Study Material Based on the
Latest **CBSE** Syllabus and **NCERT** Textbooks

Together with®

OBJECTIVE TYPE QUESTIONS

(BIOLOGY)

Authors

Dr. (Mrs.) S. Venugopal
M.Sc., M.Ed., Ph.D.

Mrs. Anu Kurara
M.Sc. (Genetics), B.Ed., PGT Biology

CLASS
12
TERM 2

RACHNA
SAGAR

CONTENTS

PART-I

[Multiple Choice Questions, Assertion-Reason Questions and Case-based Questions]

8. Human Health and Disease ..... 3 – 14

10. Microbes in Human Welfare ..... 15 – 24

11. Biotechnology: Principles and Processes ..... 25 – 35

12. Biotechnology and Its Applications ..... 36 – 47

13. Organism and Population ..... 48 – 60

15. Biodiversity and Conservation ..... 61 – 72

PART-II

[Practice Papers]

- Practice Papers 1 and 2 (Solved) ..... 73 – 92

Part-I

[Multiple Choice Questions, Assertion-Reason Questions and Case-based Questions]

8 HUMAN HEALTH AND DISEASE

Multiple Choice Questions

1. The main barrier(s) that prevent(s) the entry of micro-organism into our body is/are **[CBSE 2020]**

(*a*) antibodies (*b*) monocytes

(*c*) macrophages (*d*) skin

Ans. (*d*)

2. The principle of vaccination is based on the property of **[CBSE 2020]**

(*a*) specificity

(*b*) diversity

(*c*) memory

(*d*) discrimination between 'self' and 'non-self'.

Ans. (*c*)

3. Opioids act as **[CBSE 2020]**

(*a*) depressants (*b*) pain killers

(*c*) euphoria providers (*d*) stimulants

Ans. (*a*)

4. The diagnostic test that confirms typhoid in humans is **[CBSE 2020]**

(*a*) ELISA (*b*) Widal

(*c*) MRI (*d*) Amniocentesis

Ans. (*b*)

5. Colostrum provides passive immunity to human infants as it contains antibody **[CBSE 2020]**

(*a*) IgA (*b*) IgM (*c*) IgE (*d*) IgG

Ans. (*a*)

6. In the immune system, interferons are a part of

(*a*) physiological barriers (*b*) cellular barriers

(*c*) physical barriers (*d*) cytokine barriers.

Ans. (*d*)

7. The letter T in T-lymphocytes refers to

(*a*) tonsil (*b*) thalamus (*c*) thymus (*d*) thyroid

Ans. (*c*)

8. Use of anti-histamines and steroids gives a quick relief from

(*a*) allergy (*b*) nausea (*c*) cough (*d*) fever

Ans. (*a*)

9. Diacetylmorphine is commonly known as

(*a*) cocaine (*b*) hashish (*c*) ganja (*d*) heroin

Ans. (*d*)

10. Morphine is extracted from

(*a*) *Atropa belladona* (*b*) *Papaver somniferum*

(*c*) *Erythroxylum coca* (*d*) *Cannabis sativa*

Ans. (*b*)

11. The disease chikungunya is transmitted by **[NCERT Exemplar Problems]**

(*a*) houseflies (*b*) *Aedes* mosquitoes

(*c*) cockroach (*d*) female *Anopheles*

Ans. (*b*)

12. Anti-venom against snake poison contains **[NCERT Exemplar Problems]**

(*a*) antigens (*b*) antigen-antibody complexes

(*c*) antibodies (*d*) enzymes

Ans. (*c*)

13. Transplantation of tissues/organs to save certain patients often fails due to rejection of such tissues/organs by the patient. Which type of immune response is responsible for such rejections? **[NCERT Exemplar Problems]**

(*a*) auto-immune response

(*b*) humoral immune response

(*c*) physiological immune response

(*d*) cell-mediated immune response

Ans. (*d*)

14. Match the organisms (Pathogens) in Column I with the diseases they cause in Column II and select the correct option.

Column I	Column II
A. Rhino virus	1. Ringworm
B. *Plasmodium*	2. Filariasis
C. *Salmonella*	3. Common cold
D. *Trichophyton*	4. Typhoid
E. *Wuchereria*	5. Amoebiasis
	6. Malaria

(*a*) A – 3, B – 5, C – 4, D – 1, E – 2

(*b*) A – 3, B – 6, C – 4, D – 1, E – 2

(*c*) A – 2, B – 6, C – 4, D – 1, E – 3

(*d*) A – 5, B – 6, C – 4, D – 2, E – 1

Ans. (*b*)

15. Match the items in Column I with those in Column II and select the correct option.

Column I	Column II
A. Physiological barrier	1. Interferons
B. Cytokine barrier	2. Skin of the body
C. Cellular barrier	3. Tear in the eyes
D. Physical barrier	4. Antibodies in colostrum
	5. Polymorphonuclear leucocyte

(*a*) A – 3, B – 5, C – 1, D – 2

(*b*) A – 3, B – 1, C – 4, D – 2

(*c*) A – 4, B – 1, C – 5, D – 2

(*d*) A – 3, B – 1, C – 5, D – 2

Ans. (*d*)

16. Identify whether each of the following statements is true (T) or false (F) and select the correct option.

A. Humoral immunity is responsible for rejection of organ transplants.

B. α-interferon activates the immune system and helps to destroy the tumour cells.

C. Cannabinoids affect the digestive system.

D. Nicotine, the alkaloid in tobacco causes the hallucinogenic effect.

(*a*) A – T, B – F, C – F, D – F

(*b*) A – F, B – F, C – T, D – T

(*c*) A – T, B – T, C – F, D – F

(*d*) A – F, B – T, C – T, D – F

Ans. (*a*)

17. Mark the odd one in each of the following groups and select the correct option.

A. Saliva in the mouth, Mucus coating in respiratory tract, Tear in the eyes, Acid in the stomach.

B. Thymus, Spleen, Appendix, Tonsil.

C. Charas, Heroin, Marijuana, Hashish.

D. Typhoid, Pneumonia, Diphtheria, Malaria.

(*a*) A – Tear in the eyes B – Spleen
C – Heroin D – Malaria

(*b*) A – Tear in the eyes B – Tonsil
C – *Charas* D – Malaria

(*c*) A – Mucus coating in respiratory tract
B – Thymus C – Heroin
D – Malaria

(*d*) A – Acid in the stomach B – Thymus
C – Heroin D – Pneumonia

Ans. (*c*)

18. HIV is the virus that causes AIDS. Which of the following is not a method of HIV transmission?

(*a*) Sharing the infected needles.

(*b*) Transfusion of contaminated blood.

(*c*) Sexual contact with infected persons.

(*d*) Shaking hands with infected persons.

Ans. (*d*)

19. The term 'smack' refers to a drug produced from the

(*a*) Leaves of *Cannabis sativa*

(*b*) Flowers of *Datura*

(*c*) Fruits of *Erythroxylum coca*

(*d*) Latex of *Papaver somniferum*

Ans. (*d*)

20. When a cell gets injected with a virus, it produces a chemical that can protect neighbouring cells against infection.

(*a*) Colostrum (*b*) Serotonin (*c*) Histamine (*d*) Interferon

Ans. (*d*)

21. Colostrum contains which antibody that protect newborns from some illnesses

(*a*) IgA type (*b*) IgG type (*c*) IgD type (*d*) IgE type

Ans. (*a*)

22. Tobacco use is known to increase adrenaline and nor-adrenaline secretion. This might be caused by a component called

(*a*) Tannic acid (*b*) Curamin

(*c*) Catechin (*d*) Nicotine

Ans. (*d*)

23. Name the kind of barrier of innate immunity, where some cells secrete interferons when infected.

(*a*) Cytokine barrier (*b*) Physical barrier

(*c*) Cellular barrier (*d*) Physiological barrier

Ans. (*a*)

24. Which of the following does not belong to the lymphoid tissue?

(*a*) Tonsil (*b*) Spleen

(*c*) Thymus (*d*) Pancreas

Ans. (*d*)

25. Which of the following gland is huge at birth but shrink as you become older?

(*a*) Pituitary gland (*b*) Pineal gland

(*c*) Thyroid gland (*d*) Thymus

Ans. (*d*)

26. The organism that causes ringworm is not one of the following

(*a*) *Trichophyton* (*b*) *Microsporum*

(*c*) *Macrosporum* (*d*) *Epidermophyton*

Ans. (*c*)

27. A person suffering from sickle cell anemia is

(*a*) more prone to typhoid (*b*) more prone to malaria

(*c*) less prone to typhoid (*d*) less prone to malaria

Ans. (*d*)

28. Which of the following factor has an impact in human health?

(*a*) Infections (*b*) Lifestyle

(*c*) Genetic disorders (*d*) All of these

Ans. (*d*)

29. Which of the following disease is not contagious?

(*a*) Flu (*b*) Diphtheria

(*c*) Malaria (*d*) Cancer

Ans. (*d*)

30. Which of the following pair of diseases comprised of both an infectious and non-infectious disease?

(*a*) AIDS and cancer
(*b*) Typhoid and AIDS
(*c*) Cancer and Malaria
(*d*) Pneumonia and Malaria

Ans. (*a*)

31. In human beings, typhoid fever is induced by

(*a*) *Trichophyton*
(*b*) Rhino virus
(*c*) *Salmonella typhi*
(*d*) *Plasmodim vivax*

Ans. (*c*)

32. Which of the following is a bacterial illness that affects human beings?

(*a*) Malaria
(*b*) Dysentery
(*c*) Plague
(*d*) Both (*a*) and (*c*)

Ans. (*d*)

33. Which microorganism is responsible for whooping cough?

(*a*) *Bordetella pertussis*
(*b*) *Legionella spp*
(*c*) *Brucella melitensis*
(*d*) *Vibrio cholerae*

Ans. (*a*)

34. Which of the following group has bacterial diseases?

(*a*) Diphtheria, Leprosy, Plague
(*b*) Tetanus, Tuberculosis, Measles
(*c*) Malaria, Mumps, Polio
(*d*) Cholera, Typhoid, Mumps

Ans. (*a*)

35. The common cold is brought on by which virus

(*a*) *Streptococcus pneumonia*
(*b*) *Salmonella typhimurium*
(*c*) *Plasmodium vivax*
(*d*) Rhinovirus

Ans. (*d*)

36. Hepatitis B is spread through

(*a*) Female *Anopheles*
(*b*) Sneezing
(*c*) Coughing
(*d*) Blood transfusion

Ans. (*d*)

37. Malarial fever is caused by a poisonous chemical that causes chills and a high fever that reoccurs every 3-4 days

(*a*) Haemozoin (*b*) Interferon (*c*) Hirudin (*d*) Colostrum

Ans. (*a*)

38. Humoral immunity is linked to

(*a*) B-cells (*b*) T-cells

(*c*) Macrophages (*d*) Both (*b*) and (*c*)

Ans. (*a*)

39. Which antibody can pass the placental barrier?

(*a*) IgE (*b*) IgA (*c*) IgM (*d*) IgG

Ans. (*d*)

40. Most abundant kind of immunoglobulin in the body is

(*a*) IgE (*b*) IgA (*c*) IgM (*d*) IgG

Ans. (*d*)

Assertion-Reason Questions

Directions: For question numbers 41, 42, 43 and 44, consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

41. **Assertion (A):** Virus-infected cells protect the non-infected cells from viral infections.

Reason (R): Virus-infected cells secrete interferons.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

42. **Assertion (A):** The antibody-mediated immune response is known as humoral immune response also.

Reason (R): The T-lymphocytes are responsible for cell-mediated immunity.

Ans. (*b*) Both A and R are true and R is not the correct explanation of A.

43. **Assertion (A):** It is generally observed that children who had suffered an attack of chickenpox during their early childhood, may not contract the same disease in their adulthood.

Reason (R): Acquired immunity is characterised by memory.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

44. **Assertion (A):** The exaggerated response of the immune system to contain antigens present in the environment, is called allergy.

Reason (R): The use of drugs like adrenaline, antihistamines and steroids quickly reduce the symptoms of allergy.

Ans. (*b*) Both A and R are true and R is not the correct explanation of A.

Case-based Questions

45. **Read the following passage and answer the questions that follow:**

W and Z are non-communicable illnesses, while X and Y are communicable X is spread by vectors, while Y is spread through droplet infection. A hormone deficiency causes W, whereas Z is a degenerative illness. Answer the following questions using the material provided here.

(*a*) From the given data, recognize W, X, Y and Z.

	W	X	Y	Z
(*a*)	Coronary artery disease	Cholera	Chikungunya	Hypertension
(*b*)	Arthritis	AIDS	Shigella	Plague
(*c*)	Gonorrhea	Diphtheria	Pertussis	Anthrax
(*d*)	Diabetes	Malaria	Rhinitis	Alzheimer's disease

(*ii*) Choose the correct statement

(*a*) If Y is diphtheria than it is caused by *Bacillus anthracis*.

(*b*) If Z is myocardial infarction then patient develops acute rheumatic fever, joint pain and throat infection.

(*c*) If X is sleeping sickness then its vector *is Leishmania*.

(*d*) If W is hypothyroidism then it is caused by deficiency of thyroxine hormone.

(*iii*) Which of the following statement is true if X and Y are both common diseases?

(*a*) X could be chikungunya where Y could be rhinitis.

(*b*) X could be hepatitis whereas Y could be rabies.

(*c*) X could be chicken pox caused by *varicella zoster virus* whereas Y could be yellow fever caused by *flavivirus*.

(*d*) X could be dengue caused by *flavivirus* and Y could be AID caused by HIV.

(*iv*) If X and Y are both bacterial infections, choose the best match from the options below.

(*a*) X – Whooping cough

(*b*) X – Bubonic plague

(*c*) Y – Leprosy

(*d*) Y – Botulism

(*v*) **Assertion (A):** Infections diseases could be contagious or non-contagious.

Reason (R): Disorders which are transmitted through vectors are non-contagious diseases.

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

Ans. (*i*) (*d*) (*ii*) (*d*) (*iii*) (*a*) (*iv*) (*b*)

(*v*) (*b*) Both assertion and reason are true, but the reason is not the correct explanation of the assertion.

46. Read the following passage and answer the questions that follow:

Priya, Shweta and Zeenat are roommates. All are doing their graduation. A few months ago, Priya got sick. It took her about three weeks to recover. Her two friends were completely healthy at the time. After a while, Shweta also got another illness. This time, Priya and Zeenat both got the same illness. Based on the information above, answer the following questions.

(*i*) Which of the following is the correct explanation for priya's illness?

(*a*) Priya suffered from an infections disease transmitted by a vector.

(*b*) Priya suffered from an contagious disease that was orally transmitted by faeces.

(*c*) Priya suffered from non-communicable disease such as Down's syndrome.

(*d*) Priya suffered from non-communicable diseases such as anemia.

(*ii*) Choose the correct statement.

(*a*) Priya suffered from a disease caused by airborne microorganisms.

(*b*) Priya could have a nutritional disorder.

(*c*) Priya was suffering from a non-infectious disease.

(*d*) Both (*b*) and (*c*)

(*iii*) Which of the following statements is right about shweta's illness?

(*a*) Shweta became ill as a result of a microbiological infection.

(*b*) Shweta condition may or may not be infectious.

(*c*) Antibiotics may be able to heal shweta's sickness.

(*d*) All of the above.

(*iv*) Which best describes Priya and Shweta's illness?

	Priya	**Shweta**
(*a*)	Sickle cell anemia	Myocardial infarction
(*b*)	Gastritis	Rhinitis
(*c*)	Hypertension	Thyroid
(*d*)	Whooping cough	Tetanus

(*v*) **Assertion (A):** Diabetes mellitus is a non-communicable condition that can be healed entirely.

Reason (R): Diabetes mellitus is characterised by a lack of the hormone aldosterone.

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

Ans. (*i*) (*d*) (*ii*) (*d*) (*iii*) (*d*) (*iv*) (*b*)

(*v*) (*d*) A is False but R is true.

47. Read the following passage and answer the questions that follow:

Priya was four years old when she got chicken pox. It took her around 15 days to fully heal. Priya is now 5 years old, therefore her mother had her vaccinated with DPT (5th dosage) a few days ago as part of the immunisation schedule. She was just playing with a buddy in the park when her pal slipped on an iron pipe and seriously damaged her knee. She was rushed to the hospital, where she received an ATS injection and pain relievers. Address the following questions depending on the content provided above.

(*i*) Choose the appropriate statement.

(*a*) Priya has developed artificial active immunity against DPT.

(*b*) Priya has developed natural active immunity against chicken pox.

