that no person will be allowed to use dynamite, pesticides or other explosives for catching the fish.

- Government can declare any water area as sanctuary.
- Then there will be no permit for fishing except some license.
- An Inspector of Fisheries may without a warrant arrest any person committing
- In his view any offence under section 6, 7, 8, 9 or 11

## 20. Explain method of “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.

## 21. How invertebrate genetic resources cope with climate change?

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.

### 10 marks long questions

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

- 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 non endemic 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.

## **2. Write the objectives of CBD?**

### **Convention on Biological Diversity, 1992**

- 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 Development held at Rio De Janeiro, Brazil
- Pakistan ratified it on 26th July 1994.
- The Convention on Biological Diversity covers biodiversity at all levels:
  1. Ecosystems,
  2. Species
  3. Genetic resources
- It also covers biotechnology, including through the Cartagena Protocol on Biosafety.

### **The three inter-related objectives are:**

1. The conservation of biological diversity;
2. The sustainable use of its components;
3. 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

## **3. Feature of Pakistan terrestrial water and maritime act?**

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.

# BT401 ANIMALS GENETICS RESOURCES AND CONSERVATION

## MIDTERM PAST MCQS

1. Genetic resources are sometimes called the "first resource"
2. Landraces is a local variety of a domesticated plant species
3. Which is called the rosewood DalbergiaSissoo
4. Total area under the legume pulse crop in Pakistan 1.5m hectares
5. Which one is the Extinct species White rhino
6. Total remaining snow leopard in Pakistan 200
7. GSPC program founded in 1999
8. Microorganisms produces Antibiotic/antibodies
9. According to world data base on protected area there are over 210,000 protected areas around the world.
10. Rhino are hunted for Horns
11. Natural selection will always result in the selection of allele that gives an advantage to its possessor.
12. Cryopreservation in liquid nitrogen at -196 degree
13. How many categories of gene flow 2
14. Breeding type that is not related to half-sister half-brother and cousins line- Inbreeding
15. The strongest effect of genetic drift on small population
16. Themes of genetic resources 2
17. Population of Himalayan Brown bear in Pakistan 150-200
18. Pakistan in kinow production 6th number
19. Gene flow blocked by physical barriers Allopatric speciation
20. 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.
21. Biologists suspect we're living through the sixth major mass extinction
22. Honey bee pollinate how much plants 250,000 species of plants
23. Acacia nilotica is a pioneer species, easily regenerated from seed.
24. sheep was domesticated by humans in 10,000 BC

25. phenylketonuria caused by \_\_\_\_\_ **mutation**
26. Allele frequency affected by \_\_\_\_\_ **evolutionary mechanisms** such as (• Mutation • Gene flow • Inbreeding • Natural selection, • Founder effect • Random genetic drift)
27. Population bottleneck in 1890s due to \_\_\_\_\_ **Overhunting**
28. Reason for crustacean's migration? \_\_\_\_\_ **for breeding**
29. Sterculiakhasiana was endemic tree of ? \_\_\_\_\_ **Khasi Hills in Meghalaya in India**
30. Which involves storage in low and nonfreezing temperature \_\_\_\_\_ **Cold storage**
31. Which of the following is the earliest modern protected area \_\_\_\_\_ **Yellow stone National Park**
32. Mild form of breeding \_\_\_\_\_ **Line breeding**
33. Migration involves following types of hazards \_\_\_\_\_ **2 types(1. Natural Hazards 2. Anthropogenic hazards to migrants)**
34. Type of inbreeding \_\_\_\_\_ **3 (1-Close inbreeding 2-Mild inbreeding 3- Line inbreeding)**
35. Gene bank is a type of \_\_\_\_\_ **Ex Situ conservation**
36. Area of great genetic diversity are protected from human interference are known as \_\_\_\_\_ **Gene Sanctuary**
37. Animal genetic resources referred as \_\_\_\_\_ **All given options**
38. PGRFA Stands for \_\_\_\_\_ **Plant genetic resources for food and agriculture.**
39. NCCP stands for \_\_\_\_\_ **National culture collection of Pakistan**
40. Conservation of plant genetic resources is necessary for \_\_\_ Food security and Agro biodiversity \_\_\_ **Both A & B**
41. Peste de petits ruminants also known as \_\_\_\_\_ **Sheep and goat plague**
42. According to FAO, species of Molluskus are \_\_\_\_\_ **85000**
43. Which disease was spread due to consuming mercury poisoned fishes by people \_\_\_\_\_ **MINAMATA**

### **Current Mcqs**

44. Longest migration was observed in \_\_\_\_\_ **Artic Tern Bird**
45. Cryopreservation can be done \_\_\_\_\_ **196c**
46. Calypha belongs to family \_\_\_\_\_ **Spurge family( Euphorbaceae)**
47. Cause behind extinction of steller sea cow \_\_\_\_\_ **Hunting**
48. Darwinfinchis is example of \_\_\_\_\_ **Adaptive radiation**
49. Result of environmental and human change \_\_\_\_\_ **Bottle neck effect**

