MUHAMMAD IMRAN	BT401 Genetic Resources & Conservation
PAST PAPER SOLVED QUESTIONS	FINAL TERM

1. Mission of Ramsar conservation? 2

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

2. Which type of material DNA bank are useful?

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

3. What is legislation? 2

The process of making or enacting laws.

4. Who is responsible for botanical garden?

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

5. Give different variant of gene variant?

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

7. Historical Background of CBD?

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

8. Name of botanical institute of Pakistan?

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

9. Effect of climate changes on invertebrate?

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

10. Sanctuaries and national parks?

National Parks:

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

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

11. Habitat of species that affect climate change?

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

12. How plant cope changes climate?

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

13. Treaty?

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

14. Strict nature reserve?

Category Ia: Strict Nature Reserve Primary objective To conserve Regionally, Nationally, Globally outstanding ecosystems, Species (occurrences or aggregations), Geo diversity features

Other Objectives To preserve ecosystems, To secure examples of the natural environment for scientific studies, To minimize disturbance through careful planning, To conserve cultural and spiritual values associated with nature.

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

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

15. Two application of Germplasm conservation?

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

16. Threatened species of rann kutch?

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

17. Impact of climate IGR?

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

18. Threat of FGR?

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

19. Category three define?

: Category III: National Monument-Feature
Definition: Protected areas set aside to protect a specific natural monument. They are generally quite small protected areas and often have high visitor value.
Primary objective To protect specific outstanding natural features. Their associated biodiversity and habitats

20. Ramsar sites of Punjab?

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

21. When Nagoya protocol adapt?

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

22. Issue should not strict nature reserve?

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

23. Application storage technique germplasm?

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

24. What is botanical garden?

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

Long 5 Marks

25. Social Cluster value of national monument?

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

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

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

27. Conservation role of botanical garden?

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

28. Cartagena protocol?

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

Objectives of Cartagena Protocol on Biosafety

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

29. Why do forest genetics resources master?

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

30. Name lab of plant genetic resources?

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

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

31. Limitation of germplasm conservation?

The germplasm conservation through the conventional methods has several limitations such as short-lived seeds, seed dormancy, seed-borne diseases, and high inputs of cost and labour. The techniques of cryopreservation (freezing cells and tissues at -1960c) and using cold storages help us to overcome these problems.

32. The services provided by PEPA?

Pakistan Environmental Protection Act, 1997

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

Long 10 Marks

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

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

Effects of changing climate on organisms associated with trees

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

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

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

35. What are three pillars of Ramsar Convention? 5

Ramsar is one of the global inter-governmental environmental agreements. The treaty was negotiated in1960s by countries and NGOs. To avoid the increasing loss and degradation of wetland habitat for migratory water birds. In an 18 nations meeting it was adopted in the Iranian city of Ramsar On 2nd February 1971. Came into force in 21$_{st}$ December 1975

The "three pillars" of the convention

The Contracting Parties (160)commit to:

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

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

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

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

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

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

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

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

Forest genetic resources and climate change

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

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

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

Direct impacts of climate change

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

Effects of changing climate on organisms associated with trees

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

Changes in abiotic disturbance regimes:

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

Invasion by organisms foreign to local ecosystems

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

38. What areas are covered by Cartagena protocol?

The Bio safety (Protocol to CBD) deals with;

Safe handling,
Storage
Trans-boundary movement of the Genetically Modified Organisms (GMO).

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

Objectives of Cartagena Protocol on Biosafety

The Protocol states that it aims to;

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

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

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

39. Briefly explain historical background of Ramsar convention. 3

History: Ramsar is one of the global inter-governmental environmental agreements. The treaty was negotiated in1960s by countries and NGOs. To avoid the increasing loss and degradation of wetland habitat for migratory water birds. In an 18 nations meeting it was adopted in the Iranian city of Ramsar
On 2nd February 1971. Came into force in 21$_{st}$ December 1975

40. Describe purpose of panel code. 2

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

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

41. What is location of cholistan wildlife sanctuary? 2

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

42. Mission of Ramsar convention.

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

43. What is botanical garden? (2)

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

Types of plants in botanical gardens 1.
cacti and succulent plants.