(*c*) Priya's friend has developed artificial passive immunity against tetanus.

(*d*) All of these

(*ii*) Which is an example of natural passive immunity from your opinion?

(*a*) Administration of AGGS (anti gas gangrene serum) in a person.

(*b*) Transfer of IgA antibodies from mother to baby via mother's milk.

(*c*) A person recovered from viral infection.

(*d*) A child vaccinated for polio.

(*iii*) Which of the following statements about active immunity is correct?

(*a*) It is temporary, not long lasting.

(*b*) It has no side effects.

(*c*) It provides immediate relief.

(*d*) None of these.

(*iv*) Choose the wrong match of the following:

(*a*) Passive immunity – IgG antibodies crossing the placental barrier to reach the foetus.

(*b*) Active immunity – Corona virus vaccination.

(*c*) Active immunity – Antidiphtheria serum administration in the patient.

(*d*) Passive immunity – Fetus receiving mother's milk.

(*v*) **Assertion (A):** A person who has recovered from measles gets active immunity against the virus.

Reason (R): Active immunity occurs when a person's own cells produce antibodies in response to infection.

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

Ans. (*i*) (*d*) (*ii*) (*b*) (*iii*) (*b*) (*iv*) (*c*)

(*v*) (*a*) Both A and R are true and R is the correct explanation of A.

48. Read the following passage and answer the questions that follow:

During his summer holidays, Aditya and his parents visited his homeland in the countryside. His grandparents property is bordered on all sides by countryside. Aditya was quite pleasant to see the agriculture fields because there were many crops growing nearby. He asked his mother for permission to play in the fields. When he got home, he had a runny nose, watery eyes, and was constantly sneezing. With the passage of time, the symptoms became more severe. Answer the following questions using the information provided here.

(*i*) What may be the cause of Aditya's condition?

(*a*) Allergy (*b*) Infection

(*c*) Malnutrition (*d*) Genetic disease

(*ii*) How can person's allergy diagnosed?

(*a*) Presence of large amount of IgE antibodies in the blood.

(*b*) Presence of large amount of bacteria in the blood.

(*c*) Presence of bilirubin and bilirubin pigments in the stool.

(*d*) Presence of sickle shaped RBCs in the blood.

(*iii*) The symptoms that Aditya acquired as a result of his allergy are the consequence of

(*a*) Swelling up of tissue surrounding bronchioles of lungs.

(*b*) Dilation of all arteries so that large amount of fluid passes from blood to tissues.

(*c*) Inflammation of membrane lining of the nose and conjunctiva.

(*d*) All of these.

(*iv*) Identify the sort of allergy that Aditya has

(*a*) Asthma (*b*) Anaphylaxis

(*c*) Urticaria (*d*) Hay fever

14 Objective Type Questions—12

(*v*) **Assertion (A):** Hay fever is an allergic reaction to pollen from grasses and other plants.

Reason (R): The production of histamines causes hay fever symptoms, which frequently respond favourably to antihistamine therapy.

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

Ans. (*i*) (*a*) (*ii*) (*a*) (*iii*) (*c*) (*iv*) (*d*)

(*v*) (*b*) Both A and R are true and R is not the correct explanation of A.

10 MICROBES IN HUMAN WELFARE

Multiple Choice Questions

1. Large-holes in 'Swiss-Cheese' are due to **[CBSE 2020]**

(*a*) *Propionibacterium sharmanii*

(*b*) *Saccharomyces cerevisiae*

(*c*) *Penicillium chrysogenum*

(*d*) *Acetobacter aceti*

Ans. (*d*) or (*a*)

2. The bioactive molecule used as an immuno-suppressive agent during organ transplant, is **[CBSE 2020]**

(*a*) Tetracycline

(*b*) Cyclosporin-A

(*c*) Statin

(*d*) Streptomycin

Ans. (*b*)

3. The microbes commonly used in kitchen, are **[CBSE 2020]**

(*a*) *Lactobacillus* and yeast

(*b*) *Penicillium* and yeast

(*c*) *Microspora* and *E.coli*

(*d*) *Rhizopus* and *Lactobacillus*

Ans. (*a*)

4. Some cyanobacteria in aquatic and terrestrial environment that enrich the soil by fixing nitrogen are **[CBSE 2020C]**

(*a*) *Rhizobium* and *Azotobacter*

(*b*) *Azospirillum* and *Glomus*

(*c*) *Anabaena* and *Nostoc*

(*d*) *Azospirillum* and *Azotobacter*

Ans. (*c*)

16 Objective Type Questions—12

5. Lactic acid is formed by the process of

(*a*) fermentation (*b*) glycolysis

(*c*) citric acid cycle (*d*) β-oxidation

Ans. (*a*)

6. *Bacillus thuringiensis* is used to control

(*a*) fungal pathogens (*b*) nematodes

(*c*) bacterial pathogens (*d*) insect pests.

Ans. (*d*)

7. *Propionibacterium* produces large holes in Swiss cheese due to the

(*a*) process of oxidation of the dough (*b*) formation of large amount of CO_2

(*c*) consumption of carbohydrates (*d*) all of these

Ans. (*b*)

8. The primary treatment of waste water involves the removal of **[NCERT Exemplar Problems]**

(*a*) dissolved impurities (*b*) stable particles

(*c*) toxic substances (*d*) harmful bacteria.

Ans. (*b*)

9. Which one of the following is not a nitrogen-fixing organism? **[NCERT Exemplar Problems]**

(*a*) *Anabaena* (*b*) *Nostoc*

(*c*) *Azotobacter* (*d*) *Pseudomonas*

Ans. (*d*)

10. BOD of waste water is estimated by measuring the amount of **[NCERT Exemplar Problems]**

(*a*) total organic matter (*b*) biodegradable organic matter

(*c*) oxygen evolution (*d*) oxygen consumption.

Ans. (*d*)

11. The vitamin whose content increases following the conversion of milk into curd by lactic acid bacteria is **[NCERT Exemplar Problems]**

(*a*) vitamin C (*b*) vitamin D

(*c*) vitamin B_{12} (*d*) vitamin E

Ans. (*c*)

12. Methanogens, growing anaerobically on cellulosic material, produce

(*a*) methane gas (*b*) methane and carbon dioxide

(*c*) methane and hydrogen (*d*) methane, carbon dioxide, hydrogen.

Ans. (*d*)

13. Cyanobacteria are used as biofertilisers because they

(*a*) are photosynthetic
(*b*) grow easily anywhere
(*c*) have mucilage
(*d*) fix atmospheric nitrogen

Ans. (*d*)

14. Match the list of microbes in Column I with their commercially important products in Column II and select the correct option.

Column I	Column II
A. *Lactobacillus*	1. Acetic acid
B. *Clostridium butylicum*	2. Citric acid
C. *Aspergillus niger*	3. Lactic acid
D. *Acetobacter aceti*	4. Butyric acid
	5. Statins

(*a*) A – 3, B – 4, C – 2, D – 1
(*b*) A – 3, B – 4, C – 5, D – 1
(*c*) A – 3, B – 5, C – 2, D – 1
(*d*) A – 5, B – 4, C – 2, D – 1

Ans. (*a*)

15. Match the items in Column I with those in Column II and select the correct option.

Column I	Column II
A. *Penicillium notatum*	1. Biogas
B. *Propionibacterium sharmanii*	2. Statins
C. *Trichoderma polysporum*	3. Antibiotic, Penicillin
D. *Methanobacterium*	4. Swiss cheese
	5. Cyclosporin A

(*a*) A – 3, B – 4, C – 5, D – 2
(*b*) A – 3, B – 4, C – 5, D – 1
(*c*) A – 3, B – 5, C – 2, D – 1
(*d*) A – 3, B – 5, C – 2, D – 1

Ans. (*b*)

16. Identify whether each of the following statements is true (T) or false (F) and select the correct option.

A. *Trichoderma* is a fungus used as a biocontrol agent.
B. Cyclosporin A is used for lowering the blood cholesterol level.
C. Biogas plants are more often built in rural areas.
D. Bacteria, viruses and fungi are used as biofertilisers.

(*a*) A – T, B – F, C – F, D – T
(*b*) A – T, B – T, C – F, D – F
(*c*) A – T, B – F, C – T, D – F
(*d*) A – F, B – F, C – T, D – F

Ans. (*c*)

18 Objective Type Questions—12

17. Mark the odd one in each of the following groups and select the correct option.

A. *Anabaena*, *Streptococcus*, *Nostoc*, *Oscillatoria*.

B. Dragonflies, *Trichoderma*, Baculoviruses, *Glomus*.

C. Whisky, Wine, Brandy, Rum.

D. *Clostridium*, *Lactobacillus*, *Aspergillus*, *Acetobacter*.

(*a*) A – *Anabaena* B – *Trichoderma*
C – Wine D – *Aspergillus*

(*b*) A – *Streptococcus* B – *Glomus*
C – Wine D – *Aspergillus*

(*c*) A – *Anabaena* B – Dragonflies
C – Whisky D – Clostridium

(*d*) A – *Streptococcus* B – Dragonflies
C – Brandy D – *Aspergillus*

Ans. (*b*)

18. *Bacillus thuringiensis* is a bacteria that is used to eliminate

(*a*) Insect pests (*b*) Nematodes
(*c*) Fungal Pathogens (*d*) Bacterial Pathogens

Ans. (*a*)

19. Which of the following alcoholic beverages is made without the use of distillation?

(*a*) Whisky (*b*) Wine
(*c*) Brandy (*d*) Rum

Ans. (*b*)

20. The residue that remains after the creation of methane from animal manure is

(*a*) Burned in land fills (*b*) Burnt
(*c*) Used in civil construction (*d*) Used as manure

Ans. (*d*)

21. In rice fields, a nitrogen-fixing bacterium associated with the fern *Azolla* is

(*a*) *Rhizobium* (*b*) *Spirulina*
(*c*) *Anabaena* (*d*) *Frankia*

Ans. (*c*)

22. *Azolla pinnata* has been discovered to be a valuable biofertilizer for paddy crops. This characteristic is due to the presence of

(*a*) N_2 fixing cyanobacteria (*b*) N_2 fixing bacteria
(*c*) mycorrhizae (*d*) all of these

Ans. (*a*)

23. Which of the following is frequently employed as a successful biofertilizer in Indian rice field?
(*a*) *Acacia arabica* (*b*) *Acalypha indica*
(*c*) *Azolla pinnata* (*d*) *Rhizobium*
Ans. (*c*)

24. Which of the alternatives below includes biofertilizers?
(*a*) A quick growing crop plouged back into the field
(*b*) Cowdung manure and farmyard waste
(*c*) *Nostoc, Oscillatoria*
(*d*) None of these
Ans. (*c*)

25. Which fertilizer is non-symbiotic?
(*a*) *Azotobacter* (*b*) *Anabaena*
(*c*) *Rhizobium* (*d*) *VAM*
Ans. (*a*)

26. What causes nitrogen fixation in *Alnus* root nodules?
(*a*) *Clostridium* (*b*) *Frankia*
(*c*) *Bradyrhizobium* (*d*) *Azorhizobium*
Ans. (*b*)

27. Wastewater treatment produces a considerable amount of sludge, which may be managed by
(*a*) Floc (*b*) Chemicals
(*c*) Oxidation pond (*d*) Anaerobic digesters
Ans. (*d*)

28. Methanogenic bacteria is not located in
(*a*) Gobar gas plant (*b*) Bottom of water-logged paddy field
(*c*) Activated sludge (*d*) Rumen of cattle
Ans. (*c*)

29. *Trichoderma* is a free living fungus that can be utilised for
(*a*) Insecticides (*b*) Controlling butterfly caterpillars
(*c*) Producing antibiotics (*d*) Biological control of plant diseases
Ans. (*d*)

30. The host plant is not supported by mycorrhiza
(*a*) Increasing its tolerance to drought
(*b*) Enhancing its phosphorus uptake capacity
(*c*) Increasing its resistance to insects
(*d*) Enhancing its resistance to root pathogens
Ans. (*c*)

31. The inoculum is introduced to fresh milk in required to convert it to curd, the term 'inoculum' refers to

(*a*) A starter rich in proteins
(*b*) A starter rich in vitamin-B
(*c*) An aerobic digester
(*d*) A starter containing millions of LAB

Ans. (*d*)

32. Which of the following organisms is employed in the beverage manufacturing process?

(*a*) *Saccharomyces cerevisiae*
(*b*) *Penicillium notatum*
(*c*) *Aspergilus niger*
(*d*) *Clostridium butylicum*

Ans. (*a*)

Assertion-Reason Questions

Directions: For question numbers 33, 34, 35 and 36, consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) Both A and R are true and R is the correct explanation of A.
(*b*) Both A and R are true and R is not the correct explanation of A.
(*c*) A is true but R is false.
(*d*) A is False but R is true.

33. **Assertion (A):** Use of cynobacteria in the paddy fields increases the productivity of paddy.

Reason (R): Cynobacteria can fix atmospheric nitrogen in the soil.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

34. **Assertion (A):** Secondary treatment of sewage water is appropriately called biological treatment also.

Reason (R): Secondary treatment of sewage water is carried out by the heterotrophic microbes naturally present in the sewage water.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

35. **Assertion (A):** Wine and beer are formed without distillation.

Reason (R): Distillation decreases the alcohol content.

Ans. (*c*) A is true but R is false.

36. **Assertion (A):** Organ transplant patients are administered cyclosporin A, an immuno-suppressive agent.

Reason (R): Cyclosporin is obtained from *Monascus purpureus*.

Ans. (*c*) A is true but R is false.

Case-based Questions

37. Read the following passage and answer the questions that follow:

The first antibiotic derived from Penicillin notatum was penicillin. Antibiotics are utilized to treat bacterial infections. There can be broad spectrum, killing a wide range of disease-causing bacteria, or narrow spectrum, killing only one group of dangerous strains. Antibiotics can be bacteriostatic or bactericides. Bactericidal drugs kill bacteria by disrupting cell wall production (e.g., cephalosporin), inhibiting the operation of the 50 S ribosome (e.g., erythromycin), inhibiting amino acid-tRNA binding to the ribosome (e.g., tetracycline) and so on. Bacteriostatic antibiotics do not kill germs, instead they inhibit their development. Penicillin is an antibiotic that inhibits bacterial cell wall formation by attaching to it and inactivating protein, it belongs to the β-lactum group of antibiotics. It prevents cross-linking of the cell wall and inhibits transpeptidation. Tonsilitis, sore throat, gonorrhea, rheumatic fever and various pneumonia kinds are also treated with penicillin.

(*i*) The first antibiotic was derived from

(*a*) Lichen (*b*) Fungus

(*c*) Eubacteria (*d*) Actinomycetes

(*ii*) Which of the following destroys bacteria by interferes with the functioning of the 50 S ribosome?

(*a*) Streptomycin (*b*) Neomycin

(*c*) Cephalosporin (*d*) Erythromycin

(*iii*) Antibiotics of the β-lactum family kills bacteria by

(*a*) Inhibition of translation of mRNA

(*b*) Inhibition of transcription of mRNA

(*c*) Disruption of plasma membrane

(*d*) Disruption of cell wall

(*iv*) Penicillin is not prescribed for the treatment of

(*a*) Tonsillitis (*b*) Rheumatic fever

(*c*) Candidiasis (*d*) Pneumonia

(*v*) **Assertion:** Cephalosporins act as interrupting of bacterial cell wall production pathway.

Reason: Cephalosporin is a type of bacteriostatic antibiotic.

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

Ans. (*i*) (*b*) (*ii*) (*d*) (*iii*) (*d*) (*iv*) (*c*)

(*v*) (*c*) A is true but R is false.

38. Read the following passage and answer the questions that follow:

The capacity of enzymes to catalyze biological processes without experiencing any changes is their most well-known property. In the biotechnological sector, a great number of enzymes are employed. Microbes provide the majority of them. Proteases are enzymes that break down proteins and polypeptides. The majority of commercially available proteases are alkaline and are produced mostly by bacteria such as *Pseudomonas*, *Bacillus* and *Aspergillus*. These enzymes are used to clarify beer, softened of bread and meat, and degumming of silk etc. Alkaline serine proteases are the most often used in biotechnology. Alkaline proteases have demonstrated their capacity to function in the presence of inhibiting substances and at high pH and temperature. Amylases are another significant category of enzymes. Amylolytic enzymes are enzymes which break down starch. *Aspergillus*, *Rhizopus* and *Bacillus* sp. are used to make these. It is also used in softening and sweetening of bread and in the removal of turbidity in juices caused by starch.

(*i*) Polypeptides are broken down by which enzymes?

