

QUESTIONS FOR PRACTICE SOLUTIONS

Chapter-1

Human Health and Diseases

1. (a) What are interferons?
 (b) Name an allergen and write the response of the human body when exposed to it.

Ans. (a) These are glycoproteins which protect non-infected cells from further viral infection.
 (b) Allergen- dust, pollen. In response to an allergen, the body releases antibodies of IgE type.

2. (a) In what way are monocytes a cellular barrier in immunity?
 (b) When does a human body elicit an anamnestic response?

Ans. (a) Monocytes are natural killer lymphocytes which phagocytose and destroy microbes.
 (b) An anamnestic or secondary response is elicited on subsequent encounter with the same pathogen.

3. Why is an antibody molecule represented as H_2L_2 ?

Ans. Each antibody molecule consists of four polypeptide chains, two are long called heavy (H) chains while the other two are short called light (L) chains. Hence, an antibody is represented as H_2L_2 .

4. The following table shows certain diseases, their causative organisms and symptoms. Fill the gaps.

S.No.	Name of the Disease	Causative organism	Symptoms
(i)	Typhoid	—	High fever, weakness, headache, stomach pain, constipation.
(ii)	Pneumonia	<i>Streptococcus pneumonia</i>	—
(iii)	—	Rhinovirus	Nasal congestion and discharge, sore throat, cough, headache.
(iv)	Filariasis	—	Inflammation in lower limbs.

Ans. (i) *Salmonella typhi*

(ii) Fever, chills, cough, headache, and in severe cases, lips and finger nails turn grey to bluish in colour.

(iii) Common cold

(iv) *Wuchereria bancrofti* and *Wuchereria malayi*.

5. How does cell-mediated immune system work when our body is infected?

Ans. In cell-mediated immune system, activation of cells like phagocytes, T-lymphocytes, and release of cytokines in response to an antigen is seen instead of the production of antibodies. T-lymphocytes differentiate to form various cells like Helper T cells, Cytotoxic/Killer T cells, Suppressor T cells, and Memory T cells which have different modes of action.

6. (a) Why do the symptoms of malaria not appear immediately after the entry of sporozoites into the human body when bitten by female *Anopheles*? Explain.
 (b) Give the scientific name of the malarial parasite that causes malignant malaria in humans.

Ans. (a) After infection by *Anopheles* mosquito the sporozoites reach the liver cells, where they multiply. These then attack the red blood cells and cause their rupture. The rupture releases a toxin called haemozoin, which results in symptoms. Because of this delay the symptoms do not appear immediately.

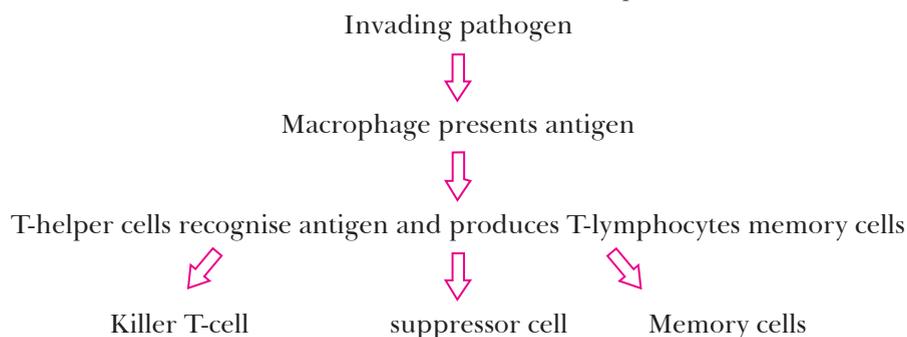
(b) *Plasmodium falciparum*

7. List the specific symptoms of typhoid. Name its causative agent.

Ans. **Symptoms:** Constant high fever (39°C to 40°C), Weakness, Stomach pain, Loss of appetite, Constipation, Headache, Intestinal perforation and death may occur in severe cases.

Causative agent: *Salmonella typhi*.

8. Given below is the flow chart for cell mediated immune response.



Answer the following questions on the basis of the flow chart:

- Name any two types of cells which act as 'Cellular Barriers' to provide Innate Immunity in humans.
- Thymus of a new born child was degenerating right from birth due to a genetic disorder. Predict its two impacts on the health of the child.
- How do cytokine barriers provide innate immunity in humans?