50. Genetic diversity is the variation of individual in \_\_\_\_ Amount of genetic information
51. Which specie is easily regenerated \_\_\_\_ Acacia nilotica
52. Sigillaria was a tree \_\_\_\_ Spore bearing
53. Thetecopa pupfish was native to the \_\_\_\_ Mojave desert
54. Extinction rate of mammals \_\_\_\_ 20%
55. Wild best are the part of \_\_\_\_ Great migration
56. Which of the following approach can be taken to analyze G×E interaction \_\_\_\_ Polygenic
57. Northern areas of Pakistan are serving \_\_\_\_ Habitat
58. Reef provide habitat to--marine life \_\_\_\_ 25%.
59. Land race is known as \_\_\_\_ cultivar.
60. Which is used to protect individual in protected environment \_\_\_\_ Insitu conservation.
61. Which is use at large scale for food and agriculture \_\_\_\_ sheep
62. Phenyl ketonuria is a genetic condition caused by \_\_\_\_ Mutant
63. which have strong genetic drift \_\_\_\_ Large, small, average, All
64. Example of founder affect \_\_\_\_ Hemophilia, dwarfism, infantdeath, All
65. Triggers of migration \_\_\_\_ local climate, local availability of food, the season of the year, for mating reasons (4)
66. Which of the following used to protect at suitable environment \_\_\_\_ in situ
67. Natural selection shows ..... change in genome \_\_\_\_ positive.
68. Which is hazard of migration \_\_\_\_ Drought, Food supply All
69. Biologists suspect we are living through ..... major mass extinction \_\_\_\_ Six
70. Dart poison frog yield compound like \_\_\_\_ Alkaloid.
71. Sigrilla was a ..... tree, \_\_\_\_ spore-bearing
72. .... are link from generation to generation of all living matter \_\_\_\_ Genes.
73. Which is example of in situ \_\_\_\_ national park, Biosphere, Gene bank ,All
74. ABSA is stands for \_\_\_\_ Access and Benefit Sharing Agreement
75. Antibiotics kill or inhibit growth of other organisms by \_\_\_\_ interfering
76. Northern areas of Pakistan are serving as \_\_\_\_ Habitat
77. in 19 th century only ....individuals of elephant seals were present \_\_\_\_ 20



78. Darwins finches are one of classical example\_\_\_\_\_ Adaptive Radiation.
79. For which purpose crustaceans migrate\_\_\_\_\_ Breeding
80. Reefs provide habitat to\_\_\_\_\_ Marine life
81. Gene pool types\_\_\_\_\_ 3.
82. Crow follow migration.\_\_\_\_\_ Daily.
83. Dwarf lake iris appearance\_\_\_\_\_ Deep blue
84. Cooling process in which water of tissue become glass instead of crystal\_\_\_\_\_ Vittrification
85. cryopreservation is applicable to\_\_\_\_\_ fishery, medical, animal husbundry, All
86. Yellow stone national park designated in\_\_\_\_\_ 1872
87. Causes of extinction\_\_\_\_\_ Climate change, hunting, pollution, All
88. Sea cow hunted to extinction in.\_\_\_\_\_ 1768
89. Extinct plant still cultivated in captivity is\_\_\_\_\_ Cyanea superba
90. Cryopreservation is done in low temp and deep freezer at\_\_\_\_\_ -80dgree
91. Allele frequency effected by\_\_\_\_\_ Mutation, gene flow, inbreeding, All
92. Breeding line have \_\_\_\_\_ Narrow genetic base
93. Animal closely related\_\_\_\_\_ Close inbreeding.
94. Transfer of gene from parent to offspring\_\_\_\_\_ Vertical transfer of gene
95. Species in danger of extinction\_\_\_\_\_ Endangered
96. GEWIS stands for \_\_\_\_\_. A Genome Wide Interaction Scan
97. Microorganisms are \_\_\_\_\_ diversity than other living organisms. Highest
98. Variation in genetic information of within of same individual of a population. Genetic diversity
99. How many animal species are in danger\_\_\_\_\_. 20,000
100. Phenyl-alkaptonuria is the genetic disease caused by\_\_\_\_\_. Mutation
101. \_\_\_\_\_ is a local variety of a domesticated plant species. Landrace
102. Which of the following is result of reproductive isolation\_\_\_\_\_ Sympatric Speciation.
103. Which of the following population has the strong effect of genetic drift\_\_\_\_\_ Small population.
104. Main threat to a large number of species\_\_\_\_\_ Pollution.
105. National strategy for PGRFA needs to be review if ...changes\_\_\_\_\_ World

106. If the advantageous gene is removed then the effect is Called \_\_\_\_\_ **Genetic Drift**
107. microorganisms are \_\_\_\_\_ **More diverse**
108. main reason behind meleda disease
109. Natural selection effects on ecosystem
110. Together with the components which fulfil agri-ecological fuctions genetic reasons are grouped under the concept \_\_\_\_\_ **Agrobiodiversity**
111. PGR are components of .....which sustain the humankind \_\_\_\_\_ **Biodiversity**
112. genetic resoucrs are heritable characteristics ..... of real or potential benefit.  
a plant b animal c none d both a and b \_\_\_\_\_ **both a and b**
113. The degree of relationship is not closer half brother or sister mating or cousin mating  
a inbreeding b outbreeding c pure breeding d line breeding \_\_\_\_\_ **linebreeding**
114. .... is a keystone species \_\_\_\_a grizzle bear b pyrenean ibex c snow lepard d sea mink \_\_\_\_\_ **Grizzle bear**
115. cryoperservation occur a liquid nitrogen b freezing temperature c vapour nitrogen d all \_\_\_\_\_ **All**
116. derived genetics expect \_\_\_\_inbreeding
117. .... cannot permeate the cell membrane such as sugar  
a membrane permeating b non membrane permeating c both a and b d none \_\_\_\_\_ **non membrane permeating membrane**
118. .... rare treat for eye \_\_\_\_\_ **hurt fern**
119. The introduction of genetic material (by interbreeding) from one population of a species to another is \_\_\_\_ **Gene Flow**
120. Which one of the following is the example of artificial barriers \_\_\_\_\_-The great chine wall .dams . barrages. **all**
121. An individual can be protected in controlled environment is \_\_\_\_\_ **ex situ conservation**
122. Genes can be transferred sexually or asexually in \_\_\_\_\_ **vertical transfer**
123. Wildebeest is an example of \_\_\_\_\_ **great migration**
124. Which one is the reason of bottle neck effect? (pollution, over hunting, habitat loss, all
125. The allele frequency in a population's gene pool affected by \_\_\_\_\_ Mutation, gene flow, inbreeding. **All of these**
126. Example of founder effect \_\_\_\_\_-Haemophilia, Dwarfism, still birth/infant birth, **All of these**
127. Sheep was domesticated by the human in \_\_\_\_\_ **10.000BC**
128. Which is easily regenerated from seed \_\_\_\_\_ **Acacia nilotica**