(*a*) Proteases (*b*) Amylases

(*c*) Lipases (*d*) Pectinases

(*ii*) Amylolytic enzymes are not derived from

(*a*) *Rhizopus* (*b*) *Aspergillus*

(*c*) *Bacillus* (*d*) *Mucor*

(*iii*) The removal of turbidity in juices produced by starch and it is attained by

(*a*) Proteases (*b*) Amylases

(*c*) Rennet (*d*) Both (*a*) and (*c*)

(*iv*) Choose the incorrect choice from the following

(*a*) Enzymes are proteinaceous substances

(*b*) Enzymes are large-sized molecules

(*c*) Enzymes are substrate specific

(*d*) Microbial enzymes can work only in normal temperature and pH.

(*v*) A corn farmer gathers and makes corn starch. He intends to make corn syrup out of this. He will utilize which enzyme for the conversion—

(*a*) Glucoamylases (*b*) Glucoisomerases

(*c*) Amylase (*d*) All of these

Ans. (*i*) (*a*) (*ii*) (*d*) (*iii*) (*b*) (*iv*) (*d*) (*v*) (*d*)

39. Read the following passage and answer the questions that follow:

Alcohols are crucial solvents in industry. Commercially, ethanol, methanol, propanol and butanol are created by the fermentation activity of fungi, primarily yeasts. Yeast cells transform cereal-derived carbohydrates into ethanol and CO_2 throughout the process of fermentation. The rate of fermentation reaction is affected by sugar content. In a high sugar solution, yeast cannot grow.

In the case of complex carbohydrate – containing nutrient medium, yeasts are combined with 1% malt or *Rhizopus*. The starch is hydrolyzed for 30 minutes at a high temperature. Mash is a mixture of crushed food and heated water used to make malt. The nutrient medium before fermentation is referred to as wort. The wort is chilled to the proper temperature before being inoculated with the yeast strain.

(*i*) The rate of alcohol generation is determined by

(*a*) Amount of yeast added in the medium.

(*b*) Amount of sugar present in the medium.

(*c*) Amount of CO_2 produced per unit time

(*d*) All of these

(*ii*) As the nutritional media, pH, and aeration change during alcoholic fermentation, a variety of compounds are created. Choose a by-product from the list below.

(*a*) Amyl alcohol

(*b*) Glycerol

(*c*) Phenylethanol

(*d*) All of these

(*iii*) The crushed food combined with hot water for getting malt during alcoholic fermentation of grains and potatoes is known as

(*a*) Wort

(*b*) Mash

(*c*) Juice

(*d*) None of these

(*iv*) Distilled alcohol with a 95% ethanol concentration is referred to as

(*a*) Gin

(*b*) Brandy

(*c*) Rectified spirit

(*d*) Absolute alcohol

(*v*) **Assertion:** *Rhizopus* or 1% malt is employed in the nutrient medium when complex carbohydrates are present.

Reason: Yeast does not produce enough diastase or amylase.

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

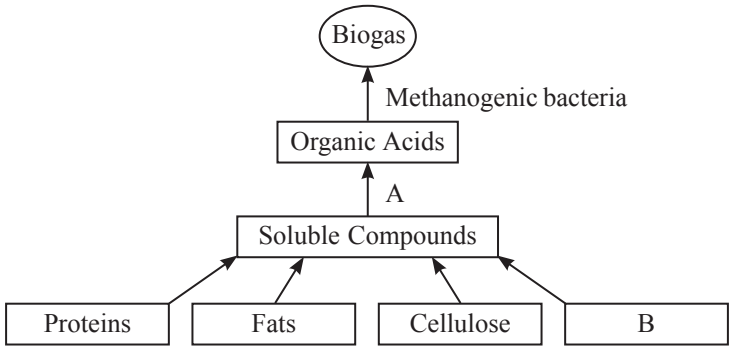
(*d*) A is False but R is true.

Ans. (*i*) (*c*) (*ii*) (*d*) (*iii*) (*b*) (*iv*) (*c*)

(*v*) (*a*) Both A and R are true and R is the correct explanation of A.

40. Read the following passage and answer the questions that follow:

Residents in Chambur began planning to generate power from cow manure for agricultural uses. For this goal, they have launched a biogas plant. Examine the biogas flow of production diagram below and respond to the following questions.



(*i*) Biogas is mostly made up of

(*a*) CO_2, H_2S and H (*b*) H_2S, H and O_2

(*c*) Methane, CO_2 (*d*) Methane, CO_2 and O_2

(*ii*) In the flowchart, the letter 'A' refers to

(*a*) Aerobic bacteria (*b*) Degrading bacteria

(*c*) Aeration microbes (*d*) Fermentative microbes

(*iii*) What is denoted by 'B' in flow chart?

(*a*) Methane (*b*) CO_2

(*c*) Hemicellulose (*d*) Inorganic material

(*iv*) The manufacturing of Biogas is

(*a*) Aerobic Process (*b*) Anaerobic Process

(*c*) Active Process (*d*) Passive Process

(*v*) The production of Biogas is done through

(*a*) Anaerobic breakdown of biomass

(*b*) Aerobic breakdown of biomass

(*c*) With the help of methanogenic bacteria

(*d*) Both (*a*) and (*c*)

Ans. (*i*) (*c*) (*ii*) (*d*) (*iii*) (*c*) (*iv*) (*b*) (*v*) (*d*)

11 BIOTECHNOLOGY: PRINCIPLES AND PROCESSES

Multiple Choice Questions

1. Introduction of an alien DNA into a plant host cell, is achieved by
(*a*) making them competent with bivalent cations
(*b*) using microinjection
(*c*) using gene gun
(*d*) using lysozyme and chitinase **[CBSE 2020]**

Ans. (*b*)

2. In biotechnology experiments, the molecular scissors used are
(*a*) plasmids
(*b*) restriction endonuclease
(*c*) vector
(*d*) sigma factors **[CBSE 2020C]**

Ans. (*b*)

3. Which of the following is not a plasmid?
(*a*) Sal I (*b*) YAC (*c*) BAC (*d*) pBR 322 **[CBSE 2020C]**

Ans. (*a*)

4. Biolistics (gene gun) is suitable for
(*a*) introducing rDNA into plant cells
(*b*) introducing rDNA into animal cells
(*c*) disarming the pathogen vectors
(*d*) DNA fingerprinting.

Ans. (*a*)

5. In genetic engineering experiments, restriction enzymes are used for
(*a*) viral DNA (*b*) bacterial DNA
(*c*) eukaryotic DNA (*d*) any type of DNA.

Ans. (*d*)

6. The DNA fragments produced by the use of restriction endonucleases can be separated by
(*a*) polymerase chain reaction (*b*) gel electrophoresis
(*c*) density gradient centrifugation (*d*) any of the above.

Ans. (*b*)

7. Plasmids in bacterial cells are

(*a*) extra-chromosomal DNA, which cannot replicate

(*b*) extra-chromosomal DNA, which can self-replicate

(*c*) extra DNA associated with the genome

(*d*) extra DNA, associated with the genome, but cannot replicate.

Ans. (*b*)

8. The DNA polymerase enzyme used in PCR is obtained from

(*a*) *Thermus aquaticus* (*b*) *Escherichia coli*

(*c*) *Agrobacterium tumefaciens* (*d*) *Salmonella typhimurium*.

Ans. (*a*)

9. While isolating DNA from bacteria, which of the following enzymes is not used? **[NCERT Exemplar Problems]**

(*a*) Lysozyme (*b*) Ribonuclease

(*c*) Deoxyribonuclease (*d*) Protease

Ans. (*c*)

10. Significance of 'heat shock' method in bacterial transformation is to facilitate **[NCERT Exemplar Problems]**

(*a*) binding of DNA to the cell wall

(*b*) uptake of DNA through membrane transport proteins

(*c*) uptake of DNA through transient pores in the bacterial cell wall

(*d*) expression of antibiotic resistance gene

Ans. (*c*)

11. Which of the following steps is catalysed by *Taq* polymerase in a PCR reaction? **[NCERT Exemplar Problems]**

(*a*) Denaturation of template DNA

(*b*) Annealing of primers to template DNA

(*c*) Extension of primer end on the template DNA

(*d*) All of the above

Ans. (*c*)

12. Which of the given statement is correct in the context of observing DNA separated by agarose gel electrophoresis? **[NCERT Exemplar Problems]**

(*a*) DNA can be seen in visible light

(*b*) DNA can be seen without staining in visible light

(*c*) Ethidium bromide-stained DNA can be seen in visible light

(*d*) Ethidium bromide-stained DNA can be seen under exposure to UV light

Ans. (*d*)

13. 'Restriction' in Restriction enzyme refers to **[NCERT Exemplar Problems]**

(*a*) cleaving of phosphodiester bond in DNA by the enzyme

(*b*) cutting of DNA at specific position only

(*c*) prevention of the multiplication of bacteriophage in bacteria

(*d*) all of the above

Ans. (*c*)

14. Match the items in Column I with those in Column II and select the correct option.

Column I	Column II
A. Sea weeds	1. Gel electrophoresis
B. Staining of DNA	2. Source of Agarose
C. Separation of DNA fragments	3. Isolation of DNA from the gel
D. Elution	4. Ethidium bromide

(*a*) A – 2, B – 4, C – 1, D – 3 (*b*) A – 4, B – 1, C – 2, D – 3

(*c*) A – 2, B – 1, C – 4, D – 3 (*d*) A – 2, B – 4, C – 3, D – 1

Ans. (*a*)

15. Match the Column I with the Column II and select the correct option.

Column I	Column II
A. Competent host	1. Separation and purification
B. Cloning vector	2. Gel electrophoresis
C. Downstream processing	3. *Taq* polymerase
D. PCR	4. Divalent cation (Ca^{2+})
	5. pBR 322

(*a*) A – 4, B – 5, C – 2, D – 1 (*b*) A – 4, B – 5, C – 1, D – 3

(*c*) A – 2, B – 5, C – 1, D – 3 (*d*) A – 5, B – 3, C – 4, D – 2

Ans. (*b*)

16. Identify whether each of the following statements is true (T) or false (F) and select the correct option.

A. The vector DNA and foreign DNA are cut by the same restriction endonuclease.

B. Agarose, the most commonly used matrix in gel electrophoresis is obtained from fungi.

C. The DNA fragments separate according to their size through the sieving effect of agarose gel during electrophoresis.

D. The cloning vector pBR 322 has three antibiotic-resistance genes.

(*a*) A – T, B – F, C – T, D – F
(*b*) A – T, B – T, C – F, D – F
(*c*) A – T, B – F, C – F, D – T
(*d*) A – F, B – F, C – T, D – F

Ans. (*a*)

17. Mark the odd one in each of the following groups and select the correct option.

A. Cellulase, Lysozyme, Chitinase, Endonuclease
B. Hind III, EcoRI, Sal I, Rop
C. Denaturation, Elution, Annealing, Extension
D. Ampicillin, Tetracycline, Kanamycin, Agarose.

(*a*) A – Cellulase B – EcoRI
C – Extension D – Agarose
(*b*) A – Endonuclease B – Rop
C – Elution D – Agarose
(*c*) A – Lysozyme B – Sal I
C – Elution D – Ampicillin
(*d*) A – Chitinase B – Hind III
C – Denaturation D – Agarose

Ans. (*b*)

18. Which of the following processes are included under biotechnology?

(*a*) *In vitro* fertilization leading to a test tube baby
(*b*) Synthesising a gene/correcting a defective gene
(*c*) Developing a DNA vaccine
(*d*) All of the above

Ans. (*d*)

19. The basic techniques of modern biotechnology is/are

(*a*) Chemical engineering
(*b*) Genetic engineering
(*c*) Both (*a*) and (*b*)
(*d*) None of these

Ans. (*c*)

20. Process of using recombinant DNA technology to alter the genetic makeup of an organism is:

(*a*) Genetic engineering
(*b*) Gene amplification
(*c*) Gene cloning
(*d*) Gene editing

Ans. (*a*)

21. How many ori sites are required in case of prokaryotes and eukaryotes?

(*a*) One and many
(*b*) Many and one
(*c*) One and zero
(*d*) Zero and one

Ans. (*a*)

22. Technique which overcome the limitation of traditional hybridisation is

(*a*) Modern hybridisation (*b*) Genetic engineering

(*c*) Chemical engineering (*d*) Gene cloning

Ans. (*b*)

23. Genetic engineering is:

(*a*) Manipulation of enzymes

(*b*) Manipulation of genes by artificial method

(*c*) Manipulation of RNA

(*d*) Study of extra nuclear gene

Ans. (*b*)

24. In presence of chromogenic substrate, the recombinant bacteria gives:

(*a*) Real coloured colonies (*b*) Colourless colonies

(*c*) Blue coloured colonies (*d*) Green colonies

Ans. (*c*)

25. What is true for plasmid?

(*a*) Plasmids are widely used in gene transfer

(*b*) These are found in virus

(*c*) Plasmid contains gene for vital activities

(*d*) These are main part of chromosome

Ans. (*a*)

26. The term "molecular scissors" generally refers to:

(*a*) DNA polymerases (*b*) RNA polymerases

(*c*) Restriction endonucleases (*d*) DNA ligases

Ans. (*c*)

27. Restriction enzymes:

(*a*) Are endonucleases which cleave DNA at specific sites

(*b*) Make DNA complementary to an existing DNA or RNA

(*c*) Cut or join DNA fragments

(*d*) Are required in vectorless gene transfer

Ans. (*a*)

28. One of the key factor which makes the plasmid a vector in genetic engineering is

(*a*) Ability to cause infection in the host

(*b*) Ability to carry a foreign gene

(*c*) Resistance to restriction enzymes

(*d*) None of these

Ans. (*b*)

29. Term genetic engineering is possible because

(*a*) It is possible to cut the DNA at specific site by molecular scissor

(*b*) It is possible to study the DNA

(*c*) Restriction enzymes extracted from one organism can be used in another

(*d*) Phenomenon of conjugation, transformation is easy to understand

Ans. (*a*)

30. The term recombinant DNA refers to:

(*a*) DNA with palindromic sequence

(*b*) DNA with a piece of foreign DNA

(*c*) DNA with selectable marker

(*d*) DNA with more than one restriction enzyme

Ans. (*b*)

31. Which one of the following has found extensive use in genetic engineering?

(*a*) *Bacillus coagulans* (*b*) *Agrobacterium tumefaciens*

(*c*) *E.coli* (*d*) *Trachysphaera fructigena*

Ans. (*c*)

32. Which of the following is/are examples of chemical scissor?

(*a*) EcoRI (*b*) Hind II

(*c*) Bam HI (*d*) All of the above

Ans. (*d*)

33. Which of the following sequence is recognized by Cla I?

(*a*) 5′ A T C G A T 3′
3′ T A G C T A 5′

(*b*) 5′ G T C A T T 3′
3′ C A G T A A 5′

(*c*) 5′ G A A T T C 3′
3′ C T T A A G 5′

(*d*) 5′ G G A T C C 3′
3′ C C T A G G 5′

Ans. (*a*)

34. In EcoRI, R stands for:

(*a*) Species (*b*) Genus (*c*) Strain (*d*) Order

Ans. (*c*)

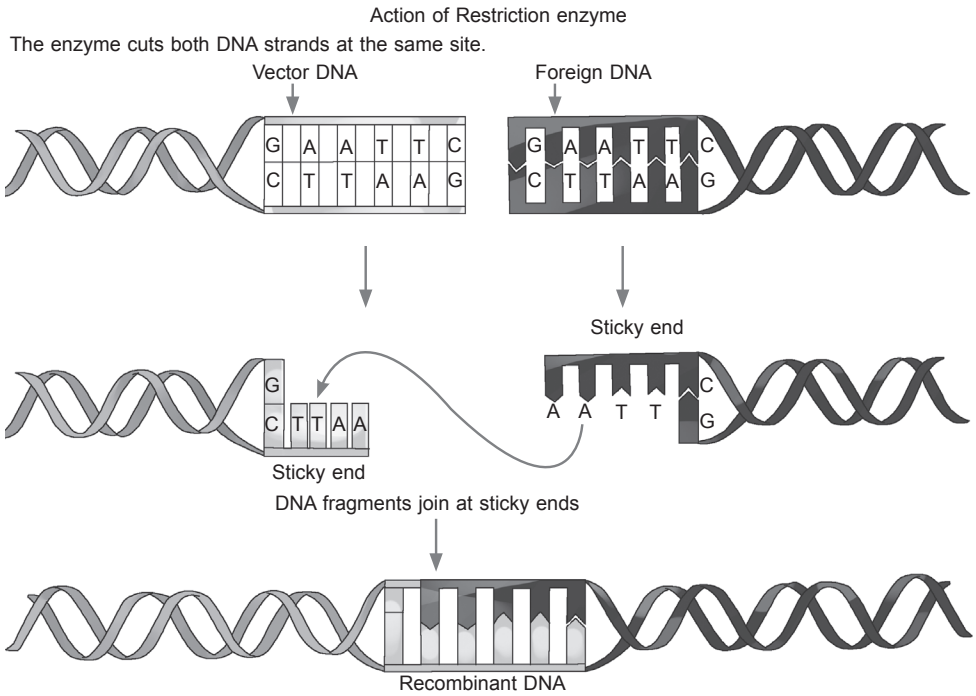
35. Second letter of the name of restriction endonuclease came from:

(*a*) Species of organism (*b*) Genus of organism

(*c*) Class of organism (*d*) Family of class

Ans. (*a*)

36. Name the enzyme involved in following steps:



(*a*) Hind II and DNA ligase
(*b*) EcoRI and DNA primase
(*c*) EcoRII and DNA ligase
(*d*) EcoRI and DNA ligase

Ans. (*d*)

37. Identify the palindromic sequence in the given options:

(*a*) 5′ ATCGAT 3′
3′ UAGCUA 5′

(*b*) 5′ GTCATT 3′
3′ CAGTUU 5′

(*c*) 5′ GAATTC 3′
3′ CTTAAG 5′

(*d*) 5′ GGATCC 3′
3′ CCTACG 5′

Ans. (*c*)

38. Restriction enzymes belong to class:

(*a*) Lyases (*b*) Hydrolases (*c*) Nucleases (*d*) Transferases

Ans. (*c*)

39. How many fragments will be generated if you digest a linear DNA molecule with a restriction enzyme having three recognition sites on DNA?