Ans. (a) Macrophage, monocytes

- T-lymphocytes mature and become antigen-specific in thymus. Because of degenerating thymus the child's immune system will become weak and the body will become prone to infectious diseases.
- The virus-infected cells produce proteins called interferons which protect the non-infected cells from further infection.

9. Explain metastasis. Why is it fatal?

Ans. Metastasis is the spread of cancerous cells through migration from one tissue to other tissue and organs resulting in formation of secondary tumour. Malignant tumour is a mass of proliferating cells called neoplastic cells. They grow rapidly and invade surrounding unaffected normal cells or tissues. Cells get sloughed off from such tumour and migrate to distant sites through blood. A new place of infection is thus established and a new tumour is formed.

10. Explain the different measures for control and prevention of drug/alcohol abuse among adolescents.

Ans. Prevention and control of drug abuse:

- Avoid undue pressure:** Every child has his own choice and personality and hence should be respected and nurtured accordingly. They should not be forced to perform beyond their threshold limits, be in sports or studies, etc.
- Educating and counselling:** Children should be educated and counselled to face problems, stresses, to accept disappointments and features as part of life. We should put in efforts to channelise child's energy into healthy pursuits like sports, reading, music, yoga etc.
- Seeking help from parents and peers:** Parents and friends can guide appropriately to sort out their problems and can thus help the youth to vent out their feelings of anxiety and guilt.

- (iv) **Looking for danger signs:** Parents and teachers should be careful enough to look for and identify the danger signs and if there, it should be brought to the notice of parents so that appropriate measures can be taken to diagnose the malady and underlying causes. This would help in initiating proper remedial steps and measures.
- (v) Seeking professional and medical help whenever required. Help from psychologist, psychiatrists, deaddiction and rehabilitation programmes and with sufficient will power, one can get rid of problem completely.



1. (a) What are antibiotics?
(b) How do biofertilisers enrich the fertility of the soil?

Ans. (a) Antibiotics are chemical substances produced by some microorganisms which can kill or retard the growth of other disease-causing microorganisms.

- (b) Biofertilisers are microorganisms which bring about nutrient enrichment of soil by enhancing the availability of nutrients to crops. They are of following types:

(i) Nitrogen fixing bacteria and cyanobacteria: They form symbiotic association with plants. They get food and shelter from plants and on the other hand, plants get nitrogen fixed by these bacteria. For example, *Rhizobium*.

(ii) Mycorrhiza: It is an association between a fungus and roots of higher plants. It takes part in the solubilisation and absorption of nutrients from organic matter. Many members of the genus *Glomus* form mycorrhiza.

(iii) Manures: They are semi-decayed organic remains of various types—manure, green manure, compost and vermicompost.

2. (a) What are biofertilisers? Give two examples.
(b) How is the presence of cyanobacteria in the paddy fields beneficial to rice crop?

Ans. (a) Biofertilisers are the microorganisms which enrich the nutrient (nitrogen, phosphorus, etc.) quality of the soil. Bacteria, fungi and cyanobacteria are the three main sources of biofertilisers.

- (b) Cyanobacteria fix atmospheric nitrogen and increase the organic matter of the soil through their photosynthetic activity. Blue-green algae increase the soil fertility by adding organic matter to the soil.

3. Bottled fruit juices are clearer as compared to those made at home. Explain.

Ans. Bottled fruit juices are clarified by pectinases and proteases which makes them clearer.

4. State the use of the following enzymes/acids produced by the microbes:

- (a) Lipase (b) Lactic acid
(c) *Streptokinase* (d) Pectinase

Ans. (a) (i) Used in detergent formulations.

(ii) Helps in removing oily stains from laundry.

- (b) Sets milk into curd

(c) Used as 'clot-buster' for removing clots from blood vessels of patients who have undergone myocardial infarction.

- (d) Used for clarifying bottled juices.

5. Why is 'starter' added to set the milk into curd? Explain.

Ans. *Lactobacillus*/lactic acid bacteria (LAB) present in starter, multiply at suitable temperature and convert milk into curd. Therefore, starter is added to set milk.

6. Explain the change that fresh milk undergoes when a small amount of curd as starter is added to it and kept at suitable temperature.

Ans. When a small amount of curd is added as starter to fresh milk millions of *Lactobacillus* and lactic acid bacteria in it start growing and convert the lactose sugar in the milk to lactic acid.