Join VU Bio Animals

## **BT401 CURRENT PAPERS FOR MIDTERM**

### **2 Marks:**

#### **1. What is outbreeding**

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

#### **2. What is 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.”

#### **3. Type of wild plant**

Prickly Acacia/Keekar • Coral Tree • Deodar Cedar • Dalbergia Sissoo /Sheesham Tree • Calotropis procera/Giant milkweed  
• Alovera • Marijuana

#### **4. When founder effect occurs?**

A founder effect occurs when a new colony is started by a few members of the original population.

#### **5. Meaning of Cryo-preservation**

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

#### **6. Reproductive isolation**

The inability of a species to breed successfully with related species due to geographical, behavioral, physiological, or genetic barriers or differences

#### **7. Endemic species**

Any species whose range is restricted to a limited geographical area

#### **8. Bottleneck effect**

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

#### **9. Major loss of genetic diversity.**

- The loss of genetic diversity within a species results in the loss of useful and desirable traits (e.g. resistance to parasites).
- Reduced diversity eliminate options to use untapped resources for food production, industry, medicine

#### **10. Enlist major sources of genetic diversity.**

- Mutations
- Speciation
- Errors in Meiosis

### **11. Gene flow in moth**

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

### **12. What is Plant domestication**

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

### **13. Define 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

### **14. Define breeding lines.**

These are lines/ populations developed in breeding programs have narrow genetic base and often contain valuable gene combination. This group nearly contains homozygous line or mutant lines and lines derived from biology programs, including transgenic lines. They are ordinarily maintained as working collection by breeders

### **15. Genetic material**

Genetic material is any material of plant, animal, microbial or other origin containing functional units of heredity.

### **16. Gene pool**

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

### **17. Endangered species**

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

### **18. What is mild inbreeding?**

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

### **19. How does genome wide interaction scan or examine GXE?**

A genome wide interaction scan (GEWIS) approach examines the interaction between the environment and a large number of independent SNP's

### **20. Define 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 the reason of extinction of sea mink.**

The sea mink (Neovison macrodon) once lived along the coasts of Maine and New Brunswick, but was prized for its fur and was hunted to extinction in the second half of the 19th century.

## **22. What is colony collapse disorder?**

“Colony collapse disorder” is wiping out entire populations of the insect.

## **23. What is progenitor?**

A person or thing from which a person, animal, or plant is descended or originates; an ancestor or parent

## **24. Enlist classes of gene pool system.**

1. Primary Gene Pool (GP1):
2. Secondary Gene Pool (GP2):
3. Tertiary Gene Pool (GP3):

## **25. what is migration with example**

“Migration is the relatively long-distance movement of individuals, usually on a seasonal basis.” e.g. Some crustaceans migrate for breeding

## **26. write some feature of myrcia skeldingii**

*Myrcia skeldingii* was a species of plant in the Myrtaceae family. It was endemic to Jamaica. It became extinct due to habitat loss.

## **27. How to observe G×E interaction**

There are two main methods to analyze gene environment interaction

1. Traditional Genetic Designs
2. Molecular Analyses

## **28. Heterosis**

Heterosis or hybrid vigor is the superiority of the crossbred offspring. Mathematically, heterosis is the difference in performance between the crossbred and the average performance of its purebred parents.

## **29. Forest genetic Resources**

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.

## **30. What are aquatic genetic resources?**

Aquatic genetic resources also comprise all water-dwelling genetic resources.

## **31. Which animal was listed as largest animal other than whales?**

Steller's sea cow is the largest mammals, other than whales

## **32. Purpose of grading up?**

The main purpose of the grading up is to attaining the superior traits in the breed.

## **33. what is gene flow**

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

**34. When did Bubal Hart beet gone 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.

**35. What should be characteristic of well design strategy for national strategy for PGRFA**

- A well-designed National Strategy needs to be tailored to the particular circumstances and needs of the country,
- Should be amenable to review and updating as country situations change.

**36. Tertiary Gene Pool (GP3):**

The genetic material which leads to production of sterile hybrids on crossing with primary gene pool is termed as tertiary gene pool or gene pool three (GP3). It includes material which can be crossed with GP1, but the hybrids are sterile. Transfer of gene from such material to primary gene pool is possible with the help of special techniques.