(*a*) 2
(*b*) 4
(*c*) 3
(*d*) 1

Ans. (*b*)

Assertion-Reason Questions

Directions: For question numbers 40, 41, 42 and 43, consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

40. **Assertion (A):** When an alien or recombinant DNA is ligated at the Pvu I site of the *E.coli* cloning vector, pBR 322, the recombinant loses resistance to ampicillin.

Reason (R): The Pvu I site lies within the coding sequence of ampicillin resistance gene.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

41. **Assertion (A):** During gel electrophoresis, DNA moves towards the anode.

Reason (R): DNA is positively charged.

Ans. (*c*) A is true but R is false.

42. **Assertion (A):** Retroviruses are used efficiently as vectors in *r*DNA technological experiments.

Reason (R): *Agrobacterium tumefaciens* is the most commonly used vector for transformation of plant cells.

Ans. (*b*) Both A and R are true and R is not the correct explanation of A.

43. **Assertion (A):** *Agrobacterium tumefaciens*, a pathogen of several dicot plants induces formation of tumors in them.

Reason (R): The bacterium Agrobacterium delivers a part of its DNA, called T-DNA into the host cells/plants.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

Case-based Questions

44. **Read the following passage and answer the questions that follow:**

Selectable marker is a gene which helps in selecting transformed host cells and eliminating non-transformants. The process of the selection of recombinants from non-recombinant occurs as the transformants containing tet^R gene are plated on an ampicillin containing medium. The mixture is then transferred on a medium containing tetracycline. The recombinants will form colonies in ampicillin medium but will not form colonies in tetracycline medium. The non-recombinants will grow on both the mediums. By this way we can select/distinguish recombinant from non-recombinant. An alternative used for selection of transformed cell is insertional inactivation.

(*i*) An antibiotic resistance gene of plasmid vector which get inactivated due to introduction of alien DNA, assists in the selection of–

(*a*) Transformants
(*b*) Recombinants
(*c*) Non-Transformants
(*d*) (*b*) and (*c*) both

(*ii*) Which of the following will get inactivated in insertional inactivation?

(*a*) *Taq* polymerase (*b*) Nuclease

(*c*) β-galactosidase (*d*) None of the above

(*iii*) In genetic engineering, the antibiotics are used:

(*a*) as sequences from where replication starts

(*b*) to keep the cultures free of infection

(*c*) as selectable markers

(*d*) to select healthy vectors

(*iv*) The colonies of non-recombinant bacteria appear blue in contrast to white colonies of recombinant bacteria

(*a*) Inactivation of nuclease enzyme in recombinant bacteria

(*b*) Presence of β-galactosidase in non-recombinant bacteria

(*c*) Insertional inactivation of β-galactosidase in non-recombinant bacteria

(*d*) Insertional inactivation of β-galactosidase in recombinant bacteria

(*v*) Which of the following is a role of selectable marker?

(*a*) Inhibits the growth of transformed cell in a culture

(*b*) Provides resistance against a substrate

(*c*) Helps to create a gene map

(*d*) Both (*i*) and (*ii*)

Ans. (*i*) (*b*) (*ii*) (*c*) (*iii*) (*c*) (*iv*) (*d*) (*v*) (*b*)

45. Read the following passage and answer the questions that follow:

Bioreactors are the tanks that supply biological, biochemical requirements for the optimal growth of the fermenting microorganisms and biochemical reactions on industries level for the synthesis of desired products. Efficient bioreactors are capable of maintaining the desired biological activity by regulating the temperature, pH, fluid velocity, heat, oxygen, carbon dioxide and nutrient supply. Bioreactors are used in large scale production.

(*i*) In which type of bioreactor air bubbles dramatically increases the oxygen transfer area?

(*a*) Simple stirred tank bioreactor

(*b*) Sparged stirred tank bioreactor

(*c*) Both (*a*) and (*b*)

(*d*) None of these

(*ii*) Stirred tank bioreactors have advantage over shake flasks because they:

(*a*) Are easy to separate

(*b*) Provide high temperature and pH

(*c*) Provide better aeration and mixing properties

(*d*) Do not allow the entry of carbon dioxide

(*iii*) Stirred-tank bioreactors have been designed for:

(*a*) availability of oxygen throughout the process

(*b*) ensuring anaerobic conditions in the culture vessel

(*c*) purification of the product

(*d*) addition of preservatives to the product

(*iv*) A device in which large volume of raw materials are converted into specific product

(*a*) Bioreactor (*b*) PCR

(*c*) Transfection (*d*) Cytometry

(*v*) Which of the following statements are correct with respect to bioreactor?

(A) It can process large volumes of culture

(B) It provides optimum temperature and pH

(C) It has an oxygen delivery system

(D) It provides aeration and mixing properties

(*a*) A, B, C (*b*) A, D, C

(*c*) A, B, C, D (*d*) A, C, D

Ans. (*i*) (*b*) (*ii*) (*c*) (*iii*) (*a*) (*iv*) (*a*) (*v*) (*c*)

46. Read the following passage and answer the questions that follow:

Biological tools are used in formation of recombinant DNA. Restriction enzyme play an important role in this formation. Restriction enzymes were isolated for the first time by W. Arber in bacteria. HindII was the first restriction enzyme which was isolated from Haemophilus influenzae. It always cut the DNA molecule at a particular point by recognising a specific sequence infact all the restriction enzyme cut at specific site by recognising a specific DNA sequence named as palindromic nucleotide sequence. Restriction enzyme are part of a wider group of enzymes called nucleases.

(*i*) The first restriction endonuclease isolated was

(*a*) EcoRI (*b*) BamHI (*c*) Sal I (*c*) Hind II

(*ii*) A restriction endonuclease is a type of enzyme that breaks bonds between

(*a*) Base pairs of DNA molecule

(*b*) Sugar and phosphate components of a nucleic acid molecule

(*c*) Base pairs of RNA molecule

(*d*) Exons and introns of RNA molecule

(*iii*) When a linear DNA molecule is digested using a restriction enzyme that has four recognition sites on the DNA, then how many fragments will be produced?

(*a*) 3 (*b*) 6 (*c*) 4 (*c*) 5

(*iv*) The sticky ends of a fragmented DNA molecule are made of

(*a*) Unpaired bases (*b*) Endonuclease enzyme

(*c*) Calcium salts (*d*) Ethyl group

(*v*) BamHI is a restriction enzyme that recognises which of the following sequence?

(*a*) GAATTC
CTTAAG

(*b*) AAGCTA
TTCGAT

(*c*) GGATCC
CCTAGG

(*d*) CCCAAT
GGGTTA

Ans. (*i*) (*d*) (*ii*) (*b*) (*iii*) (*d*) (*iv*) (*a*) (*v*) (*c*)

47. Read the following passage and answer the questions that follow:

Vectors are DNA molecules that carry a foreign DNA segment and replicate inside the host cell. They are also known as vehicle DNA/Carrier DNA. Vectors may be plasmid, bacteriophage, cosmids, YAC, BAC, transposons. The most commonly used vector are plasmid and bacteriophage vectors. Some important features of cloning vectors are ori, selectable marker, cloning sites. Different vectors are used for cloning genes in plants and animals. pBR322 was the first cloning vector constructed in 1977.

(*i*) In plant genetic engineering, which of the following bacteria is utilised as a vector?

(*a*) *Agrobacterium tumefaciens* (*b*) Bacteriophage

(*c*) *Thermus aquaticus* (*d*) *Pyrococcus furiosus*

(*ii*) What happens if the cloning vector pBR322 lacks the 'ori site'?

(*a*) Transformation will not take place

(*b*) Sticky ends will not produce

(*c*) Translation will not occur

(*d*) Replication will not take place

(*iii*) Which of the following does not function as a cloning vector?

(*a*) Cosmid (*b*) pBR322 (*c*) Sal I (*d*) Phagemid

(*iv*) Read the given statement and select the correct option:

Statement 1: In recombinant DNA technology, the tumour inducing plasmid serves as a cloning vector.

Statement 2: The Ti plasmid which is engaged in the mechanism of delivering gene to a plant or animal cell remains pathogenic.

(*a*) Both statements are correct

(*b*) Statement 1 is correct but statement 2 is incorrect

(*c*) Statement 1 is incorrect but statement 2 is correct

(*d*) Both statements are incorrect

(*v*) The pBR322 cloning vector contains the gene 'rop', which codes for

(*a*) protein involved in replication

(*b*) protein involved in transcription

(*c*) protein involved in translation

(*d*) None of these

Ans. (*i*) (*a*) (*ii*) (*d*) (*iii*) (*c*) (*iv*) (*b*) (*v*) (*a*)

12 BIOTECHNOLOGY AND ITS APPLICATIONS

Multiple Choice Questions

1. Which of the following is not the product of transgenic experiments? **[CBSE 2020]**

(*a*) Pest-resistant crop variety

(*b*) High nutritional value in grains

(*c*) Production of insulin by *r*DNA technology

(*d*) Drought-resistant crops

Ans. (*d*)

2. Nematode-specific genes were introduced into the tobacco plants using vector **[CBSE 2020]**

(*a*) pBR 322 (*b*) plasmid

(*c*) bacteriophage (*d*) *Agrobacterium*

Ans. (*d*)

3. ELISA technique is based on the principle of **[CBSE 2020]**

(*a*) DNA replication (*b*) antigen-antibody interaction

(*c*) pathogen-antigen interaction (*d*) antigen-protein interaction

Ans. (*b*)

4. Cry protein coded by the gene *cryIAb* controls **[CBSE 2020]**

(*a*) cotton bollworm (*b*) corn borer

(*c*) tobacco budworm (*d*) mosquito

Ans. (*b*)

5. *cry* genes that code for insecticidal toxins are present in **[CBSE 2020]**

(*a*) cotton bollworm (*b*) nematodes

(*c*) corn borer (*d*) *Bacillus thuringiensis*

Ans. (*d*)

6. Which among the following is based on antigen-antibody interaction?

(*a*) PCR (*b*) Electrophoresis

(*c*) ELISA (*d*) All of these.

Ans. (*c*)

7. Which among the following is not allowed to take place in the case of RNA interference employed in making tobacco plants resistant to the nematode, *Meloidegyne incognitia*?

(*a*) Transcription of *m*RNA (*b*) Translation of *m*RNA

(*c*) Replication of DNA (*d*) Maturation of *hn* RNA.

Ans. (*b*)

8. Night blindness can be prevented by use of

(*a*) golden rice (*b*) transgenic tomato

(*c*) transgenic maize (*d*) Bt brinjal.

Ans. (*a*)

9. The T_i plasmid used for producing transgenic plants is found in

(*a*) *Azotobacter* (*b*) *Rhizobium*

(*c*) *Azospirillum* (*d*) *Agrobacterium*

Ans. (*d*)

10. α-1 antitrypsin is: **[NCERT Exemplar Problems]**

(*a*) an antacid (*b*) an enzyme

(*c*) used to treat arthritis (*d*) used to treat emphysema.

Ans. (*d*)

11. C-peptide of human insulin is **[NCERT Exemplar Problems]**

(*a*) a part of mature insulin molecule.

(*b*) responsible for formation of disulphide bridges.

(*c*) removed during maturation of pro-insulin to insulin.

(*d*) responsible for its biological activity.

Ans. (*c*)

12. Match the items in Column I with those in Column II and select the correct option.

Column I	Column II
A. Rosie	1. Polio vaccine safety
B. T_i plasmid	2. Human alpha-lactalbumin
C. RNAi	3. *Agrobacterium tumefaciens*
D. ELISA	4. *Meloidegyne incognitia*
	5. Antigen-antibody interaction

(*a*) A – 2, B – 3, C – 4, D – 5 (*b*) A – 2, B – 3, C – 1, D – 5

(*c*) A – 5, B – 4, C – 3, D – 1 (*d*) A – 3, B – 4, C – 2, D – 1

Ans. (*a*)

13. Match the terms in Column I with those in Column II and select the correct option.

Column I	Column II
A. Gene therapy	1. Human insulin
B. Cotton bollworm	2. Biopiracy
C. Eli Lilly	3. Emphysema
D. α-1 antitrypsin	4. ADA deficiency
	5. Lepidopteran

(*a*) A – 3, B – 5, C – 1, D – 2 (*b*) A – 4, B – 5, C – 1, D – 3

(*c*) A – 4, B – 5, C – 3, D – 2 (*d*) A – 3, B – 4, C – 2, D – 1

Ans. (*b*)

14. Identify whether each of the following statements is true (T) or false (F) and select the correct option.

A. The disorder ADA deficiency can be cured by gene therapy only.

B. Transgenic mice are used to test the safety of polio vaccine.

C. The recombinant therapeutics induce unwanted immunological responses.

D. ELISA is based on introducing a functional gene in place of a defective gene.

(*a*) A – F, B – T, C – F, D – F (*b*) A – T, B – F, C – T, D – T

(*c*) A – F, B – F, C – T, D – F (*d*) A – T, B – F, C – F, D – F

Ans. (*a*)

15. Mark the odd one in each of the following groups and select the correct option.

A. PCR, Widal, *r*DNA technology, ELISA.

B. Tetanus taxoid, α-1 antitrypsin, Hepatitis B vaccine, Humulin.

C. *Agrobacterium*, RNA*i*, *CryIAc*, *Meloidegyne*.

D. *CryIAb*, *Cry IIAb*, *CryIAc*, RNA*i*

(*a*) A – Widal B – Humulin
C – RNA*i* D – *Cry IAb*

(*b*) A – PCR B – α-1 antitrypsin
C – RNA*i* D – *Cry IAb*

(*c*) A – Widal B – Tetanus taxoid
C – *Cry IAc* D – RNA*i*

(*d*) A – ELISA B – Humulin
C – *Meloidegyne* D – RNA*i*

Ans. (*c*)

16. Which one is the biotechnological application in order to increase food production?

(*a*) Silviculture (*b*) Apiculture

(*c*) Agro- chemical based agriculture (*d*) Tissue culture

Ans. (*c*)

17. Agrochemical based agriculture includes

(*a*) Genetically modified crops (*b*) Fertilisers and pesticides

(*c*) RNA interference (*d*) All of these

Ans. (*b*)

18. Applications of biotechnology include

(*a*) Therapeutics (*b*) Bioremediation (*c*) None of these (*d*) Both (*a*) and (*b*)

Ans. (*d*)

19. Best way to increase food production without using fertilizers and pesticides is

(*a*) Green revolution (*b*) Aeroponics

(*c*) Hydroponics (*d*) Genetically engineered technique

Ans. (*d*)

20. Green revolution has been a enormous success in terms of production but still its not preferable one because

(*a*) It has not succeeded in fulfilling the demands of humans

(*b*) Use of pesticides and fertilizers is expensive and harmful too

(*c*) Results of production were not same throughout India.