7. Explain the process of sewage water treatment.

Ans. Sewage treatment is carried out in two stages:

(i) **Primary treatment or physical treatment:**

It is the physical removal of large and small particles from sewage. First, the floating debris is removed by sequential filtration by passing through wire mesh screens. Then, the grit (soil and small pebbles) are removed by sedimentation in settling tanks. The sediment is called primary sludge and the supernatant is the effluent. The effluent is taken for secondary treatment.

(ii) **Secondary treatment or biological treatment:**

Primary effluent is passed into large aeration tanks with constant mechanical agitation and air supply. Useful aerobic microbes grow rapidly and form flocs. Flocs are masses of bacteria associated with fungal filaments to form mesh-like structures. The growing microbes consume organic matter and thus reduce the biochemical oxygen demand (BOD). When BOD of sewage has reduced, the effluent is passed into settling tank. Here, the bacterial flocs settle and the sediment is called activated sludge. A small part of the sludge is used as an inoculum in the aeration tank and the remaining part is passed into large tanks called anaerobic sludge digesters. In the digesters, heterotrophic microbes anaerobically digest bacteria and fungi in sludge producing mixture of gases such as methane, hydrogen sulphide (H_2S) and CO_2 , which form the biogas. Effluent is now released into rivers and streams.

8. Explain the role of baculoviruses as biological control agents. Mention their importance in organic farming.

Ans. Baculoviruses are pathogens that attack insects and other arthropods. These viruses are very useful for species-specific, narrow-spectrum insecticidal applications. Also, as they show no negative impacts on plants, mammals, birds, fish or even on non-target insects, they are beneficial in integrated pest management (IPM) programme in which beneficial insects are conserved.

9. Large quantities of waste water are generated everyday. It is treated in sewage plants before releasing into water bodies.



(a) What is BOD?

(b) What does it mean if a water sample has more BOD?

(c) Distinguish between the roles of flocs and anaerobic sludge digesters in sewage treatments.

Ans. (a) BOD stands for biochemical oxygen demand which represents the amount of dissolved oxygen that would be consumed if all the organic matter in one litre of water were oxidised by microorganisms.

- (b) More BOD value means the water sample is polluted by organic matter.
- (c) Flocs are masses of bacteria associated with fungal filaments which reduce the BOD of sewage. On the other hand, in anaerobic sludge digesters, heterotrophic microbes anaerobically digest bacteria and fungi in sludge producing mixture of gases such as methane, hydrogen sulphide and CO₂.

10. (a) What are biopesticides? Give any two examples of their application.

(b) What are mycorrhiza? How does it act as a biofertiliser?

Ans. (a) Biopesticides are methods of controlling pests that rely on natural predation rather than introduced chemicals/or living organisms used to kill pests. *Bacillus thuringiensis* bacteria act as biopesticide to control the growth of insect pests. *Trichoderma*, fungal species, is an effective biocontrol agent of several plant pathogens.

(b) Fungi form symbiotic association with the roots of higher plants called mycorrhiza, e.g., *Glomus*. The fungal hyphae absorb phosphorus from soil and passes it to the plant. Mycorrhiza shows the following benefits to plant:

(a) resistance to root-borne pathogens.

(b) tolerance to salinity and drought.

(c) overall increase in plant growth and development.



Chapter-3 BIOTECHNOLOGY: PRINCIPLES AND PROCESSES

- (a) What is plasmid?
(b) Why is *Taq* polymerase preferred in PCR?

Ans. (a) Plasmid is an autonomously replicating circular extra-chromosomal DNA.
(b) The enzyme *Taq* polymerase can tolerate high temperature and is thus thermostable. It does not get denatured during PCR at high temperature.

- (a) Why are restriction endonucleases known as molecular scissors?
(b) Give the palindromic sequence recognised by *EcoR* I.

Ans. (a) Restriction enzymes are also called 'molecular scissors' because they cut the helix of DNA at a specific site.

(b) 5' GAATTC 3'

- Differentiate between *rDNA* and *cDNA*.

Ans. *rDNA* is recombinant DNA formed by combining DNA of different organisms. *cDNA* is complementary DNA formed from *rRNA* by reverse transcription.

- Which is the most commonly used bioreactor? Explain its functioning.