**37. Ecosystem is facing massive destruction due to extinction of species How?**

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

**38. When organism is functionally extinct 2**

A species may become functionally extinct when only a handful of individuals survive, which are unable to reproduce due to; • Poor health, • Age, • Sparse distribution over a large range, • A lack of individuals of both sexes (in sexually reproducing species

**39. what is the major cause of loss of genetic diversity.2m**

- The loss of genetic diversity within a species results in the loss of useful and desirable traits (e.g. resistance to parasites).
- Reduced diversity eliminates options to use untapped resources for food production, industry, medicine.

**3 Marks:**

**1. Causes of migration**

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

**2. Why do we need to conserve plant genetic resources**

- conservation of plant genetic resources is necessary for food security and agro-biodiversity
- 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

### 3. Type of genetic stocks

Genetic stocks can be divided into three general groups:-

1. cytological stocks
2. mutants stock
3. Germplasm set

### 4. Reason for 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

### 5. How pollution is threat to species?

Marine animals are exquisitely sensitive to traces of toxic chemicals in lakes, oceans and rivers. Drastic changes in oxygen levels, caused by industrial pollution, can suffocate entire populations. Large bodied animal and rare species are more prone to the changes caused by humans to the planet. Constant exposure to pollution can render plants and animals more susceptible to dangers including starvation, loss of habitat and disease

### 6. Article 6 for agricultural G. R?

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

### 7. Types of out breeding

There are 3 types of out breeding

1. Cross breeding
2. Grading up
3. Species cross

### 8. Huntington's 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.

### 9. Difference between vertical and horizontal gene transfer.

Vertical Gene transfer	Horizontal gene transfer
The transfer of <a href="#">genes</a> from parents to offspring	Transfer of gene occur between different species
Transfer of genetic material occurs through sexual or	Transfer of genes between organisms via methods other

asexual reproduction	than asexual or sexual reproduction.
transfer of genetic material is from parents to offspring	Genes are passed down from parent to progeny.

#### 10. Objective of GSPC.

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

#### 11. Characteristics of Gene Pool.

- 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.

#### 12. Write uses of 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 Sub-Himalayan 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

#### 13. What is Threatend of species

“A species is likely to become endangered if it is not protected” e.g. Giant Panda

#### 14. why harts tounge fern was 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

#### 15. Give diff concept of gene environment interaction

There are two different conceptions of gene–environment interaction.

- Tabery has labeled them *biometric* and *developmental* interaction
- Sesardic uses the terms *statistical* and *commonsense* interaction

#### 16. Ratio of vegetables grown in pakistan

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

### **17. what is 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).

### **18. Importance of domestic animal resources.**

- 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 anti-coagulant 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

### **19. What is 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 mitochondria and the chloroplast.

### **20. Enlist various methods of storage.**

There are various methods of storage :

- **Cryopreservation** - generally involves storage in liquid nitrogen.
- **Coldstorage** - it involves storage in low and non freezing temperature.
- **Lowpressure** – it involves partially reducing the atmospheric pressure of surrounding.
- **Lowoxygenstorage** - it involves reducing the oxygen level but maintaining the pressure

### **21. Primary genetic consequences on inbreeding**

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

### **22. Passenger pigeons**

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

### **23. Define cryopreservation.**

**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).

### **24. Some effect of lesser number of gene in gene population.**

Populations with a lesser number of genes in their gene pool will be susceptible to problems. This may cause them to become endangered or even die altogether, i.e., become extinct

### **25. How many types of in situ conservation**

There are 3 types of in-situ conservation 1) National park 2) biosphere reserve 3) gene sanctuary

## 26. What is sardine run

One of the largest and most ecologically important migrations occurs along the eastern coast of South Africa, the **Sardine Run**. In July, after spawning in the cold waters of the Cape of South Africa millions of sardines migrate north to warmer waters in the KwaZulu-Natal coast.

## 27. Why Acalypha rubrinervis known as string tree?

It was called string tree on account of the thin pendulous inflorescences which resembled red strings.

## 28. Write Merits of in-situ

- Plants and animals conserved in their natural environment
- Biodiversity permanently protected
- Natural and cultural heritage protected permanently
- Ecological integrity is maintained and managed
- Opportunities may arise for ecologically sustainable land uses (which come with associated economic benefits)
- Facilitates scientific research of the site

## 29. 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.

## 30. Characteristics of Sigillaria?

The Sigillaria tree is one you would probably find strange today. It's a tree that doesn't reproduce via seeds, like today's deciduous and coniferous trees do. It was a spore-bearing, tree-like plant that flourished in the late Carboniferous period

## 31. Difference between genetic drift and natural selection.

- **Natural selection** shows the positive changes in the genome that may give its possessor an adaptive advantage; **genetic drift** shows changes in the genome that may be advantageous, deleterious or may have no effect.
- **Natural selection** is response to an organism's environmental challenges. **Genetic drift** is completely random and is solely based on luck.
- **Natural selection** will always result in the selection of allele that gives an advantage to its possessor, while genetic drift causes advantageous genes to be removed in the following generations.
- **Genetic drift** is largely influenced by the population size, whereas natural selection is not.
- **Genetic drift** leads to the reduction of genetic variations, or may sometimes be responsible for introducing genetic variation in a population. **Natural selection** will always result in introducing more genetic variations in a population

## 32. write a note on effect of over fishing

- The large numbers of many marine fish species and the wide ranging habitats seems virtually impossible that one fish species could be eradicated through overfishing.
- Fisheries can drastically lower the numerical abundance of individual stocks or even entire fish species by overfishing
- **For example**, various cod and herring stocks in the North Atlantic

### **33. Difference between policy and strategy 3**

**Policy:** - A policy is a set of basic principles and guidelines, formulated and enforced by a nation government to direct and limit its actions in pursuit of long-term goals

**Strategy:** - A strategy refers to a concrete plan of actions, specifically designed to achieve concrete goals

### **34. Effect of loss in genetic diversity**

- The loss of genetic diversity within a species result in the loss of useful and desirable traits (e.g. resistance to parasites).
- Reduced diversity eliminate options to use untapped resources for food production, industry, medicine.