(*d*) All of these

Ans. (*d*)

21. Which one of the following is not a feature of genetic modification?

(*a*) Make crops more tolerant to cold, drought

(*b*) Reduced dependency on pesticides and fertilizers

(*c*) Helped to protect plants after cultivation

(*d*) Change the quality of food.

Ans. (*d*)

22. Bt toxin is

(*a*) Intracellular crystalline protein (*b*) Extracellular crystalline protein

(*c*) Intracellular polysaccharide (*d*) Extracellular polysaccharide

Ans. (*b*)

23. Which of the following Bt crops is being grown in India by the farmers?

(*a*) Brinjal (*b*) Maize (*c*) Cotton (*d*) Soyabean

Ans. (*c*)

24. *cryIIAb* and *cryIAc* produce toxins that control
(*a*) Cotton bollworms and corn borer respectively
(*b*) Cotton borer and cotton bollworms respectively
(*c*) Tobacco budworms and nematodes respectively
(*d*) Nematodes and tobacco budworms respectively
Ans. (*a*)

25. Which of the following risks are associated with genetically modified food?
(*a*) Allergic reactions in human beings
(*b*) Toxicity in human beings
(*c*) Antibiotic resistance in microorganisms present in alimentary canal
(*d*) All of the above
Ans. (*d*)

26. Bt toxin protein crystals present in bacterium *Bacillus thuringiensis* do not kill the bacteria themselves because
(*a*) Bacteria are resistant to the toxin
(*b*) Bacteria enclose toxins in a special sac
(*c*) Toxins occur as inactive protoxins in bacteria
(*d*) None of these
Ans. (*c*)

27. Bt toxins kill the larvae of certain insects
(*a*) By altering central dogma taking place in the cells of gut of larva
(*b*) By stopping transcription of larval cells
(*c*) By binding of activated toxin on mid gut epithelial cells, creating pores, leading to swelling and lysis
(*d*) By stopping protein synthesis
Ans. (*a*)

28. Bt toxin is harmful to insects like
(*a*) Lepidopterans (*b*) Dipterans (*c*) Coleopterans (*d*) All of the above
Ans. (*d*)

29. Which of the following Bt crops is not being grown in India by the farmers?
(*a*) Tomato (*b*) Maize (*c*) Cotton (*d*) Soyabean
Ans. (*b*)

30. The main reason for success of green revolution is
(*a*) Improved crop varieties (*b*) Use of agrochemicals
(*c*) Use of genetically modified plants (*d*) Use of herbicides
Ans. (*b*)

31. Application of GM is

(*a*) To make tailor made plants

(*b*) To reduced reliance on agrochemicals

(*c*) To reduce post harvest loss

(*d*) All of the above

Ans. (*d*)

32. Characteristics of Bt cotton are

(*a*) High yield and production of toxic protein against dipterans

(*b*) Long fibre and resistant to aphids

(*c*) Long fibre and resistant to bollworms

(*d*) High yield and resistant to bollworms

Ans. (*d*)

33. *Bacillus thuringiensis*(*Bt*) strains have been used for designing novel _____.

(*a*) bio-fertilizers

(*b*) bio-metallurgical techniques

(*c*) bio-mineralization processes

(*d*) bio-insecticidal plants

Ans. (*d*)

34. Tobacco plants resistant to a nematode have been developed by the introduction of DNA that produced (in the host cells)

(*a*) both sense and anti-sense RNA.

(*b*) a particular hormone.

(*c*) an antifeedant.

(*d*) a toxic protein.

Ans. (*a*)

35. RNA interference involves

(*a*) Synthesis of *c*DNA and RNA using reverse transcription

(*b*) Interference of RNA in reverse transcription

(*c*) Silencing of specific *m*RNA due to complementary RNA.

(*d*) Synthesis of *t*RNA from DNA

Ans. (*c*)

36. Source of complementary RNA used in RNA*i* could be

(*a*) Virus having RNA as genetic material

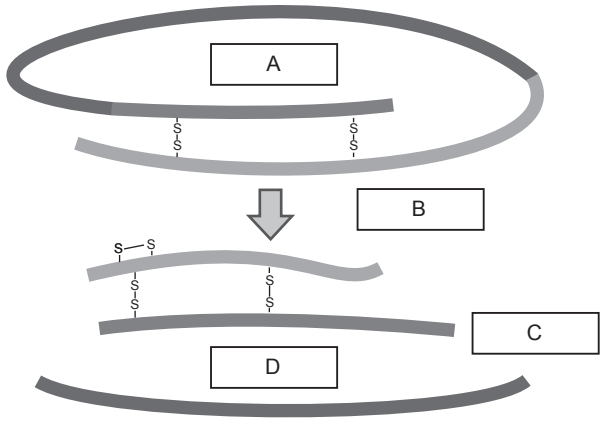
(*b*) Bacteria having RNA as genetic material

(*c*) Protozoa having RNA as genetic material

(*d*) All of the above

Ans. (*a*)

37. Which of the following is the correct set of the labels A, B, C and D in the given figure of maturation of pro-insulin into insulin?



(*a*) A – Proinsulin, B – Cell peptidase, C – Insulin, D – Free C – peptide

(*b*) A – Insulin, B – Cell peptidase, C – Free C – peptide, D – Proinsulin

(*c*) A – Insulin, B – Free C – peptide, C – Cell peptidase, D– Proinsulin

(*d*) A – Insulin, B – Proinsulin, C – Free C – peptide, D – Cell peptidase

Ans. (*a*)

38. What is the disadvantage of using porcine insulin (from pig) in diabetic patients?

(*a*) It leads hypercalcemia.

(*b*) It is expensive.

(*c*) It may cause allergic reactions.

(*d*) It can lead to mutation in human genome.

Ans. (*c*)

39. Arrange the steps involved in production of humulin in the correct sequence and select the correct option.

(A) Synthesis of gene from human insulin artificially

(B) Culturing recombinant E.coli in bioreactors

(C) Purification of humulin

(D) Insertion of human insulin gene into plasmid

(E) Introduction of recombinant plasmid into E.coli

(F) Extraction of recombinant gene product from E.coli

(*a*) B,A,D,C,E,F (*b*) A,C,E,F,B,D (*c*) A,D,E,B,F,C (*d*) C,E,B,A,F,D

Ans. (*c*)

40. The first human drug made using recombinant DNA technology was

(*a*) glyphosate (*b*) TPA

(*c*) humulin (*d*) erythropoietin

Ans. (*c*)

Assertion-Reason Questions

Directions: For question numbers 41, 42, 43 and 44, consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

41. **Assertion (A):** A patient of ADA-deficiency requires periodic or repeated infusion of genetically-engineered lymphocytes.

Reason (R): Lymphocytes are not immortal, but have life span.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

42. **Assertion (A):** A single stranded DNA or RNA labelled with a radioactive molecule, is called a probe.

Reason (R): A probe is used to detect mutations in HIV-infected cells.

Ans. (*c*) A is true but R is false.

43. **Assertion (A):** *cry* genes isolated from *Bacillus thuringiensis* are incorporated into crop plants, to make them pest-resistant.

Reason (R): *cryIAb* and *cryIIAb* provide resistance to cotton bollworms.

Ans. (*c*) A is true but R is false.

44. **Assertion (A):** RNA interference (RNA*i*) takes place in all eukaryotic organisms as a method of defence.

Reason (R): A novel strategy based on RNA*i* was adopted to prevent the infestation of tobacco plants by *Meloidegyne incognitia*.

Ans. (*b*) Both A and R are true and R is not the correct explanation of A.

Case-based Questions

45. **Read the following passage and answer the questions that follow:**

Green revolution succeeded in tripling the food supply but yet it was not enough to feed the growing human population. So, GM crops is the possible solution. GMO refer to organisms which have been genetically manipulate and can be plants, animals or even microbes. Genetically modified animals are mainly used for research purposes, while genetically modified plants are

common in today's food supply. In most of GM crops, the aim is to introduce a new *trait* to the plant which does not occur naturally in the species. Examples in food crops include resistance to certain pests, diseases, environmental conditions, reduction of spoilage, resistance to chemical treatments (e.g. resistance to a *herbicide*), or improving the nutrient profile of the crop.

(*i*) The genetically-modified (GM) brinjal in India has been developed for

(*a*) insect-resistance

(*b*) enhancing shelf life

(*c*) enhancing mineral content

(*d*) drought-resistance

(*ii*) Which of the following statement is not correct regarding the genetic modification of crops?

(*a*) It makes crops more tolerant to abiotic stresses

(*b*) It results in decreased efficiency on mineral usage by plants

(*c*) It helps to reduce post harvest losses

(*d*) It enhances the nutritional value of food

(*iii*) Read the given statements and select the correct option

Statement A– Food derived from transgenic crops are called GM foods.

Statement B– Health and food safety concerns have been raised to ensure the safety of GM foods.

(*a*) Both statements are correct

(*b*) Statement A is correct but statement B is incorrect

(*c*) Statement A is incorrect but statement B is correct

(*d*) Both statement A and B are incorrect

(*iv*) Though Green Revolution has been a resounding success in terms of agricultural production, yet it has failed in its overall social objective because

(*a*) It has not succeeded in making India totally and permanently self-sufficient in food

(*b*) Use of agrochemicals become very expensive for Indian farmers as well as these have harmful effect on environment.

(*c*) In regional terms, only Punjab and Haryana states and the eastern plains of river Ganges in West Bengal state, showed reasonably good results, but results were less impressive in other states of India.

(*d*) All of these

(*v*) Golden rice is yellow in colour due to the presence of

(*a*) Riboflavin (*b*) Beta-carotene

(*c*) Vitamin A (*d*) Vitamin D

Ans. (*i*) (*a*) (*ii*) (*b*) (*iii*) (*a*) (*iv*) (*d*) (*v*) (*b*)

46. Read the following passage and answer the questions that follow:

Transgenic plants are plants that have had their genomes modified through genetic engineering techniques either by the addition of a foreign gene or removal of a certain detrimental gene. The vector used to introduce new genes into plant cells in most often a plasmid from soil bacterium. A foreign gene inserted into a plant can be of a different species or even kingdom. The first transgenic plant was developed through the insertion of *nptII* bacterial antibiotic resistance gene into tobacco. The main purpose in the production of transgenic plants is to produce crops, which have ideal traits, quality, and high yield. Besides being beneficial to the agriculture sector, the plants are found to be able to act as the factory for pharmaceutical protein production.

(*i*) The vector used to introduce new genes into plant cells is extracted from

(*a*) *Agrobacterium tumefaciens*

(*b*) *E.coli*

(*c*) *Taenia solium*

(*d*) *Rhizobium leguminosarum*

(*ii*) *nptII* stands for

(*a*) Neomycin phosphotransferase II

(*b*) Neomycin phosphotransacetylase II

(*c*) Neomycin phosphatase II

(*d*) Neomycin phosphoterminase II

(*iii*) Which of the following agricultural challenges cannot be solved with transgenic techniques?

(*a*) Crops are damaged by frost/ drought

(*b*) Crops are damaged by insect pests

(*c*) Public concern about safety of synthetic pesticides

(*d*) Public preference for organic vegetables

(*iv*) The plasmid induces tumors in broad leaf plants such as

(*a*) Tomato, tobacco, soyabean (*b*) Tomato, potato

(*c*) Tomato, soyabean (*d*) Tomato, tobacco

(*v*) How many types of vector systems are used in eukaryotic plants?

(*a*) 1 (*b*) 2 (*c*) 3 (*d*) 4

Ans. (*i*) (*a*) (*ii*) (*a*) (*iii*) (*d*) (*iv*) (*a*) (*v*) (*c*)

47. Read the following passage and answer the questions that follow:

Insect-resistant transgenic crops were first commercialized in the mid-1990s with the introduction of GM corn (maize), potato and cotton plants expressing genes encoding the δ-endotoxin from Bacillus thuringiensis (Bt; also known as Cry proteins). The concept of using genes encoding Cry proteins was not novel as Bt formulations have been used commercially for approximately four decades to control insect pests, and in particular Lepidoptera. Early commercial varieties

of insect-resistant transgenic crops expressed single Cry proteins with specific activity against lepidopteran pests, as illustrated by Bollgard cotton expressing *cryIAc* developed by Monsanto and attribute maize expressing *cryIAb* developed by Syngenta.

(*i*) *Bacillus thuringiensis* (Bt) strains have been used for designing novel

(*a*) bio-fertilizers

(*b*) bio-metallurgical techniques

(*c*) bio-mineralization processes

(*d*) bio-insecticidal plants

(*ii*) Bt toxin gene has been introduced in plants to provide resistance to insects. Examples of such plants are

(*a*) Cotton and corn (*b*) Rice and potato

(*c*) Tomato and soyabean (*c*) All of these

(*iii*) Which of the following genes were introduced in cotton to protect it from cotton bollworms?

(*a*) *cryII Ac* and *cryI Ab* (*b*) *cryI Ac* and *cryII Ab*

(*c*) *cryII Ac* and *cryII Ab* (*d*) nif genes

(*iv*) *cryII Ab* and *cryI Ab* produce toxins that control

(*a*) cotton bollworms and corn borer respectively

(*b*) corn borer and cotton bollworms respectively

(*c*) tobacco budworms and nematodes respectively

(*d*) nematodes and tobacco budworms respectively

(*v*) Bt toxin is harmful to insects like

(*a*) lepidopterans (tobacco budworm, armyworms)

(*b*) coleopterans (beetles)

(*c*) dipterans (flies and mosquito)

(*d*) all of the above

Ans. (*i*) (*d*) (*ii*) (*d*) (*iii*) (*b*) (*iv*) (*a*) (*v*) (*d*)

48. Read the following passage and answer the questions that follow:

RNA interference is the phenomenon of inhibiting activity of a gene by synthesis of RNA molecules complementary to the *m*RNA. The normal *m*RNA of a gene is called sense because it carries the codons that are read during translation. The strand complementary to *m*RNA sense does not contain a sequence of codon that can be translated to produce a functional protein known as anti-sense RNA.

(*i*) The process of RNA*i* has been used to make tobacco plant resistant to

(*a*) *Bacillus thuringiensis* (*b*) *Meloidogyne incognita*

(*c*) Nematodes (*d*) *Rhizobium leguminosarum*

(*ii*) RNA*i* involves

(*a*) Synthesis of *c*DNA and RNA using reverse transcriptase

(*b*) Silencing of specific mRNA due to complementary RNA

(*c*) Interference of RNA in synthesis of DNA

(*d*) Synthesis of mRNA from DNA.

(*iii*) RNAi is a mechanism to silence genes with the help of

(*a*) *ss*RNA (*b*) *ss*DNA

(*c*) *ds*RNA (*d*) *ds*DNA

(*iv*) To protect plant against Meloidegyne incognitia using RNAi, nematode specific gene were introduced in plant using

(*a*) transposons (*b*) retrotransposons

(*c*) virus with RNA genome (*d*) *Agrobacterium*

(*v*) Silencing of mRNA has been used in producing transgenic plants resistant to

(*a*) bollworms (*b*) nematodes

(*c*) white rusts (*d*) bacterial blights

Ans. (*i*) (*b*) (*ii*) (*b*) (*iii*) (*c*) (*iv*) (*d*) (*v*) (*b*)

13 ORGANISM AND POPULATION

Multiple Choice Questions

1. Animals from colder climates generally have shorter limbs. This is called

(*a*) Allen's rule (*b*) Johnson's rule (*c*) Arber's rule (*d*) Niche rule

Ans. (*a*)

2. Niche is defined as

(*a*) a component of an ecosystem

(*b*) an ecologically adapted zone of a species

(*c*) the physical position and functional role of a species within the community

(*d*) all plants and animals living at the bottom of a water body.

Ans. (*c*)

3. If natality is balanced by mortality in a population at a given time, there will be a/an

(*a*) decrease in the population size (*b*) increase in the population size

(*c*) zero population growth (*d*) population explosion

Ans. (*c*)

4. Mycorrhiza is an example of

(*a*) ectoparasitism (*b*) mutualism (*c*) endoparasitism (*d*) predation

Ans. (*b*)

5. The interspecific interaction in which one partner is benefitted and the other is unaffected (neutral), is called

(*a*) amensalism (*b*) mutualism

(*c*) competition (*d*) commensalism

Ans. (*d*)

6. Individuals of one kind, *i.e.,* one species occupying a particular geographic area, at a given time form a/an

(*a*) community (*b*) biome (*c*) population (*d*) deme

Ans. (*c*)

7. The formula of exponential population growth curve, is

(*a*) $dN/dt = rN$ (*b*) $dt/dN = rN$ (*c*) $dN/rN = dt$ (*d*) $rN/dN = dt$

Ans. (*a*)

8. Niche overlap indicates

(*a*) mutualism between two species

(*b*) active cooperation between two species

(*c*) sharing of one or more resources between the two species

(*d*) two different parasites on the same host

Ans. (*c*)

9. Amensalism is an association between two species where **[NCERT Exemplar Problems]**

(*a*) one species is harmed and other is benefitted

(*b*) one species is harmed and other is unaffected

(*c*) one species is benefitted and other is unaffected

(*d*) both the species are harmed.