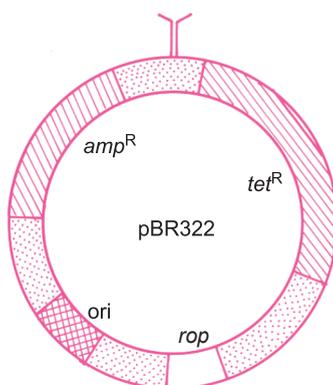
Ans. The most commonly used bioreactor is stirred-tank bioreactor.

A stirred-tank bioreactor is usually cylindrical and have a stirrer which mixes the reactor contents evenly and makes oxygen available throughout the bioreactor. Optimum conditions of temperature, pH and foam control are provided.

- Draw a schematic diagram of the *E.coli* cloning vector pBR322 and mark the following in it :

- ori*
- rop*
- ampicillin resistance gene
- tetracycline resistance gene

Ans.



- (a) How is repetitive/satellite DNA separated from bulk genomic DNA for various genetic experiments? [CBSE Delhi 2014]
(b) How can bacterial DNA be released from the bacterial cell for biotechnology experiments? [CBSE Delhi 2011]

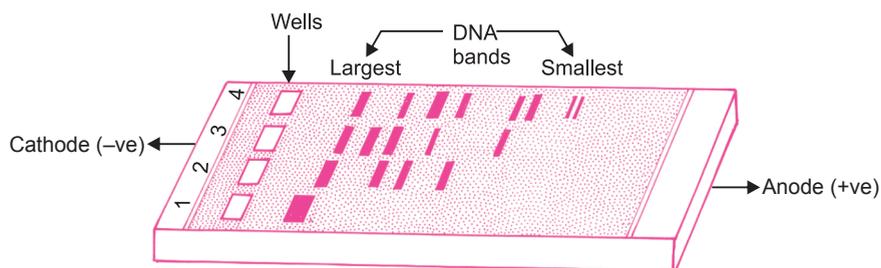
Ans. (a) Repetitive/satellite DNA is separated from bulk genomic DNA by the technique density gradient centrifugation.

(b) Lysozyme enzyme is used to break open the bacterial cell and release the bacterial DNA from the bacterial cell.

7. Name and explain the techniques used in the separation and isolation of DNA fragments to be used in recombinant DNA technology.

Ans. Gel electrophoresis is the technique used for separating DNA fragments based on their size.

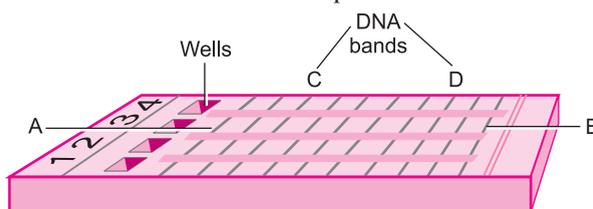
- Firstly, the sample DNA is cut into fragments by restriction endonucleases.



A typical agarose gel electrophoresis showing migration of undigested (lane 1) and digested set of DNA fragments (lane 2 to 4)

- The DNA fragments being negatively charged can be separated by forcing them to move towards the anode under an electric field through a medium/matrix.
- Commonly used matrix is agarose, which is a natural linear polymer of D-galactose and 3, 6-anhydro-L-galactose which is extracted from sea weeds.
- The DNA fragments separate-out (resolve) according to their size because of the sieving property of agarose gel. Hence, smaller the fragment size, the farther it will move.
- The separated DNA fragments are visualised after staining the DNA with ethidium bromide followed by exposure to UV radiation.
- The DNA fragments are seen as orange coloured bands.
- The separated bands of DNA are cut out and extracted from the gel piece. This step is called elution.

8. Study the diagram given below and answer the questions that follow:



- Why have DNA fragments in band 'D' moved farther away in comparison to those in band 'C'?
- Identify the anode end in the diagram.
- How are these DNA fragments visualised? [CBSE (F) 2011]

Ans. (a) The DNA fragments separate-out (resolve) according to their size because of the sieving property of agarose gel. Hence, smaller the fragment size, the farther it will move.

(b) B is anode

(c) The separated DNA fragments are visualised after staining the DNA with ethidium bromide followed by exposure to UV radiation.