### **35. How environment effect change gene environment interaction in case of phenylketonuria?3**

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.

### **36. Allopatric and sympatric speciation?3**

**Allopatric speciation:**

“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

**Sympatric speciation:**

- Artificial physical barriers are man-made barriers such as “The Great Chine Wall”, barrages or dams etc
- 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

### **37. How pollution effects the aquatic organism's??? 3**

- Pollution caused by industrial effluents and wastewater of private households has severely damaged the habitats of many fish species

- Famous example of effect of aquatic pollution is "MINAMATA Disease." This disease was spread due to consuming mercury poisoned fishes by people

### 38. Gene environment example in Human.

A bunch of women from West Africa, where malarial is present, mate with a group of Europeans. Their children are less susceptible to contracting malaria due to the presence of antibodies from their West African mothers

### 5Marks:

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

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

**Explanation:-** It is an extreme example of genetic drift that happens when the size of a population is severely reduced. Events like natural disasters (earthquakes, floods, fires) can destroy a population, killing most individuals and leaving behind a small, random assortment of survivors.

**Bottleneck effect and Allele Frequencies:** 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

#### 2. How animals figure out that where they are going or, Ways of animals how they move to different areas?

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.
- **Example:-** Some crustaceans also migrate for breeding. In many species of crabs, the females will move into shallow coastal waters to mate and lay her eggs and then they return to deeper ocean waters.

#### 3. Brief description about animals' genetic resources for food and agriculture.

The term 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.

#### **Animal genetic resources for 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".

#### Values of animal genetic resources:

- Direct use value
- Indirect use value
- Option value
- Bequest value
- Existence value

#### 4. Reproduction isolation

##### 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

#### 5. What is threat to AnGR

##### Threats to 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.

#### 6. Difference between gene flow and genetic Draft

##### 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.



## **7. Why it is necessary to take precautionary measures to prevent the loss of genetic diversity**

### **Why to prevent the loss of Genetic Diversity?**

- The loss of genetic diversity is difficult to see or measure. In contrast, the reduction and extinction of populations is far easier to see.
- Extinction is not only the loss of whole species, but is also preceded by a loss of genetic diversity within the species.
- This loss reduces the species ability to perform its inherent role in the whole ecosystem.
- The loss of genetic diversity within a species results in the loss of useful and desirable traits (e.g. resistance to parasites).
- Reduced diversity eliminates options to use untapped resources for food production, industry, medicine.

## **8. Merits of insitu and exsitu conservation**

### **In situ Conservation**

#### **Merits:-**

- Plants and animals conserved in their natural environment
- Biodiversity permanently protected
- Natural and cultural heritage protected permanently
- Ecological integrity is maintained and managed
- Opportunities may arise for ecologically sustainable land uses (which come with associated economic benefits)
- Facilitates scientific research of the site

### **Ex situ Conservation**

#### **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.

## **9. Give different steps of Allopatric speciation.**

### **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.

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

## **10. Explain global strategy for plant conservation. or Note on GSPC**

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 stop 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

## **11. Write a note on microbial resources?**

The complexity and diversity of microbial populations is highest among all living organisms. The diversity of microbial communities and their ecologic roles are being explored in;

- Soil • Water • Plants • In animals
- In extreme environments such as the arctic deep-sea vents or high saline lakes.

### **Microorganisms include;**

- Algae, Bacteria (including cyanobacteria), Fungi (including yeasts), Protistan groups, Viruses.

### **Number & Richness Genetic Resources of Microorganism:**

- 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 demonstrating that knowledge of these groups is grossly insufficient

## **12. Difference between out breeding and inbreeding.**

### **1. 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. Outbreeding is the recommended breeding practice for most purebred sheep breeders. Within pure-breeding, there are several types of mating systems. Outbreeding is the recommended breeding practice for most purebred sheep breeders.

### **2. In-breeding**

Inbreeding is a system of breeding in which closely related animals are mated. This includes sire to daughter, son to dam, and brother to sister. 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.

### **13. Write the steps of the conservation of PGR.**

#### **Conservation of plant genetic resources**

- Selection of target taxa
- Project commission
- Eco geographic survey/preliminary survey mission
- Conservation objectives
- Field exploration
- Conservation strategies
- Conserved product deposition and dissemination
- Characterization/ Evaluation
- PGR utilization
- Utilization products

### **14. Five types of genetic resources.**

#### **1. 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.

#### **2. Animal genetic resources**

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**

**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**

Aquatic genetic resources also comprise all water-dwelling genetic resources.