2. herb gardens.
3. greenhouses, shade houses

44. Define forest genetic resources? (2)

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

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

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

1. adaptation
2. Migration
3. phenotypic plasticity

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

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

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

- Sex can introduce new gene combinations into a population.

47. Define seed storage? (3)

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

1. Seeds of many valuable species can survive long-term storage ('longterm' is defined as spanning a period of time longer than one rotation
2. Good storage facilities are now available in most of the world, and they are used extensively for

tree seed storage for various regeneration purposes;

3. Seed storage is a relatively cheap method for conserving a broad range of germplasm
4. Large land areas are not tied up in conservation
5. International exchange of genetic material is facilitated by seed storage.

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

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

Types of plants in botanical gardens 1.
cacti and succulent plants.

2. herb gardens.
3. greenhouses, shade houses.

4. tropical plants.
5. Medicinal Plants.
6. aromatic or textile plants
7. other exotic plants.

science.

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

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

4- Conservation

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

5- Climate Change

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

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

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

Slow Freezing- Slow thawing

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

2. Rapid cooling and rapid thawing

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

3. Vitrification

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

4. Ultrarapid Freezing

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

50. name physical method for storage

There are various methods of storage :

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

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

51. primary objectives of national park

Primary objective

To protect natural biodiversity along with its underlying ecological structure.

Other objectives

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

52. runn of kutch wildlife sanctuary

Runn of Kutch Wildlife Sanctuary

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

53. phenotypic plasticity

The role of phenotypic plasticity

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

54. Write two derived resources 2

2. Derived Genetic Resources

➢ Obsolete varieties

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

54. What are the needs of genetic preservation 2

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

A genetic preservation serves as an insurance policy for breeders and owners of valuable cattle by enabling them to extend and develop a specific bloodline when additional production is needed or untimely losses or reproductive inabilities occur.
The DNA, cryogenically preserved from the tissue sample, can permanently store the genoptype of the elite donor animal, providing a genetic blueprint to recreate that cow, bull, heifer - or even a steer - at any time in the future.

55. Define tertiary gene pool 3

Tertiary gene pool

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

56. What is pakistan animal resource management program 3

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

Snow Leopard	
□□	Alpine Markhors

The primary objectives[5] of the Roundtable were to:

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

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

[5] This sections draws on the initial presentation of Simeon Ehui, who was the principal organizer of the Roundtable at ILRI

Specific immediate objectives

The immediate objectives of the Roundtable were to:

- review the contribution and potential of livestock to increase sustainable food production, and contribute to income generation in low income countries with a forward perspective to 2020 ("The Global 2020 Vision for Livestock");

- identify major social, economic, technical and institutional constraints limiting livestock's contribution to achieving food security and economic development; and

- define appropriate strategies to alleviate these constraints and propose a framework for international action to enhance animal productivity in its broadest sense.

Expected outputs

The expected outputs of the Roundtable were:

- an analysis of past and present trends in livestock productivity and consumption of livestock products which would be used in part as an input to a "2020 Vision" paper to be further developed after the meeting;

- a statement of a defined set of objectives within the time frame specified and a related description of the constraints that must be overcome for the objectives to be achieved; and

- formulation of the set of measures ("a framework for action") or strategies needed for increasing livestock productivity in low income countries and securing better management of the natural resource base from the present to the end of the second decade of the 21st century.

57. What is phenylketonuria? 2

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

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

Define threatened species? 2

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

State 2 quarantine principle? 2

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

Modern quarantine does not have to be absolute to be effective

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

58. Explain habitat lose cause of extinction? 3

Habitat destruction is the process in which naturalhabitat is rendered unable to support the speciespresent. In this process, the organisms that previously used the site are displaced or destroyed, reducingbiodiversity. ... Habitat destruction is currently ranked as the primary cause of species extinctionworldwide.