9. What are the steps in the process of recombinant DNA technology?

Ans. Steps in the process of recombinant DNA technology:

- Isolation of the genetic material (DNA)
- Cutting of DNA at specific locations
- Isolation of desired DNA fragment

- (iv) Amplification of gene of interest using PCR
- (v) Ligation of DNA fragment into a vector
- (vi) Insertion of recombinant DNA into the host cell/organism
- (vii) Culturing the host cells
- (viii) Extraction of desired gene product
- (ix) Downstream processing

10. (a) Describe the different steps in one complete cycle of PCR.

(b) State the purpose of such an amplified DNA sequence.

Ans. (a) PCR is carried out in the following three steps:

(i) Denaturation

— The double-stranded DNA is denatured by subjecting it to high temperature of 94°C for 15 seconds. Each separated single stranded strand now acts as template for DNA synthesis.

(ii) Annealing

— Two sets of primers are added which anneal to the 3' end of each separated strand.
— Primers act as initiators of replication.

(iii) Extension

— DNA polymerase extends the primers by adding nucleotides complementary to the template provided in the reaction.

— A thermostable DNA polymerase (Taq polymerase) is used in the reaction which can tolerate the high temperature of the reaction.

— All these steps are repeated many times to obtain several copies of desired DNA.

(b) Amplified DNA sequence is used to form recombinant DNA. These can be used to study diseases and developing drugs.



1. (a) What is the possible source of RNA interference (RNAi) gene?

(b) What are *cry* genes? In which organism are they present?

[CBSE (AI) 2017]

Ans. (a) The source of RNAi gene could be from an infection by viruses having RNA genomes or mobile genetic elements (transposons) which replicate through an RNA intermediate.

(b) *cry* genes produce a toxin called cry protein which is poisonous to some insects, thus giving resistant characters to the plants. These are present in *Bacillus thuringiensis*.

2. (a) PCR requires very high temperature conditions where most of the enzymes get denatured. How was this problem resolved in a PCR? [CBSE Sample Paper 2017]

(b) State the role of transposons in silencing of *mRNA* in eukaryotic cells. [CBSE (AI) 2013]

Ans. (a) The problem of temperature in PCR was resolved by using thermostable polymerase enzyme called *Taq* polymerase.

(b) Transposons are mobile genetic elements which replicate through an RNA intermediate and silence the gene by stopping the process of translation.

3. What is meant by ADA deficiency? How is gene therapy a solution to this problem? Why is it not a permanent cure?

Ans. ADA deficiency is adenosine deaminase enzyme deficiency caused by deletion of gene for adenosine deaminase. In gene therapy, lymphocytes from patient's blood are grown in a culture and functional ADA. *cDNA* is introduced in these lymphocytes using a retroviral vector. The lymphocytes are then transferred into the patient's body.

Gene therapy is not a permanent cure because periodic infusion of such genetically engineered lymphocytes needs to be done because these cells are mortal.

4. What happens when *Meloidogyne incognita* consumes cells with RNAi gene?

Ans. The specific *mRNA* of the nematode is silenced and the parasite dies.

5. What are transgenic bacteria? Illustrate using any one example.

Ans. The bacteria whose DNA is manipulated to carry and express a foreign DNA is called transgenic bacteria. These microbes are used for producing important biochemicals. They have been synthesising alcohol, enzymes, steroids and antibiotics. Example, *Bacillus thuringiensis* for Bt cotton.

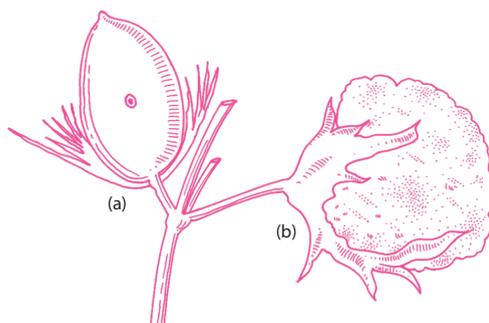
6. How is a probe used in molecular diagnostics?

Ans. A single stranded DNA or RNA tagged with a radioactive molecule is called probe. A probe is allowed to hybridise to its complementary DNA in the clone of cells. The cells are then detected by autoradiography. The cell with mutated gene will not be observed on the photographic film because the probe was not complementary to the mutated gene.