Ans. (*b*)

10. A population has more young individuals compared to the older individuals. What would be the status of the population after some years? **[NCERT Exemplar Problems]**

(*a*) It will decline (*b*) It will stabilise

(*c*) It will increase (*d*) It will first decline and then stabilise

Ans. (*c*)

11. Match the terms in Column I with those in Column II and select the correct option.

Column I	Column II
A. Amensalism	1. The interspecific interaction, where both are equally benefitted.
B. Parasitism	2. The interspecific interaction, where one is benefitted and one is neutral.
C. Mutualism	3. The interspecific interaction, where one is harmed and the other is neutral.
D. Commensalism	4. The interspecific interaction, where one is benefitted and one is harmed.

(*a*) A – 3, B – 4, C – 1, D – 2 (*b*) A – 4, B – 3, C – 2, D – 1

(*c*) A – 4, B – 3, C – 1, D – 2 (*d*) A – 2, B – 4, C – 1, D – 3

Ans. (*a*)

12. Match the terms in Column I with their descriptions in Column II and select the correct option.

Column I	Column II
A. Homeostasis	1. Animal which can tolerate a wide range of temperature.
B. Conformers	2. The number of births in a given population at a given time.
C. Natality	3. Per capita births in a given population.
D. Eurythermal	4. Maintenance of a relatively constant internal environment.
	5. Animals which change their body temperature according to the ambient temperature.

(*a*) A – 5, B – 4, C – 2, D – 1 (*b*) A – 4, B – 5, C – 2, D – 1

(*c*) A – 4, B – 5, C – 1, D – 2 (*d*) A – 5, B – 4, C – 2, D – 3

Ans. (*b*)

13. Identify whether each of the following statements is true (T) or false (F) and select the correct option.

A. The success of mammals is due to their ability to change their body temperature according to their surroundings.

B. Small animals like shrews and humming birds are rarely found in polar regions.

C. Organisms living in water bodies (lake, sea, river) do not face any water related problems.

D. $dN/dt = rN$ is the equation describing logistic growth.

(*a*) A – T, B – T, C – F, D – F (*b*) A – F, B – T, C – T, D – F

(*c*) A – T, B – F, C – F, D – T (*d*) A – F, B – T, C – T, D – T

Ans. (*a*)

14. Mark the odd one in each of the following groups and select the correct option.

A. Aestivation, Migration, Hibernation, Diapause.

B. Parasitism, Predation, Commensalism, Amensalism.

C. Ticks, Lice, Copepods, Tapeworm.

D. Pathogens, Competitors, Temperature, Predators.

(*a*) A – Diapause B – Predation
C – Ticks D – Competitors

(*b*) A – Migration B – Amensalism
C – Copepods D – Predators

(*c*) A – Aestivation B – Parasitism
C – Lice D – Pathogens
(*d*) A – Migration B – Amensalism
C – Tapeworm D – Temperature

Ans. (*d*)

15. Arrange the following in particular sequence:
Macromolecules, individual, tissue, biome, population, cell
(*a*) Macromolecules, individual, tissue, biome, population, cell
(*b*) Population, cell, macromolecules, individual, tissue, biome
(*c*) Macromolecules, cell, tissue, individual, population, biome
(*d*) Cell, tissue, macromolecules, individual, population, biome

Ans. (*c*)

16. Choose the correct option in regarding 4 levels of biological organisation.
(*a*) Individual, tissue, population, cell
(*b*) Individual, population, biome, cell
(*c*) Individual, population, biome, community
(*d*) Cell, tissue, organism, population

Ans. (*c*)

17. Branch of biology which studies the interactions among organisms and between organisms and physical environment is called as
(*a*) Etiology (*b*) Ethology
(*c*) Ecology (*d*) Epidemiology

Ans. (*c*)

18. The main factor responsible for annual variation in intensity and duration of temperature is
(*a*) Rotation of planet around sun
(*b*) Tilted on its axis
(*c*) Both (*a*) and (*b*)
(*d*) None of the above

Ans. (*c*)

19. Environmental factors responsible for formation of major biomes are:
(*a*) Temperature (*b*) Precipitation
(*c*) Soil texture (*d*) Both (*a*) and (*b*)

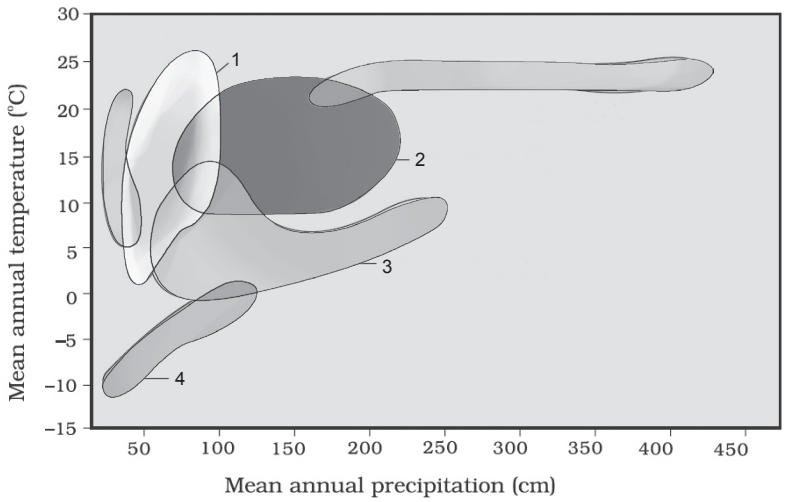
Ans. (*d*)

20. Characteristics of a terrestrial biomes are strongly influenced by its

(*a*) Climate (*b*) Flora (*c*) Fauna (*d*) All of the above

Ans. (*d*)

21. Identify the biome represented as 1,2,3 and 4 in following figure:



(*a*) 1- Grassland, 2- Temperate forest, 3- Coniferous forest, 4- arctic and alpine tundra

(*b*) 4- Grassland, 2- Temperate forest, 1- Coniferous forest, 3- arctic and alpine tundra

(*c*) 1- Grassland, 3- Temperate forest, 4- Coniferous forest, 2- arctic and alpine tundra

(*d*) 4- Grassland, 2- Temperate forest, 3- Coniferous forest, 1- arctic and alpine tundra

Ans. (*a*)

22. The key elements that determine differences in environmental conditions of different habitats include

(*a*) Temperature (*b*) Sunlight (*c*) Soil (*d*) All of the above

Ans. (*d*)

23. Choose the correct pair of extreme and harsh habitats

(*a*) Tundra, desert

(*b*) Rain soaked Meghalaya forest, permafrost polar regions

(*c*) High mountain tops, grasslands

(*d*) Stinking compost pits, desert

Ans. (*b*)

24. Region of human body unique for growth of microbes is

(*a*) Stomach (*b*) Oesophagus (*c*) Intestine (*d*) Mouth

Ans. (*b*)

25. What are the key elements that lead to so much variations in the physical and chemical conditions of different habitats?

(*a*) Temperature and water

(*b*) Light and soil

(*c*) Only temperature

(*d*) Temperature, water, light and soil

Ans. (*d*)

26. Read the following statements and answer the question.

(*i*) Temperature progressively decreases from pole to equator.

(*ii*) Our intestine is a unique habitat for hundreds of species of microbes.

(*iii*) Average temperature exceeds 100°C in thermal springs and hydrothermal vents.

(*iv*) In polar areas and high altitudes temperature goes to 70°C.

(*v*) Temperature goes to > 50°C in tropical desert in summer.

How many of the above statements are incorrect?

(*a*) (*i*), (*ii*), (*iii*)

(*b*) (*i*), (*iv*)

(*c*) (*ii*), (*iv*), (*v*)

(*d*) (iii), (iv)

Ans. (*b*)

27. Study the following statements and answer the question.

(*i*) Mango trees cannot grow in temperate countries like Canada and Germany.

(*ii*) Tuna fish are rarely caught beyond tropical latitude in the ocean.

(*iii*) Snow Leopards are not found in Kerala.

Which of the following factor is responsible for the above statements?

(*a*) Light

(*b*) Water

(*c*) Temperature

(*d*) Soil

Ans. (*c*)

28. Temperature is considered as the most ecologically relevant environmental factor because it affects …… of organism.

(*a*) Physiology

(*b*) Morphology

(*c*) Geographical distribution

(*d*) All of these

Ans. (*d*)

29. A few organisms can tolerate and thrive a wide range of temperature. Such animals are called

(*a*) stenothermal

(*b*) eurythermal

(*c*) thermophilic

(*d*) ectothermal

Ans. (*b*)

30. Water is the second most important factor influencing life of organisms because

(*a*) It makes maximum part of organism's body

(*b*) Life originated on earth

(*c*) Productivity of plants depends on water.

(*d*) Both (*a*) and (*c*)

Ans. (*d*)

31. Water bodies A, B and C are observed. A contains 4 parts per thousand salinity, B contains 30 parts per thousand salinity and C contains 105 parts per thousand salinity. So, choose the correct statement.

(*a*) A is lagoon (*b*) B is sea

(*c*) C is inland water source (*d*) All are correct

Ans. (*b*)

32. Organisms that are restricted to a narrow range of salinity, are called

(*a*) ectohaline (*b*) osmoconformer

(*c*) euryhaline (*d*) Stenohaline

Ans. (*d*)

33. The salinity in sea water in parts per thousand (ppt) ranges between

(*a*) 5-15% (*b*) 30-35%

(*c*) 50-75% (*d*) more than 100%

Ans. (*b*)

34. Many animals use the diurnal and seasonal variations in light intensity and photoperiod to time their

(*a*) Migration (*b*) Reproductive activities

(*c*) Suspension (*d*) All of these

Ans. (*d*)

35. Which algae is found in deep sea?

(*a*) Green (*b*) Brown (*c*) Red (*d*) All of these

Ans. (*a*)

36. Nature and properties of soil depends on

(*a*) Climate (*b*) Weathering process

(*c*) Development of soil (*d*) All of the above

Ans. (*d*)

37. Percolation rate and water holding capacity of soil depends upon

(*a*) Chemical composition of soil (*b*) Particle size of soil

(*c*) Aggregation of soil particle (*d*) All of these

Ans. (*d*)

38. Which factors determine the vegetation in a particular area?

(*a*) pH (*b*) Mineral composition

(*c*) Both (*a*) and (*b*) (*d*) None of these

Ans. (*c*)

39. The benthic organisms

(*a*) live near the sea bottom (*b*) found in open water

(*c*) always live at the depth of 50-100 m (*d*) live outside water

Ans. (*a*)

Assertion-Reason Questions

Directions: For question numbers 40, 41, 42 and 43, consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

40. **Assertion:** Verhulst Pearl logistic growth model is considered a more realistic one.

Reason: Any population growing exponentially under unlimited resource conditions, can reach enormous population densities in a very short period.

Ans. (*b*) Both A and R are true and R is not the correct explanation of A.

41. **Assertion:** Weeds like *Calotropis* flourish in abandoned fields.

Reason: *Calotropis* produces highly poisonous cardiac glycosides.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

42. **Assertion:** In summer, when the outside temperature is more than our body temperature, we sweat profusely.

Reason: In winter, when the outside temperature is very low, we start shivering.

Ans. (*b*) Both A and R are true and R is not the correct explanation of A.

43. **Assertion:** No two species can occupy the same niche.

Reason: Every organism has an invariably defined range of conditions that it can tolerate, the diverse resources it can utilise and a distinct functional role in the ecological system.

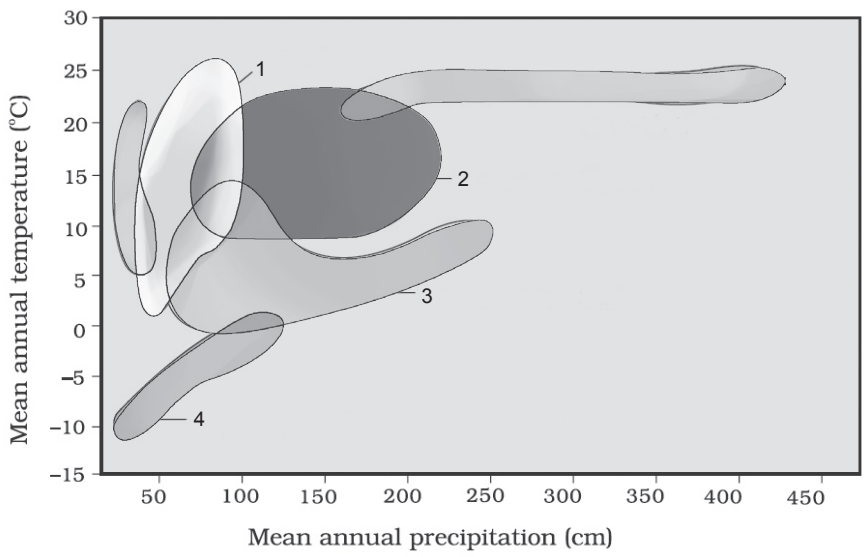
Ans. (*a*) Both A and R are true and R is the correct explanation of A.

Case-based Questions

44. Read the following passage and answer the questions that follow:

Ecology at the organismic level is essentially physiological ecology which tries to understand how different organisms are adapted to their environment in terms of not only survival but also reproduction. Seasonal variation together with annual variation in precipitation account for formation of major biomes. On Earth, life exists in a few favorable habitats as well as extreme habitats. The most important key elements that lead to variation in the physical and chemical conditions of different habitat are temperature, water, light and soil.

(*i*)



	Grassland	Temperate forest	Coniferous forest	Arctic and Alpine tundra
(*a*)	2	1	3	4
(*b*)	1	2	3	4
(*c*)	2	1	4	3
(*d*)	1	2	4	3

(*ii*) Different biomes are formed due to annual variation in

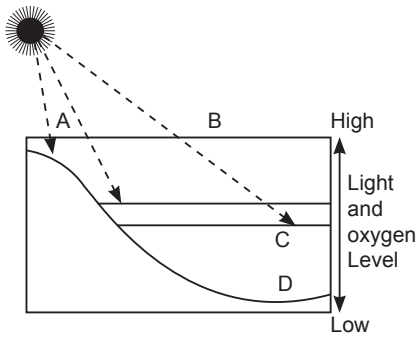
(*a*) Temperature, Precipitation, Incident solar radiation

(*b*) Abiotic and biotic factors

(*c*) Temperature

(*d*) All of these

(*iii*) Identify



	A	B	C	D
(*a*)	Limnetic zone	Littoral zone	Benthic zone	Profundal zone
(*b*)	Littoral zone	Limnetic zone	Profundal zone	Benthic zone
(*c*)	Littoral zone	Euphotic zone	Disphotic zone	Benthic zone
(*d*)	Limnetic zone	Littoral zone	Disphotic zone	Benthic zone

(*iv*) Organisms that can tolerate a wide range of temperature and saline are _____ and _____ respectively.

(*a*) Eurythermal, Euryhaline (*b*) Euryhaline, Eurythermal

(*c*) Stenothermal, Stenohaline (*d*) Stenohaline, Stenothermal

(*v*) Desert, tundra, rainforest etc. are examples of

(*a*) Ecosystem (*b*) biome

(*c*) Niche (*d*) Community

Ans. (*i*) (*b*) (*ii*) (*a*) (*iii*) (*b*) (*iv*) (*a*) (*v*) (*b*)

45. Read the following passage and answer the questions that follow:

Many methods to cope up with the stressful conditions are regulate, conform, migrate and suspend. Some animals are able to maintain a constant body temperature and osmotic concentration despite changes in external environment. Maximum animals and all plants can't maintain internal temperature and osmotic concentration comes under the category of conformers. Some organism migrate temporarily from unfavorable habitat to favorable area. Some organism undergo avoid unfavorable conditions by hibernation, suspension and diapause.

(*i*) 99% of animals cope up with the stressful external conditions by

(*a*) Regulators (*b*) Conformers

(*c*) Suspend (*d*) Diapause

(*ii*) Birds and mammals comes under which category

(*a*) Conformers (*b*) Regulators

(*c*) Suspension (*d*) Hibernation

(*iii*) Which of the following statement is incorrect?