59. What are molecular marker? 3

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

RFLP (or Restriction fragment length polymorphism)

SSLP (or Simple sequence length polymorphism)

AFLP (or Amplified fragment length polymorphism)

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

60. What are three common function of quarantine?3

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

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

61. What are mechanism of cryopreservation name steps? 5

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

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

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

Cryopreservation can be done at
Over solid carbon dioxide (at -79 degree) Low temperature deep freezer (at -80 degree)
In vapor phase nitrogen (at -150 degree)
In liquid nitrogen (at -196 degree)

62. DNA Bank. 5

DNA banks can now be considered as a means of complimentary conservation. DNA storage is particularly useful for those species that cannot be conserved in traditional seed or field genebanks and nor conserved in situ due to high risk in that area.
Advantages
DNA banking is an efficient, simple and long-term method to conserve the genetic information.

Disadvantages
There are problems with subsequent gene isolation, cloning and transfer of DNA back to a plant and it currently does not allow the regeneration of the same genotype as the original sample. Storage strategy
Determining what to store and for how long is an important consideration, used to determine sample size, capacity of the DNA bank, preparation of samples and documentation. Long-term needs and expected volume and number of samples to be stored will determine organization and repository design.
Processing of samples
DNA preserved in DNA banks will be stored either within cells and extracted upon retrieval from storage or extracted from cells and purified before storage. The quality of the DNA is expressed through yield, purity, molecular weight, amplification efficiency and authenticity of sequences. The quality of DNA extracted from plant specimens is dependent on the condition of the

specimen before storage, the storage environment and the duration of storage. Rapid drying of plant samples with silica gel or lyophilisation helps to preserve the DNA. S torage
Once extracted DNA is a stable biomolecule, although it can easily be degraded during extraction and storage. Quality declines within days in hydrated samples held at room temperature or in refrigerators. Drying the sample or storing it in freezers or liquid nitrogen achieves better preservation of DNA molecular size. For this reason, DNA is better conserved in a form that is close to the original state and most DNA banks store cells or tissues and extract DNA upon request.
There is little information on the long-term stability of extracted DNA during frozen storage, but most repositories consider several years to decades as realistic. Information on the stability of purified DNA dissolved in buffer suggests that the overall fragment size decreases with storage time, and that the usefulness of the specimen for PCR-based assays may be 1–2 years when stored at 4 °C, 4–7 years when stored at -18 °C and greater than 4 years when stored at -80 °C (Madisen et al. 1987; Visvikis et al. 1998).
The choice of temperature usually depends on the moisture level within the sample

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

Inbreeding:

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

Outbreeding:
"The intentional breeding of distantly related or unrelated individuals for the purpose of producing offspri ng of superior quality.

64. Biological diversity. 2

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

65. Define extiniction?

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

66. Germplasm Conservation 10

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

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

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

o In vivo Gene Bank o In vitro

Gene Bank (i) In vivo Gene

Bank:

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

(ii) In vitro Gene Bank:

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

Methods of Preservation

Free Preservation or Cryopreservation:

Cryopreservation (Latin Kuos means frost) means storage of materials at very low temperature. Plant cells and tissue cultures are brought to zero state of metabolism by subjecting them to ultra-low temperature i.e. -I96°C. It is done by using liquid nitrogen which provides approximately -496°C. Cryoprotectants (e.g. glycerol, proline, mannitol, dimethylsulfoxide, sorbitol) are also used to protect the viable cells from the damage during freezing and thawing (to become unfrozen or warm). Germplasm of some plants (in the form of shoot tips, nodal or meristem explant culture) are stored at low and nonfreezing temperature (1-9°C). At low temperature, growth of plant material is slow down but not completely stopped as in cryo-preservation. In cold storage there is no risk of cold injuries.

Low-pressure and Low-oxygen Storage:

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

67. Germplasm Exploration Laboratory 5

Germplasm Exploration Laboratory:

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

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

68. Gene flow 5

Gene Flow:

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

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

69. Steps for conservation of plant genetic resources 5

The Global Strategy for Plant Conservation

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

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

Objectives:

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

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

70. Critical Endangered Species.

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

Examples:

Eastern Lowland Gorilla

Hawksbill Turtle

Javan Rhino

71. Game Reserve(2)

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

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

72. Name of second largest national park (2)

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

73. Define strict nature reserve.2 marks

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

74. Define phenotypic plasticity.2 marks

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

75. Assisted migration.2

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

76. Central goal of zoo.2

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

77. Role of earthworm in soil 2

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

78. Types of gene bank(2)

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

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

11. Disadvantages of Dna bank?

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

79. Clonal repository 2

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

80. Two types of cryoprotectans 2

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

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

81.Maximum temp 4 cryopreservation 2

Maximum temperature of cryopreservation is -196C.