#### **5. Genetic resources of micro-organisms**

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

#### **6. Invertebrates Genetic Resources**

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

**15. Write three ways have bacteria transfer their DNA horizontally.**

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

**16. Explain any two types of ex situ conservation**

Types of Ex Situ conservation

- Gene bank
- Botanical garden

**1. GeneBank**

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 Gene 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

**17. 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.
- A well-designed National Strategy needs to be tailored to the particular circumstances and needs of the country,
- Should be amenable to review and updating as country situations change.

- The National Strategy for PGRFA should also be complementary to other national, regional and global conservation strategies or initiatives

## **18. Close inbreeding and line 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

## **19. Example of genes interaction in plants**

### **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.

## **20. Need of National strategy for PGRFA**

### **Why is a National Strategy for PGRFA needed?**

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 to access to needed genetic materials and govern the sharing of the growing benefits; add value to them through crop improvement; and sustainably intensify crop production as may be needed.

## **21. Genetic stock in detail**

### **Geneticstocks**

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 can be divided into three general groups:-**

1. cytological stocks
2. mutants stock
3. Germplasm set

## **22. Advantage and disadvantages of in breeding**

### **Advantages of Inbreeding**

1. Inbreeding is essential to the development of pre-potent animals — animals that uniformly “stamp” their characteristics on their progeny.
2. Inbreeding uncover genes that produce abnormalities or
3. In general, inbreeding results in an overall lowering in performance: vigor, disease resistance, reproductive efficiency, and survivability.
4. It also increases the frequency of abnormalities. For example, the spread of spider lamb disease in black-faced sheep is believed to be the consequence of inbreeding.
5. Inbreeding suggests only highly qualified operators who are making an effort to stabilize important traits in a given set of animals.

### **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

## **23. How climate change effect species extinction**

Extinction event also known as a mass extinction 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”

## **24. 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 additively of the main effects of heredity and environment, but whether such interaction is 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.

**25. How wildebeest related to migration.5 marks**

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.

**26. Advantages and disadvantages of out breeding? 5 marks.**

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

**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:**

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

**27. Note on Indus Dolphin? 5marks**

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

**28. Merits and demerits of ex situ? 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

## 29. Explain Steller's cow and Dodo

### Steller's sea cow

The largest mammals, other than whales, to have existed in the holocene epoch, the Steller's sea cow reached up to nine metres in length but was hunted to extinction in 1768, within 27 years of its discovery by Europeans.

### Dodo

Perhaps the most famous extinct species, the dodo - endemic to Mauritius - was wiped out in just a few decades. The first recorded mention of the flightless bird was by Dutch sailors in 1598; the last sighting of one in 1662. It owes much of its fame to its appearance in Alice's Adventures in Wonderland.

## MIDTERM PAST FILE

### 2 Marks Short Questions:

1. **Forest Genetic Resource? 2marks**

**Answer:** 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.

2. **Sympatric Speciation? 2marks**

**Answer:** 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.

3. **What is plant domestication? 2 marks**

**Answer:** "Plant domestication is the process whereby wild plants have been evolved into crop plants through artificial selection."

4. **Which form is closest to inbreeding? 2 marks (NOT CONFIRMED)**

**Answer:**

- 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)

5. **Inbreeding depression? 2marks**

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

6. **Endemic species? 2marks**

**Answer:** Any species whose range is restricted to a limited geographical area.

7. **Name four causes of extinction? 2marks**

**Answer:** 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

8. **Color moths mating? 2 marks**

**Answer:** Populations 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.

9. **AnGR stand for? 2marks**

**Answer:** The term AnGR stand for Animal genetic resources.

**10. Breeding lines? 2marks**

**Answer:**

- These are lines/ populations developed in breeding programs have narrow genetic base and often contain valuable gene combination.
- This group nearly contain homozygous line or mutant lines and lines derived from biology programs, including transgenic lines.

**11. Why *Acalypha rubrinervis* is called string tree? 2marks**

**Answer:** *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.

**12. Write the application of cryopreservation in medical science? 2marks**

**Answer:** 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.

**13. Genetic drift? 2 marks**

**Answer:** "Random changes in gene frequency especially in small populations when leading to preservation or extinction of particular genes".

**14. What is progenitor? 2 marks**

**Answer:** a person or thing from which a person, animal, or plant is descended or originates; an ancestor or parent

**15. What are aquatic genetic resources? 2 marks**

**Answer:** "Aquatic genetic resources include all genetic resources living in water"  
For Examples: Fish, cyclostomes, mussels, decapods, marine mammals.

**16. What does it mean "functionally extinct"? 2 marks**

**Answer:** A species may become functionally extinct when only a handful of individuals survive, which are unable to reproduce due to; • Poor health, • Age, • Sparse distribution over a large range, • A lack of individuals of both sexes.

**17. What is the major objective of cryopreservation? 2 marks**

**Answer:** 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.

**18. Define pure breeding? 2 marks**

**Answer:** 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.

**19. How to identify Gene Environment interaction? 2marks**

**Answer:** There are two main methods to analyze gene environment interaction

1. Traditional Genetic Designs
2. Molecular Analyses

**20. Define wild plant resources? 2 marks**

**Answer:** Wild plant resources refer to those that grow spontaneously in self-maintaining populations in natural or semi-natural ecosystems and can exist independently.”

**21. What is genetic material? 2 marks**

**Answer:** Genetic material is any material of plant, animal, microbial or other origin containing functional units of heredity.