7. What is *Agrobacterium* mediated genetic transformation described as natural genetic engineering in plants?

Ans. *A. tumefaciens* is a pathogen of several dicot plants. It delivers a piece of DNA known as 'T-DNA' in the Ti plasmid which transforms normal plant cells into tumor cells to produce chemicals against pathogens.

8. Given below is the figure of two types of cotton bolls: one destroyed by bollworms and the other is fully matured one.



Answer the following questions on the basis of above figure:

- (a) What is Bt cotton?
- (b) Bt toxins are released as inactive crystals in the bacterial body. What happens to it in the cotton bollworm body that it kills the bollworm?
- (c) List the type of *cry* genes that provide resistance to corn plants and cotton plants respectively against Lepidopterans.

- Ans.** (a) Bt cotton is a transgenic plant which is made resistant to bollworm infestation by gene insertion.
- (b) Bt toxins are initially inactive protoxins but after ingestion by the insect their inactive toxin becomes active due to the alkaline pH of the gut, which solubilises the crystals. The activated toxin binds to the surface of midgut epithelial cells thus creating pores which causes cell swelling and lysis, further leading to death of the insects.
- (c) Proteins encoded by the genes *cryIAc* and *cryIAb* control the cotton bollworms and that of *cryIAb* control corn borer.

9. Explain the role of Ti plasmids in biotechnology.

- Ans.** Ti plasmid vectors are used for genetic transformation in many dicot plants. The tumour inducing (Ti) plasmid of *Agrobacterium tumifaciens* has been modified into a cloning vector which is no more pathogenic to the plants but is still able to use the mechanisms to deliver genes of interest into a variety of plants.

10. Explain the application of *r*DNA technology.

- Ans.** (i) Genetic modification of crops have resulted in
- (a) increased tolerance against abiotic stresses (cold, drought, salt, heat).
 - (b) reduced reliance on chemical pesticides (pest-resistant crops).
 - (c) reduced post-harvest losses.
 - (d) increased efficiency of minerals used by plants .
 - (e) enhanced nutritional value of food, *e.g.*, vitamin 'A' enriched rice (golden rice).
 - (f) creation of tailor-made plants to supply alternative resources such as starches, fuels and pharmaceuticals to industries.
- (ii) The recombinant DNA technology is used for production of therapeutic drugs which are safe and effective.
- (iii) Early detection of a disease is possible by *r*DNA methods.



1. (a) Define carrying capacity.
(b) What is Allen's rule?

Ans. (a) Every ecosystem or environment or habitat has limited resources to support a particular maximum number of individuals called its carrying capacity (K).
(b) Allen's rule is an ecogeographical rule stating that animals in colder regions have shorter ears and limbs to minimise heat loss.

2. (a) State Gause's Competitive Exclusion principle. [CBSE (AI) 2014]
(b) What does nature's carrying capacity for a species indicate? [CBSE (F) 2016]

Ans. (a) Gause's competitive exclusion principle states that two closely related species competing for the same resource cannot coexist indefinitely and the competitively inferior one will be eliminated eventually by the superior one.

(b) Nature's carrying capacity indicates that no further growth in population is possible.

3. Explain why very small animals are rarely found in polar region.

Ans. Small animals like humming birds have a large surface area relative to their volume. So they tend to lose body heat very fast when it is cold outside. Then, these animals have to use their energy (generated by metabolic reactions) to generate body heat. Therefore, small sized animals are rarely found in the polar regions.

4. Name the interaction in each of the following:

- (a) Clown fish living among the tentacles of sea anemone.
- (b) Sucker fish lives attached to the shark.
- (c) Smaller barnacles disappeared when *Balanus* dominated in the coast of Scotland.
- (d) Wasp pollinating fig inflorescence.

Ans. (a) commensalism, (b) parasitism, (c) commensalism, (d) mutualism

5. How does Monarch butterfly defend itself from predators? Explain.

Ans. The Monarch butterfly is highly distasteful to its predator (birds) because of a special chemical present in its body which is acquired by the butterfly by feeding on a poisonous weed in its caterpillar stage.

6. How does the human body maintains constant temperature both in summers and winters? Explain.

Ans. In summers, when outside temperature is more than our body temperature, we sweat profusely and the resulting evaporative cooling brings down the body temperature. In winters, when temperature is lower we shiver, a kind of exercise that produces heat and raises the body temperature.