3 marks;

82. Different variation of gene variation (3)

- Genetic refers to variation of genetic DNAorigin, and variation of genes atdifferent levels:

1. variation between species,
2. variation between populations within species
3. variation between individual trees within populations. The largest variationis between species, and loss of whole species is therefore also the mostdramatic loss of future options.

- Resources refers to the use of genetic variation—in the broad sense statedabove—considered to be of potential value for humans at present or in thefuture.

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

Physical growth limitation

- Low temperature
- Low light/restricted photoperiod
- Minimal containment
- Minimal O2
- Osmotic (water) stress

84. Objective of category 6(3)

Primary objective

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

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

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

86. State of worlds forest genetic resources.3

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

87. Ramsar sites of panjab.3

- Uchhali Complex
- Taunsa Barrage
- Chashma Barrage

88. Criteria of national park.3

Distinguishing features

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

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

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

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

90. CBD history ?3

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

91. Three pillers of ramsar site?

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

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

92. Founder effect 3 examples 3

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

The Amish People

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

Sickle Cell Disease

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

 Huntington's Disease

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

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

93. 3 causes of extinction 3

 Climate Change

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

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

 Lack of genetic diversity

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

94. Strategy of DNA banks 3

Storage strategy

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

95. Objectives of CBD

Objectives of CBD, 1992

The three inter-related objectives are:

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

relevant technologies, ▪
Funding.

96. Three botanical gardens

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

5 marks:

97. Application of cryopreservation

 In Animal Husbandry

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

 In fishery science

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

 In medical science

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

 Cryopreservation of testicular tissue

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

 Embryo cryopreservation

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

98. Processing of sample in Dna bank?

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

99. Features of habitat species management area (5)

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

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

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

101. Pakistan terrestrial water and marritime zone act.5

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

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

102. Effect of climate change on invertebrate genetic resourse

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 othercontributing factors, these outbreaks can occur because the extreme event eliminates or weakens apest's natural enemies.

103. Purpose of CBD 5

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

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

104. Stratigies fallowed by effective conservation if AnGR(05)

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

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

105. Future of cryopreservation (5)

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

106. Why do forest genetic resources matter?5

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

107. . Crypreservation methed ?5

There are four different types of methods :

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

2. Rapid freezing method - it involves plunging the vials in liquid nitrogen. The temperature decreases from -300 to -1000 degree rapidly.

3. Combined freezing method - this is combination of both slow and rapid freezing method. The process is carried out in step wise like manner.

4. Dry freezing method - in this method dehydrated cells and seeds are stored.

108. Animals included n quarantine 5

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

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

109. Laws of environmental resources 5

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

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

1. Pakistan Environmental Protection Act, 1997

PEPA provides for;

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

2. Pakistan Panel Code, 1860

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

These punishment are of following types;

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

3. Forest Act, 1927

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

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

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

110. Quarantine principle?

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

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

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

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

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

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

111. Hingol national park?

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

112. Link between climate change and botanical garden? 5

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

113. Three pillars Ramsar site? 5

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

114. Biodiversity of habitat species management area?

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

115. Define phenotypic plasticity?

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

Ans: 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.

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

Ans: ◦ Low temperature ◦ Low light/restricted photoperiod ◦ Minimal containment ◦ Minimal O2 ◦ Osmotic (water) stress

117. Objective of category 6?

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

118. Name of second largest park?

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

119. Assisted migration ?

Ans: Assisted migration involves human movement of tree seed and seedlings from current locations to sites modelled to experience analogous environmental conditions in the future. Assisted migration may be undertaken over long distances, or just beyond the current range limit of particular genotypes and populations, or within the existing range . A gradual form of assisted migration could consist of reforestation of harvested sites with seed from

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

120. Central goal of zoo?

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

121. Ramser site of Punjab?

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

BEST OF LUCK