

BT401 CURRENT SUBJECTIVE

2 marks:

1. Game Reserve(2)

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

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

2. 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.

3. 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.

4. Define phenotypic plasticity.2 marks

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

5. 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.

6. 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.

7. Mission of Ramsar convention.2

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.”

8. Role of earthworm in soil 2

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

9. What is legislation 2

The process of making or enacting laws.

10. 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.

12. 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.

13. Two types of cryoprotectants 2

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

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

14. Maximum temp 4 cryopreservation 2

Maximum temperature of cryopreservation is -196C.

3 marks;

1. Different variation of gene variation (3)

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

2. 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

3. Objective of category 6(3)

Primary objective

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

4. Biodiversity of habitat- 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.

5. 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.

6. Ramsar sites of panjab.3

- Uchhali Complex
- Taunsa Barrage
- Chashma Barrage

7. 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.

8. Who is responsible for botanical garden 3

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.

9. Role of national park in landscap and seasap(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.

10. 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.

11. Three pillars of ramsar site?

The “three pillars” of the convention

The Contracting Parties (160) commit to:

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

12. 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.

13. 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.

14. 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.

15. 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.

16. Three botanical gardens

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

5 marks:

1. 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 adequately 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

2. 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.

3. 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

4. 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.

5. Pakistan terrestrial water and maritime zone act.5

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

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

6. Services provided by pepa.5

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.

7. Effect of climate change on invertebrate genetic resource

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

8. Purpose of CBD 5

- CBD is about the conservation and wise use of different biological resources (plants and animals).
- It was adopted in 1992 at Rio De Janeiro, Brazil and entered force on January, 1993, which was 90 days after the 30th ratification.
- Pakistan signed it in June 1992 at United Nations Conference on Environment and Development held at Rio De Janeiro, Brazil
- Pakistan ratified it on 26th July 1994.
- The Convention on Biological Diversity covers biodiversity at all levels:
 - Ecosystems,
 - Species
 - Genetic resources
- It also covers biotechnology, including through the Cartagena Protocol on Biosafety.
- In fact, it covers all possible domains that are directly or indirectly related to biodiversity and its role in development, ranging from science, politics and education to agriculture, business, culture and much more.

9. Strategies followed by effective conservation of AnGR(05)

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

1. Formulating the National Livestock and wild-life Breeding Policies.
2. Encouraging the Formation of Breed Associations.
3. Developing Professional Human Resources.
4. Strengthening Research and Development Institutions

5. Developing Infrastructure for marketing International co-operation and assistance is needed in capacity building to remodel available livestock farms/research stations to conserve and develop genetic resources

10. 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.

11. 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.

12. Cryopreservation method ?5

There are four different types of methods :

- 1 Slow freezing method- the tissue or plant material is slowly frozen at slow cooling rate. The advantage is the plant cells are partially dehydrated and survive better.
2. Rapid freezing method - it involves plunging the vials in liquid nitrogen. The temperature decreases from -300 to -1000 degree rapidly.
3. Combined freezing method - this is combination of both slow and rapid freezing method. The process is carried out in step wise like manner.
4. Dry freezing method - in this method dehydrated cells and seeds are stored.

13. 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.

14. Function of invertebrates?

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

- Healthy soils – and healthy, diverse soil invertebrate communities – will be vital to climate change adaptation. For example, earthworms help to maintain soil structure and the availability of water throughout the soil profile. Studies have shown that the presence of these animals can help to alleviate the effects of drought on crop Production. Studies have also revealed the remarkable ability of diverse soil invertebrate communities to restore the structure of degraded soil. The potential for managing soil invertebrates to enhance their beneficial roles has been little explored. Few if any deliberate attempts have been made to introduce soil invertebrates into new countries or ecosystems. Given the potential for such species to become invasive, it is inadvisable to attempt any such introductions until soil ecology is much better understood than it is today. However, every effort should be made to avoid agricultural practices that disrupt resident soil invertebrate communities and the services they provide.
- 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.
- It is likely that some pests, as they move into new areas in response to climate change, will at least temporarily escape from their natural enemies. This is likely to increase demand for classical biological control agents, especially in places where the newly established pest population is separated from its original home by a physical barrier such as the sea or a mountain range. For this reason, access to new classical biological control agents is likely to be particularly important for island countries.

15. Laws of environmental resources 5

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

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

1. Pakistan Environmental Protection Act, 1997

PEPA provides for;

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

2. Pakistan Penal Code, 1860

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

These punishment are of following types;

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

3. Forest Act, 1927

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

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

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

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

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

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

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

4. When germplasm is endangered or the need for particular accessions is particularly urgent, some discretion should be possible on the part of quarantine officials in allowing exceptions for controlled entry, despite existing regulations to the contrary.

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

6. Because delays in transit can be detrimental for any germplasm accessions, access to good communication and transportation services is essential for quarantine.

17. 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.

10 marks:

Write the impact of climate change on FGR also discuss the effect of climate change on organism (10)

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.