(*a*) Most of the animals and all plants are unable to maintain temperature.

(*b*) Osmoconformers are able to maintain temperature and osmotic conditions.

(*c*) Birds and mammals can maintain internal temperature and osmotic concentration.

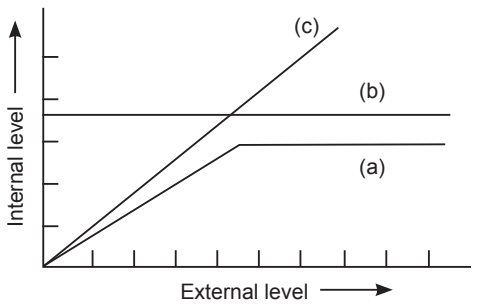
(*d*) Snails and fish underdo aestivation to cope up with the environment.

(*iv*) The process under which organism changes location to escape from harsh environment, is called

(*a*) Migration (*b*) Hibernation

(*c*) Suspension (*d*) Aestivation

(*v*)



	A	B	C
(*a*)	Partial regulators	Regulators	Conformers
(*b*)	Hibernation	Regulators	Conformers
(*c*)	Aestivation	Regulators	Conformers
(*d*)	Hibernation	Conformers	Regulators

Ans. (*i*) (*b*) (*ii*) (*b*) (*iii*) (*b*) (*iv*) (*a*) (*v*) (*a*)

46. Read the following passage and answer the questions that follow:

Adaptation is any attribute of the organism that enables the organism to survive and reproduce in its habitat. Plants undergoes different adaptations depending upon the condition. For example plants adapted to bright sunlight, plants show adaptation to dry habitats and high temperature conditions. Many desert plants have thick cuticle on leaf surface to decrease the rate of transpiration. Animals also undergo adaptations. Adaptations can be temporary/ short term or permanent/ long term. For example – camouflage, mimicry. Animals found in desert show different type of adaptations – reducing water loss and ability to tolerate arid conditions like kangaroo rat.

(*i*) If an organism's body pattern resembles its environment making it difficult to spot, is called

(*a*) Mimicry (*b*) Camouflage

(*c*) Warning coloration (*d*) Both (*a*) and (*b*)

(*ii*) Plants which grow in partial shade / low intensity light are called

(*a*) Heliophytes (*b*) Sciophytes

(*c*) Xerophytes (*d*) Ephermerals

(*iii*) Plants able to tolerate high concentration of salts

(a) Halophytes (*b*) Hydrophytes

(c) Sciophytes (*iv*) Heliophytes

(*iv*) 90% of water requirement of kangaroo rat is fulfilled by

(*a*) metabolic waste (*b*) food

(*c*) drinking water (*d*) both 1 and 2

(*v*) **Assertion:** Stomata generally open in light and close in dark.

Reason: Transpiration affects by stomata opening and closing.

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

Ans. (*i*) (*b*) (*ii*) (*b*) (*iii*) (*a*) (*iv*) (*a*)

(*v*) (*b*) Both A and R are true and R is not the correct explanation of A.

47. Read the following passage and answer the questions that follow:

Age structure of a population can be depicted in the form of a pyramid. It is affected by natality and mortality. There are three major functional age groups in any population: pre reproductive, reproductive and post reproductive. If the percent individuals of a given age groups is plotted for the population, the resulting structure is called an age pyramid.

(*i*) Total number of individuals per unit area per unit time is

(*a*) Population density (*b*) Population size

(*c*) Population dynamics (*d*) Demography

(*ii*) A population with large proportion of older individuals than younger ones will likely to

(*a*) Grow larger first than decline

(*b*) Continue to grow indefinitely

(*c*) Decline

(*d*) None of these

(*iii*) An triangular shaped pyramid represents

(*a*) stationary population

(*b*) rapidly growing population

(*c*) declining population

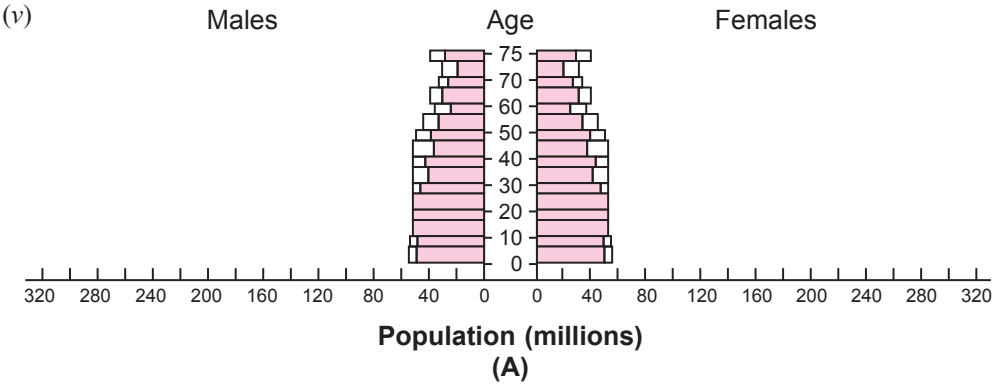
(*d*) None of these

(*iv*) Shape of age pyramid in which pre reproductive individuals are equal to post reproductive individuals

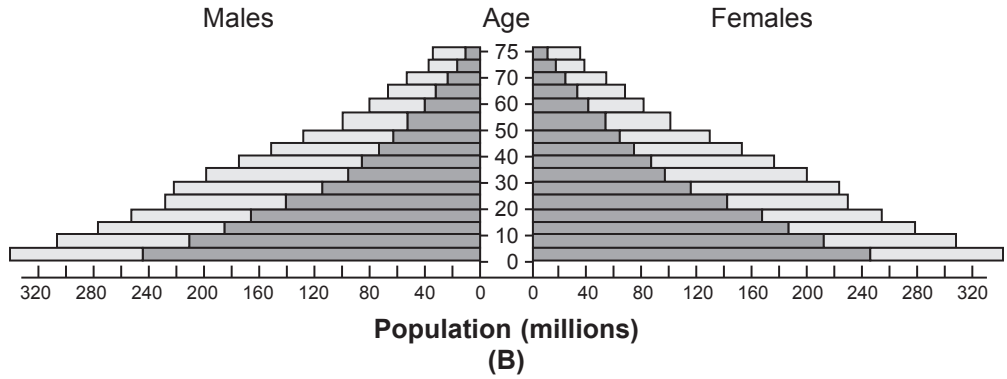
(*a*) Triangular (*b*) Urn shaped

(*c*) Bell shaped (*d*) None of these

(*v*)



(A)



(B)

Which of the following is correct regarding age sex pyramid A and B?

(*a*) A represents age sex pyramid of developed country.

(*b*) B represents age sex pyramid of developing country.

(*c*) A represents rapidly growing population and B represents opposite to it.

(*d*) Both (*a*) and (*b*)

Ans. (*i*) (*a*) (*ii*) (*c*) (*iii*) (*b*) (*iv*) (*b*) (*v*) (*d*)

15 BIODIVERSITY AND CONSERVATION

Multiple Choice Questions

1. Species-Area relationship is represented on a log scale as **[CBSE 2020]**

(*a*) hyperbola (*b*) rectangular hyperbola

(*c*) linear (*d*) inverted

Ans. (*c*)

2. One of the *ex situ* conservation methods for endangered species, is **[CBSE 2020]**

(*a*) biosphere reserves (*b*) national parks

(*c*) cryopreservation (*d*) wildlife sanctuaries

Ans. (*c*)

3. It is observed that the species diversity decreases as we move **[CBSE 2020]**

(*a*) away from the equator to poles (*b*) towards equator from poles

(*c*) along the equator (*d*) from deserts to rain forests

Ans. (*a*)

4. $\log S = \log C + Z \log A$

In the given equation of species–area relationship, the value of regression coefficient for a whole continent, would be

(*a*) 0.1 – 0.2 (*b*) 0.5 – 0.7 (*c*) 0.6 – 1.2 (*d*) 0.3 – 0.5

Ans. (*c*)

5. Which of the following organisation is responsible for maintaining the Red Data Book?

(*a*) IDRI (*b*) IUCN (*c*) UNESCO (*d*) USDA

Ans. (*b*)

6. From his long term ecosystem experiments, David Tilman showed that

(*a*) decreased diversity contributed to higher productivity

(*b*) decreased diversity contributed to decreased productivity

(*c*) increased diversity contributed to increased productivity

(*d*) increased diversity contributed to decreased productivity

Ans. (*c*)

7. Which of the following is a hotspot of biodiversity in India?

(*a*) Western Ghats (*b*) Indo-gangetic plain (*c*) Eastern Ghats (*d*) Aravalli Hills

Ans. (*a*)

8. Which among the following is not a method of *in-situ* conservation?

(*a*) National Park (*b*) Botanical garden (*c*) Wildlife sanctuary (*d*) Ramsar sites

Ans. (*b*)

9. The World Summit on Sustainable Development (2002) was held in

(*a*) Brazil (*b*) South Africa

(*c*) Sweden (*d*) Argentina

Ans. (*b*)

10. The most important cause of extinction of animals and plants, especially in tropical rain forests is

(*a*) habitat loss (*b*) afforestation (*c*) pollution (*d*) soil erosion

Ans. (*a*)

11. The enormous number of varieties of mango in India represents

(*a*) genetic diversity (*b*) species diversity

(*c*) ecological diversity (*d*) hybridisation programmes

Ans. (*a*)

12. Which one of the following is not a major characteristic feature of biodiversity hotspots?

[NCERT Exemplar Problems]

(*a*) Large number of species (*b*) Abundance of endemic species

(*c*) Large number of exotic species (*d*) Destruction of habitat

Ans. (*d*)

13. Which of the following is not a cause for loss of biodiversity?

[NCERT Exemplar Problems]

(*a*) Destruction of habitat (*b*) Invasion by alien species

(*c*) Keeping animals in zoological parks (*d*) Over-exploitation of natural resources

Ans. (*c*)

14. Match the items in Column I with those in Column II and select the correct option.

Column I	Column II
A. Cryopreservation	1. Hotspot
B. Endemism	2. *In situ* conservation
C. Plant-pollinator mutualists	3. *Ex situ* conservation
D. Wildlife sanctuary	4. Coevolution
	5. Alien species

(*a*) A – 3, B – 1, C – 4, D – 2 (*b*) A – 5, B – 4, C – 3, D – 2

(*c*) A – 5, B – 4, C – 2, D – 1 (*d*) A – 4, B – 5, C – 3, D – 2

Ans. (*a*)

15. Match the items in Column I with those in Column II and select the correct option.

Column I	Column II
A. Narrowly utilitarian	1. Passenger pigeon
B. Broadly utilitarian	2. Tannins, Resins of plants
C. The Earth Summit	3. Pollination of plants
D. Over-exploitation	4. Rio de Janeiro, in 1992
	5. Ethical Arguments

(*a*) A – 3, B – 2, C – 5, D – 2 (*b*) A – 2, B – 3, C – 5, D – 1

(*c*) A – 2, B – 3, C – 4, D – 1 (*d*) A – 3, B – 2, C – 4, D – 1

Ans. (*c*)

16. Identify whether each of the following statements is true (T) or false (F) and select the correct option:

A. Stellar's sea cow is an extinct animal.

B. India is one of the mega diversity countries of the world.

C. 20 per cent of the total oxygen in the earth's atmosphere is produced by temperate forests like Amazon forest.

D. Endemic species are those which are distributed in almost all parts on the globe.

(*a*) A – F, B – T, C – T, D – F (*b*) A – T, B – T, C – F, D – F

(*c*) A – F, B – T, C – F, D – T (*d*) A – T, B – T, C – T, D – F

Ans. (*d*)

17. Mark the odd one in each of the following groups and select the correct option.

A. *Parthenium*, *Mangifera*, *Lantana Eichhornia*

B. Bali, Javan, Caspian, Dodo

C. Seed banks, Tissue culture, Sacred groves, Cryopreservation

D. Aravalli Hills, Chanda and Bastar, Khasi Hills, Zoological park

(*a*) A – *Mangifera* B – Dodo
C – Seed banks D – Zoological park

(*b*) A – *Mangifera* B – Dodo
C – Sacred grove D – Zoological park

(*c*) A – *Lantana* B – Bali
C – Seed banks D – Khasi Hills

(*d*) A – *Parthenium* B – Bali
C – Tissue culture D – Aravali Hills

Ans. (*b*)

18. No. of species of ants present on earth

(*a*) 20000 (*b*) 25000 (*c*) 15000 (*d*) 23000

Ans. (*a*)

19. Biodiversity is important for biosphere as

(*a*) Maintain ecological balance (*b*) Preserve climate and environment

(*c*) Prevent erosion and help in pollination (*d*) All of these

Ans. (*d*)

20. Humans benefitted from the ecosystem as

(*a*) Ecological life support (*b*) Supply oxygen, clean air

(*c*) Pollination of plants (*d*) All of these

Ans. (*d*)

21. The term biodiversity is popularised by

(*a*) Edward Wilson (*b*) Odum

(*c*) Herbert Spencer (*d*) Arthur Tansley

Ans. (*a*)

22. Immense diversity exist at

(*a*) Species level (*b*) Genetic level

(*c*) Ecological diversity (*d*) All of these

Ans. (*d*)

23. Genetic variation affect the production of *Rauwolfia vomitoria* in Himachal region. What kind of diversity does it indicate?

(*a*) Species diversity (*b*) Genetic diversity

(*c*) Ecological diversity (*d*) No diversity

Ans. (*b*)

24. In India, we found different types of rice like basmati, mogra, jasmine etc. What kind of diversity does it represent?

(*a*) Species diversity (*b*) Genetic diversity

(*c*) Ecological diversity (*d*) Mutation

Ans. (*b*)

25. What kind of diversity is represented by amphibian species found in western ghats?

(*a*) Ecological diversity (*b*) Species diversity

(*c*) Genetic diversity (*d*) None of these

Ans. (*b*)

26. India represents more ecosystem diversity than Norway. The type of diversity represented by India is

(*a*) Species diversity (*b*) Genetic diversity

(*c*) Ecological diversity (*d*) None of these

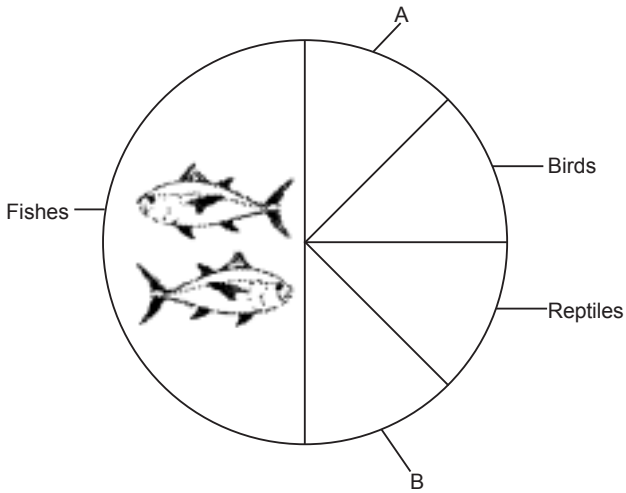
Ans. (*c*)

27. What is the total number of species present on earth as estimated by Robert May?

(*a*) 3 million (*b*) 5 million (*c*) 7 million (*d*) 9 million

Ans. (*c*)

28. Given pie chart represents the proportionate number of classes of vertebrates. Identify the class A and B.

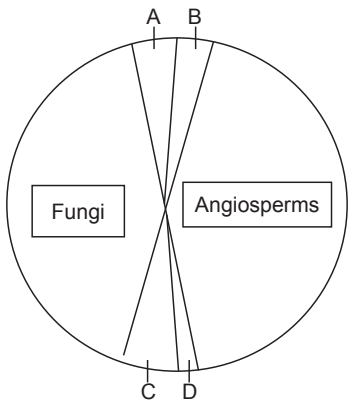


(*a*) A- Mammals , B- Amphibians (*b*) A- Amphibians , B- Mammals

(*c*) A- Aves, B- Osteichthyes (*d*) A- Vertebrates , B- Amphibians

Ans. (*a*)