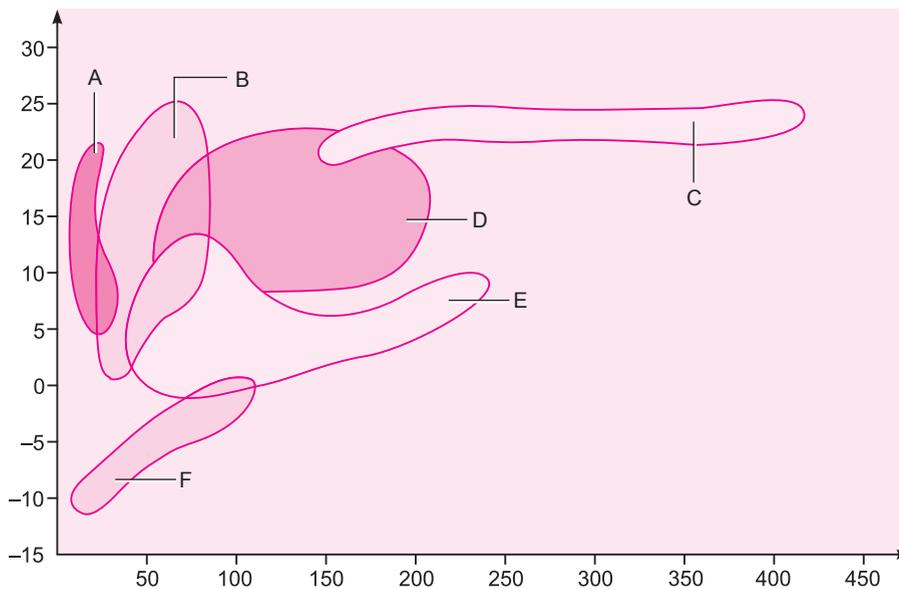
7. Distinguish between hibernation and aestivation. Give one example of each.

Ans. (a)

Differences between hibernation and aestivation

S. No.	Hibernation	Aestivation
(i)	It is the condition of passing the winter in a resting or dormant condition.	It is the state of inactivity during hot dry summer.
(ii)	Animals rest in a warm place.	Animals rest in a cool and shady place.
(iii)	It lasts usually for the whole winter season.	It generally last for hot dry day-time because nights are often cooler.
(iv)	It is also called winter sleep.	It is also called summer sleep.
(v)	For example, polar bears hibernate in winter.	For example, desert rats aestivate in summers.

8. The graph given below shows the distribution of biomes:



(a) What do the 'X' and 'Y' axes represent?

(b) Identify the 'grassland' and 'coniferous forest' biomes, from the above figure.

(c) Why is 'F' located at the given position in the graph?

Ans. (a) X-Mean annual precipitation (cm) ; Y- Mean annual temperature (°C)

(b) Grassland – B, Coniferous forest – E

(c) F represents arctic and alpine tundra forest. This region experiences lowest precipitation and temperature.

9. How does mutualism differ from commensalism? Give one example of each.

Ans.

Differences between commensalism and mutualism

S. No.	Commensalism	Mutualism
(i)	It is an interspecific interaction in which one species is benefited and other is neither harmed nor benefited.	It is an interspecific interaction in which both the species (individuals) are mutually benefited.
(ii)	The two individuals may be physically associated.	The two individuals may be physically or physiologically associated.
(iii)	E.g., Sucker fish and shark.	E.g., <i>Rhizobium</i> and the legume plants.

10. (a) What is an age-pyramid?
(b) Name three representative kinds of age-pyramids for human population and list the characteristics for each one of them.

Ans. (a) When the age distribution (per cent individuals of a given age or age group) is plotted for the population, the resulting structure is called age pyramid.

- (b) The shape of the pyramids reflects the growth status of the population and is of three types:
- (i) **Expanding (Triangular shaped pyramid):** Number of pre-reproductive individuals is very large, reproductive individuals moderate in no. and post-reproductive are fewer. Population is growing and show rapid increases.
 - (ii) **Stable (Bell shaped pyramid):** Population size remains stable, neither growing nor diminishing *i.e.*, all the age group are evenly balanced.
 - (iii) **Declining (Urn shaped pyramid):** Population is declining or diminishing population showing negative growth.



1. (a) Define endemism.
- (b) What are biodiversity hot spots?

Ans. (a) Endemism is the state of a species being native to a single defined geographic location, such as an island, state, nation or country.