**22. Define varieties in cultivation? 2 marks**

**Answer:** 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.

**23. Define protected areas? 2 marks**

**Answer:** “A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values”

**24. How hart's tongue fern become threatened? 2 marks**

**Answer:** 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

**25. Differentiate b/w close and line inbreeding. 2marks**

**Answer:**

Close inbreeding	Line inbreeding
Animals are very closely related and can be traced back to more than one common ancestor.	Mating animals that are more distantly related which can be traced back to one common ancestor
e.g. full brothers and sisters	e.g. Cousins Grandparents to grand offspring, Half-brother to half-sister

**26. Types of in situ conservation? 2 marks**

**Answer:** There are three types of in situ conservation.

1. National park
2. Biosphere reserve
3. Gene sanctuary

**27. Define breed? 2marks**

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

**28. Ultrarapid Freezing? 2 marks**

**Answer: 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.

**29. Gene sanctuary?2 marks**

**Answer:** The genetic diversity is sometimes conserved under natural habitat. In other words, areas of great genetic diversity are protected from human interference. These protected areas in natural habitat are referred to as gene sanctuaries.

**30. Grading up? 2 marks**

**Answer:** Breeding of animals of two different breeds where the animal 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.

**31. Anthropogenic hazards to migration.? 2 marks**

**Answer:** . Anthropogenic hazards to migrants

- Barriers (fences, dams & skyscrapers)
- Water, air craft and fishes practices
- Telegraphic wires, towers and light houses
- Illegal hunting

**32. How genetic drift change the frequency of gene??2 marks**

**Answer:** 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.

**3 MARKS SHORT QUESTIONS:**

**1. Enlist extinct animals of Pakistan? 3 marks**

**Answer:** Extinct animals of the Pakistan are:

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

**2. Difference between allopatric and sympatric speciation? 3 marks**

**Answer:**

Allopatric speciation	Sympatric speciation
Allopatric speciation is speciation that results when a population is separated by a physical barrier.	Sympatric speciation is speciation that occurs without physical separation of members of the population.
It is geographical isolation that doesn't allow population of the same species to exchange genetic material	The 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
e.g. Darwin finches	e.g. In Apple Maggot Flies

**3. Differentiate of ex situ and in situ conservation?3 marks**

**Answer:**

Ex situ conservation	In situ conservation
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It involves placing of threatened animals and plants in special care unit for their protection	This method involves protection of endangered species in their natural habitats
There are two types of ex situ conservation 1. Gene bank 2. Botanical garden	There are three Types of in situ conservation 1. National park 2. Biosphere reserve 3. Gene sanctuary
It helps in recovering populations or preventing their extinction under stimulated conditions that closely resemble their natural habitats.	It helps in recovering populations in the surroundings where they have developed their distinct features.

#### 4. Define migration and its causes? 3 marks

**Answer:** 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.

##### **Causes of Migration**

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

#### 5. Local migration? 3 marks

**Answer:** 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

#### 6. Vertical and horizontal gene transfer? 3 marks

**Answer:**

**Vertical gene transfer:** The transfer of genes from parents to offspring. It may be through sexual or asexual reproduction

**Horizontal Gene Transfer:** Horizontal gene transfer is basically the transfer of genes between organisms via methods other than asexual or sexual reproduction. Genes and the characteristics code for are passed down from parent to progeny.

There are three ways for bacteria to transfer their DNA horizontally

1. Conjugation
2. Transformation
3. Transduction

#### 7. What are endanger species explain with examples? 3 marks

**Answer:** "A species of plant or animal that is in immediate danger of becoming extinct and needs protection to survive."

For Examples:

- The Indus River dolphin
- Markhor
- Asian Black Bear
- Snow Leopard
- Marco Polo sheep
- Marbled Teal
- White-Headed Duck
- Musk Deer

#### 8. Nagoya Protocol? 3 marks

**Answer:** The Nagoya Protocol focuses on the equitable sharing of genetic material (plant, animal, microbial, and

other) including the traditional knowledge associated with the genetic resources, and the benefits that arise from their use.

**9. How overhunting cause to extinction of animals? 3 marks**

**Answer:** 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

**10. Names of wild Animal genetic resources of Pakistan? 3 marks**

**Answer:** Some most important wild animal resources in Pakistan are as follow:

- Snow Leopard • Alpine Markhors • Asiatic Cobra • Mugger Crocodile • Himalayan Brown Bear • Indus River Dolphin • Asian Black Bear • Fishing Cat

**11. Types of cryoprotectants? 3 marks**

**Answer:** There are two 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

**12. What are the triggers for migration? 3 marks**

**Answer:** 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

**13. Seasonal migration? 3 marks**

**Answer:** Respond to change in the season tropical & sub tropical countries area, this occurs at the beginning or end of the warm season. This type of migration is for food or breeding. They migrate from the south to the north during summer. e.g. snow bunting, red wing, shore lark.

**14. Compare insitu conservation and exsitu conservation demerits? 3 marks**

**Answer:**

**Demerits of insitu 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

**Demerits of exsitu 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.

**15. Passenger pigeon? 3marks**

**Answer:** 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.



**16. Vegetables growth ratio in Pakistan? 3 marks**

**Answer:** 74% of the total production

**17. Causes of migration? 3**

**Answer:**

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

**18. What is horizontal gene transfer? 3 marks**

**Answer:** 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."

**19. Bottleneck effect with example? 3 marks**

**Answer:** The bottleneck effect is a sharp lowering of a population's gene pool because of an environmental, or human-caused, change."

It is an extreme example of genetic drift that happens when the size of a population is severely reduced. Events like natural disasters (earthquakes, floods, fires) can decimate a population, killing most individuals and leaving behind a small, random assortment of survivors.