(b) Biodiversity hotspots are regions of high levels of species richness and high degree of endemism.

2. (a) Define biodiversity.
- (b) Name the type of biodiversity represented by the following:
 - (i) 50,000 different strains of rice in India
 - (ii) Estuaries and alpine meadows in India.

[CBSE Delhi 2013] [HOTS]

Ans. (a) The occurrence of different types of genes, gene pools, species, habitats and ecosystems in a particular place and various parts of earth is called biodiversity.

(b) (i) Genetic diversity (ii) ecological diversity

3. Describe what are sacred groves.

Ans. Sacred groves are forest patches set aside for worship. All the trees and wildlife within are given total protection by tribal people.

4. Explain the 'rivet popper hypothesis'.

Ans. Rivet popper hypothesis assumes the ecosystem to be an airplane and the species to be the rivets joining all parts together. If every passenger pops a rivet to take home (resulting in species extinction), it may not affect the flight safety initially (proper ecosystem functioning) but with time as more rivets are removed the plane becomes dangerously weak and fatal to the life of other species.

5. Alien species are a threat to native species. Justify taking examples of an animal and a plant alien species.

Ans. Exotic species are defined as species that have been introduced from another geographic region to an area outside its natural range. For example, (i) *Parthenium*, *Lantana* and *Eichhornia* are the exotic species of plants that have invaded the native species of India and caused environmental damage. (ii) Introduction of African catfish *Clarias gariepinus* for aquaculture purpose has posed threat to many indigenous catfish.

6. Name the type of biodiversity represented by the following:

- (a) 1000 varieties of mangoes in India.
- (b) Variations in terms of potency and concentration of reserpine in *Rauvolfia vomitoria* growing in different regions of Himalayas.

Ans. (a) Species diversity (b) Genetic diversity

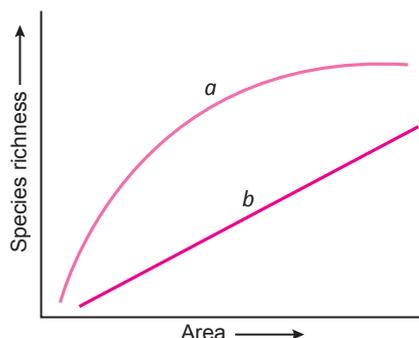
7. Differentiate between *In-situ* and *Ex-situ* approaches of conserving biodiversity.

Ans.

S. No.	<i>In situ</i> conservation	<i>Ex situ</i> conservation
(i)	It is the conservation and protection of biodiversity in its natural habitat.	It is the conservation of selected threatened plant and animal species in places outside their natural habitat.

(ii)	Population is conserved in the surroundings where they have developed their distinctive features.	Population is conserved under simulated conditions that closely resemble their natural habitats.
(iii)	<i>E.g.</i> , national parks, biosphere reserves, wildlife sanctuaries, etc.	<i>E.g.</i> , botanical gardens, zoological parks, wildlife safari, gene banks, etc.

8. The graph shows species-area relationship:



If *b* denotes the relationship on log scale:

- Describe *a* and *b*.
- How is slope represented? Give the normal range of slope.
- What kind of slope will be observed for frugivorous birds and mammals in a tropical forest?

Ans. (i) *a* represents the relationship between species richness and area for a wide variety of taxa. *b* is the relationship on a logarithmic scale.

(ii) Slope is represented as: $\log S = \log C + Z \log A$

The normal range of slope is 0.1-0.2

(iii) For frugivorous (fruit eating) birds and mammals in the tropical forest of different continents, the slope is 1.15.

9. Why certain regions have been declared as biodiversity “hot spots” by environmentalists of the world? Name any two “hot spot” regions of India.

Ans. Biodiversity hotspots are regions of high levels of species richness and high degree of endemism. These regions involve protection of species in their natural habitat. In India, the three hotspots are Western Ghats and Sri Lanka, Indo–Burma and Himalaya.

10. Write a note on the efforts for the conservation of biodiversity in India.

Ans. The Earth Summit was held in Rio de Janeiro in 1992, which called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilisation of its benefits. The World Summit on Sustainable Development was held in Johannesburg, South Africa in 2002 in which 190 countries pledged to reduce the current rate of biodiversity loss at global, regional and local levels by 2010.