**20. Cryopreservation? 3 marks**

**Answer:** 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).

**21. Endangered species in Pakistan? 3 marks**

**Answer:** "A species of plant or animal that is in immediate danger of becoming extinct and needs protection to survive."

Some most endangered species in Pakistan are:

- The Indus River dolphin • Markhor • Asian Black Bear • Snow Leopard • Marco Polo sheep
- Marbled Teal • White-Headed Duck • Musk Deer

**22. How plant genetic resources are important? 3 marks**

**Answer:**

- 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.
- Plant genetic resources include all our agricultural crops and even some of their wild relatives because they too often have valuable traits.
- Plant genetic resources are components of biodiversity which sustain the humankind

23. Effect of over fishing on aquatic genetic resources? 3 marks

Answer:

- The large numbers of many marine fish species and the wide ranging habitats seems virtually impossible that one fish species could be eradicated through overfishing.
- Fisheries can drastically lower the numerical abundance of individual stocks or even entire fish species by overfishing. For example, various cod and herring stocks in the North Atlantic

24. Types of genetic stock? 3 marks

Answer: Genetic stocks can be divided into three general groups:-

1. Cytological stocks
2. Mutants stock
3. Germplasm set

25. Importance of domestic animal resources? 3 marks

Answer:

**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 anti-coagulant 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

26. Differ b/w outbreeding and inbreeding? 3 marks

Answer:

Outbreeding	Inbreeding
"The intentional breeding of distantly related or unrelated individuals for the purpose of producing offspring of superior quality."	"Inbreeding, the mating of individuals or organisms that are closely related through common ancestry."
There are 3 types of out breeding. <ol style="list-style-type: none"><li>4. Cross breeding</li><li>5. Grading up</li><li>6. Species cross</li></ol>	There are 3 types of inbreeding <ol style="list-style-type: none"><li>4. Close inbreeding</li><li>5. Mild inbreeding</li><li>6. Line inbreeding</li></ol>

27. Describe Number & Richness Genetic Resources of Microorganism? 3marks

Answer: 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 demonstrating that knowledge of these groups is grossly inadequate

28. Difference between Wild form and wild relatives? 3 marks

Answer:

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

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

their evolution.

**29. Difference between genetic drift and gene flow? 3 marks**

**Answer:**

- 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.

**30. Note on Nut trees? 3 marks**

**Answer:** Nut Trees in Pakistan are as follow:

- Almonds • Walnut • Tree Nuts

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

**31. What is Out breeding? 3 marks**

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

**Types of Out breeding:**

There are 3 types of out breeding.

1. Cross breeding
2. Grading up
3. Species cross

**32. In which population Huntington's diseases often occur? 3 marks**

**Answer:** 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.

**5 MARKS LONG QUESTIONS:**

**1. Reproductive isolation? 5 marks**

**Answer:** 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

**2. Detail note on global strategy for plant Conservation(GSPC)? 5 marks**

**Answer:**

The Global Strategy for Plant Conservation (GSPC) is a program of the UN's Convention on Biological Diversity founded in 1999

**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 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.

3. **Merits and demerits of ex situ? 5 marks**

**Answer:**

**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.

4. **Write down the Threats on AnGR? 5 marks**

**Answer: Threats to 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.

5. **Different freezing methods in Cryopreservation? 5marks**

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.

6. **Purpose of National strategy of PGRFA? 5 marks**

**Answer:** 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.

- A well-designed National Strategy needs to be tailored to the particular circumstances and needs of the country
- should be amenable to review and updating as country situations change.
- The National Strategy for PGRFA should also be complementary to other national, regional and global conservation strategies or initiatives.

7. **Note on Indus Dolphin? 5marks**

**Answer: .**

**The Indus River 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

8. **Write five types of genetic resources? 5 marks**

**Answer:**

**Types of Genetic Resources**

**1. 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.

**2. Animal genetic resources**

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**

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**

Aquatic genetic resources also comprise all water-dwelling genetic resources.

**5. Genetic resources of micro-organisms**

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

**6. Invertebrates Genetic Resources**

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

9. **Advantages and disadvantages of out breeding? 5 marks.**

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

**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:**

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

**10. What are the obstacles of cryopreservation? 5 marks**

**Answer:**

- 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

**11. Why National strategy for PGRFA needed? 5 marks**

**Answer:** 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

**12. How the climate change cause the extinction? 5 marks**

**Answer:** 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

**13. How wildebeest related to migration? 5 marks**

**Answer:** 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.

**14. Explain the term "animal genetic resources for food and agriculture"? 5 marks**

**Answer:** 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".

**Values of animal genetic resources:** • Direct use value • Indirect use value • Option value • Bequest value • Existence value

**List of animal species for food and agriculture:**



## List of animal species used for food and agriculture

Widespread species	
Species	No. of breeds
Pig	350
Goat	320
Sheep	850
Cattle	815
Buffalo	70
Horse	350
Donkey/Ass	70
Dromedary	50
Bactrian Camel	6

7

### 15. Biometric gene environment interaction? 5 marks

#### Answer

- 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 interaction is present in particular settings is 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.

### 16. Future for cryopreservation? 5 marks

**Answer:** Vitrification method of cryopreservation may bring new opportunities to research protocols. It is still an experimental procedure. There are two major concern 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

### 17. How climate change effect species extinction? 5marks

**Answer:** 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