29. Given pie chart represents the proportionate number of classes of vertebrates. Identify the class A, B, C and D.



(*a*) A- Mosses, B- Ferns, C- Algae, D- Lichens

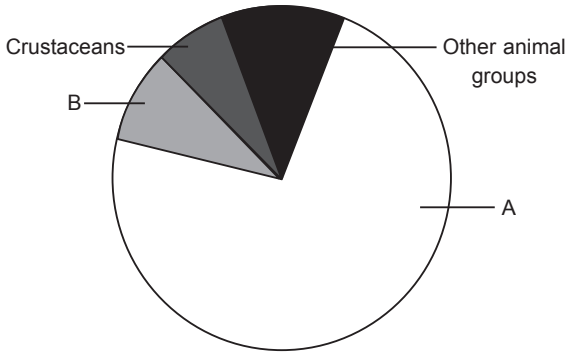
(*b*) A- Ferns, B- Algae, C- Mosses, D- Lichens

(*c*) A- Ferns, B- Mosses, C- Lichens, D- Algae

(*d*) A- Mosses, B- Algae, C- Ferns, D- Lichens

Ans. (*a*)

30. Identify A and B.



(*a*) A- Insects, B- Molluscs
(*b*) A- Molluscs, B- Insects
(*c*) A- Annelids, B- Arthropoda
(*d*) A- Insects, B- Arthropoda

Ans. (*a*)

31. Which group of organisms can not be estimated?

(*a*) Prokaryotes
(*b*) Eukaryotes
(*c*) Multicellular
(*d*) Unicellular

Ans. (*a*)

32. Species diversity is maximum at

(*a*) Polar region
(*b*) Tropical region
(*c*) Temperate region
(*d*) Equator

Ans. (*d*)

33. Which one is maximum species of birds?

(*a*) Colombia
(*b*) New York
(*c*) Greenland
(*d*) North pole

Ans. (*a*)

34. Which of the following has the greatest biodiversity on Earth?

(*a*) Horn of Africa
(*b*) Amazonian rainforest
(*c*) Temperate forest
(*d*) Mountain of south- west China

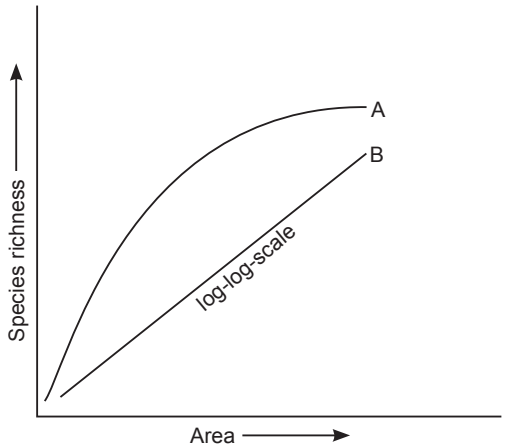
Ans. (*b*)

35. Which favor species diversification

(*a*) Undisturbed places for million of years
(*b*) Less seasonal variations
(*c*) Predictable environment
(*d*) All of these

Ans. (*d*)

36. Identify A and B:



(*a*) (A) Log S = Log C + Z Log A, (B) $S = CA^Z$

(*b*) (A) $S = CA^Z$, (B) Log S = Log C + Z Log A

(*c*) (A) $S = CA^2$, (B) Log S = Log C + Z Log A

(*d*) (A) Log S = Log C + Z Log A, (B) $S = CA^2$

Ans. (*b*)

37. Who observed that within a region, species richness increased with increasing explored area?

(*a*) Alexander von Humboldt (*b*) David Tilman

(*c*) Paul Ehrlich (*d*) Edward Wilson

Ans. (*a*)

38. Graph draw between species richness and explored area for a wide variety of taxa is

(*a*) Hyperbola (*b*) Parabola (*c*) Straight line (*d*) Both (*a*) and (*b*)

Ans. (*a*)

39. In equation Log S = Log C + Z Log A, S and Z represents

(*a*) S represents species richness and Z represents regression coefficient

(*b*) Z represents species richness and S represents regression coefficient

(*c*) S represents diversity and Z represents intercept

(*d*) None of these

Ans. (*a*)

40. Stable community

(*a*) Should not show much variations

(*b*) Should be resilient to disturbances

(*c*) Should be resistant to invasion by alien species

(*d*) All of these

Ans. (*d*)

Assertion-Reason Questions

Directions: For question numbers 41, 42, 43 and 44, consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

41. **Assertion (A):** The tropical regions have a greater biological diversity.

Reason (R): The tropical regions have remained relatively undisturbed in their environmental conditions and got a long evolutionary time for species diversification.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

42. **Assertion (A):** Western Ghats in India have been declared as biodiversity hotspots.

Reason (R): Western Ghats have high levels of species richness and high degree of endemism.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

43. **Assertion (A):** India has a greater ecosystem biodiversity than a Scandinavian country like Norway.

Reason (R): India has much of its land area in the tropical lattitudes.

Ans. (*a*) Both A and R are true and R is the correct explanation of A.

44. **Assertion (A):** More than 70 percent of all species recorded are animals and plants comprise only about 22 percent.

Reason (R): Among animals, insects are the most species-rich taxonomic group, constituting about 70 per cent of the total animals.

Ans. (*b*) Both A and R are true and R is not the correct explanation of A.

Case-based Questions

45. **Read the following passage and answer the questions that follow:**

Walter G. Rosen coined the term biodiversity but it was popularized by Edward Wilson. Edward Wilson described diversity at all levels of biological organization ranging from biomolecules to biomes. It is of three unrelated hierarchical levels- genetic diversity, species diversity and ecological diversity where ecological diversity is further divided into alpha, beta and gamma diversity. Genetic diversity refers to the high diversity of a species at the genetic level over its distributional range. Species diversity is variety in number and richness of a species of a region.

(*i*) Species diversity within a community/habitat is

(*a*) alpha diversity (*b*) beta diversity

(*c*) gamma diversity (*d*) genetic diversity

(*ii*) 50000 genetically different strains of rice represents

(*a*) species diversity

(*b*) genetic diversity

(*c*) ecological diversity

(*d*) beta diversity

(*iii*) India has only ……..% of the world's land area, however it shares ……% of global diversity.

(*a*) 2.4%, 8.1% (*b*) 3.4%, 8.1%

(*c*) 2.8%, 8.1% (*d*) 3.8%, 8.1%

(*iv*) Which of the following statement regarding the estimates of number of species found on earth is not correct?

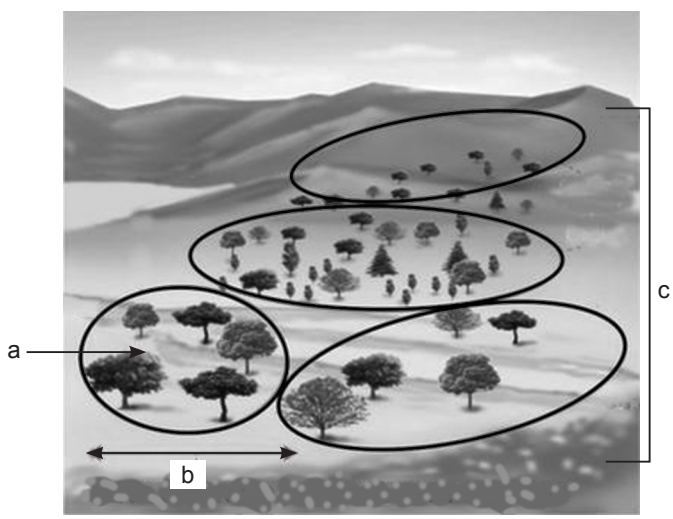
(*a*) According to Robert May, global species diversity is 7 million.

(*b*) Plants constitutes > 70% of species recorded, whereas animals constitutes not more than 22% of the total.

(*c*) Insects constitutes > 70% of all the animal species.

(*d*) None of these

(*v*)



Identify *a*, *b* and *c*

(*a*) *a*-alpha diversity, *b*-beta diversity, *c*-gamma diversity

(*b*) *a*-gamma diversity, *b*-beta diversity, *c*-alpha diversity

(*c*) *a*-alpha diversity, *b*-gamma diversity, *c*-beta diversity

(*d*) *a*-gamma diversity, *b*-alpha diversity, *c*-beta diversity

Ans. (*i*) (*a*) (*ii*) (*b*) (*iii*) (*a*) (*iv*) (*d*) (*v*) (*a*)

46. Read the following passage and answer the questions that follow:

Patterns of biodiversity are latitudinal gradients, species area relationship and importance of species diversity to ecosystem. The diversity of plants and animals is not uniform throughout the world but shows rather uneven distribution. e.g. a forest in tropical region has up to 10 times as many species of vascular plants as a forest of equal area in a temperate region like Midwest of USA. Alexander Von Humboldt proposed that species richness increases with increasing area, but up to a certain limit. The maintenance of biodiversity is important because of ecological stability, productivity and ecosystem health.

(*i*) Rivet popper hypothesis was given by

(*a*) Alexander Von Humboldt (*b*) Robert May

(*c*) Edward Wilson (*d*) Paul Ehrlich

(*ii*) Which of the following has the greatest biodiversity on earth?

(*a*) Tropical Amazonian Rainforest

(*b*) Temperate Amazonian Rainforest

(*c*) Montane subtropical forest

(*d*) Alpine forest

(*iii*) _____ proposed that species richness increases with increasing area.

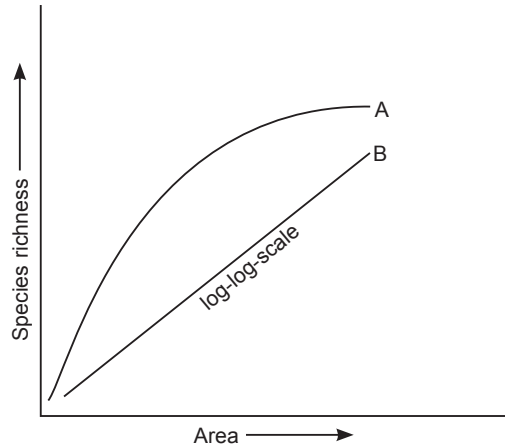
(*a*) Alexander Von Humboldt (*b*) Robert May

(*c*) Edward Wilson (*d*) Paul Ehrlich

(*iv*) Tropics 23.5° N to 23.5° S have …….. species as compared to temperate species.

(*a*) less (*b*) more (*c*) equal (*d*) None of these

(*v*) Identify A and B.



(*a*) (A) $S = CA^Z$, (B) Log S = Log C + Z Log A

(*b*) (A) $S = CA^2$, (B) Log S = Log C + Z Log A

(*c*) (A) $S = CA^Z$, (B) Log S = Log A + Z Log C

(*d*) (A) $S = CA^Z$, (B) Log S = Log C – Z Log A

Ans. (*i*) (*d*) (*ii*) (*a*) (*iii*) (*a*) (*iv*) (*b*) (*v*) (*a*)

47. Read the following passage and answer the questions that follow:

The IUCN maintains a Red Data Book which is a catalogue of taxa facing risk of extinction. IUCN Red List (2004) documents the extinction of 784 species (including 338 vertebrates, 359 invertebrates and 87 plants) in the last 500 years. Some examples of recent extinctions include dodo, quagga, thylacine, steller's sea cow and three subspecies of tiger. The last year alone have witnessed the disappearance of 27 species. Adding to the grim scenario of extinctions is the fact that more than 15500 species world-wide are facing the threat of extinction. Extinctions can be natural, mass and anthropogenic.

(*i*) How many species are documented to be extinct in last 500 years by IUCN Red List, 2004?

(*a*) 338 vertebrates, 359 invertebrates, 87 plants

(*b*) 359 vertebrates, 338 invertebrates, 87 plants

(*c*) 339 vertebrates, 369 invertebrates, 85 plants

(*d*) 369 vertebrates, 339 invertebrates, 85 plants

(*ii*) Bali, Javan and Caspian are the subspecies of

(*a*) Cheetah (*b*) Tiger

(*c*) Lion (*d*) Cat

(*iii*) According to IUCN, some of the extinctions include

I. Dodo II. Thylacine

III. Caspian IV. Steller's sea cow

(*a*) I, II, III (*b*) II, III, IV

(*c*) I, II, III, IV (*d*) I, III, IV

(*iv*) K-T boundary extinction means

(*a*) Mass extinction (*b*) Anthropogenic extinction

(*c*) Natural extinction (*d*) Background extinction

(*v*) Identify the figure

(*a*) Mass extinction (*b*) Anthropogenic extinction

(*c*) Background extinction (*d*) Natural extinction

Ans. (*i*) (*a*) (*ii*) (*b*) (*iii*) (*c*) (*iv*) (*a*) (*v*) (*a*)

48. Read the following passage and answer the questions that follow:

The increased rates of species extinction that the world is facing are largely due to human activities. There are four major causes (The Evil Quartet). They are habitat loss and fragmentation, over exploitation, alien species invasion and co- extinctions.

(*i*) Lion-tailed macaque is the example of

(*a*) Endangered species

(*b*) Critically endangered species

(*c*) Vulnerable species

(*d*) Extinct

(*ii*) Dodo, Pygmy hog and Clouded leopard are the examples of

(*a*) Dodo – Extinct, Pygmy hog – Critically endangered, Clouded leopard – Vulnerable

(*b*) Dodo – Endangered, Pygmy hog – Critically endangered, Clouded leopard – Lower risk

(*c*) Dodo – Extinct, Pygmy hog – Endangered, Clouded leopard – Non-vulnerable

(*d*) Dodo – Extinct, Pygmy hog – Endangered, Clouded leopard – Vulnerable

(*iii*) Dodo, Passenger pigeon and Steller's Sea Cow have become extinct due to

(*a*) Habitat loss and fragmentation

(*b*) Co-extinction

(*c*) Over-exploitation

(*d*) Alien species invasion

(*iv*) Most important cause of extinction is

(*a*) Habitat loss and fragmentation

(*b*) Over exploitation

(*c*) Alien species invasion

(*d*) Co-extinction

(*v*) **Assertion (A):** Over- exploitation of a species reduces the size of its population eventually leading to its extinction.

Reason (R): Steller's Sea Cow have become extinct in the last 500 years due to over exploitation by humans.

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

Ans. (*i*) (*a*) (*ii*) (*a*) (*iii*) (*c*) (*iv*) (*a*)

(*v*) (*b*) Both A and R are true and R is not the correct explanation of A.

Part-II

[Practice Papers]

1 | PRACTICE PAPER

[Time Allowed: 90 Minutes] [Maximum Marks: 35]

General Instructions:

(*a*) The Question Paper contains three sections.
(*b*) **Section A** has **24** questions. Attempt any **20** questions.
(*c*) **Section B** has **24** questions. Attempt any **20** questions.
(*d*) **Section C** has **12** questions. Attempt any **10** questions.
(*e*) All questions carry equal marks.
(*f*) There is **no** negative marking.

SECTION–A

Section – A consists of 24 questions. Attempt any 20 questions from this section. The first attempted 20 questions would be evaluated.

1. Kangaroo rat lives in water scarcity regions are capable of meeting all their water requirements by

(*a*) Oxidising stored fat to produce water as a by product
(*b*) Having a thick coat to minimize evaporative desiccation
(*c*) Producing very concentrated urine and solid faeces
(*d*) All of these

Ans. (*a*)

2. A protein or polysaccharide molecule that promotes the production of antibodies.

(*a*) Antibiotics (*b*) Antigen
(*c*) Exotoxin (*d*) Endotoxin

Ans. (*b*)

3. The substrate for restriction enzyme is

(*a*) Single-stranded RNA (*b*) Proteins

(*c*) Double-stranded DNA (*d*) Single-stranded DNA

Ans. (*c*)

4. Whose experiment proved that increased species diversity contributed to higher productivity?

(*a*) Alexander von Humboldt (*b*) David Tilman

(*c*) Paul Ehrlich (*d*) Edward Wilson

Ans. (*b*)

5. The process in which the body's internal environment is kept stable is known as

(*a*) homeostasis (*b*) adaptation

(*c*) geometry (*d*) Acclimatization

Ans. (*a*)

6. Restriction enzyme EcoRI cuts the DNA between bases G and A only when the sequence in DNA is:

(*a*) GATATC (*b*) GAATTC

(*c*) GATTCC (*d*) GAACTT

Ans. (*b*)

7. Chemical produced by some microorganisms that can kill or slow the growth of other microbes are referred to as

(*a*) Antacids (*b*) Antiseptics

(*c*) Antibiotics (*d*) None of these

Ans. (*c*)

8. Antibiotics are derived from

(*a*) Actinomycetes (*b*) Fungi

(*c*) Bacteria (*d*) All of these

Ans. (*d*)

9. Which of the following antibiotics was widely utilised to treat injured American soldiers during world war II?

(*a*) Bacitracin (*b*) Penicillin

(*c*) Neomycin (*d*) Chloramphenicol

Ans. (*b*)

10. Nematode-specific genes were introduced into the tobacco plants using vector

(*a*) pBR 322 (*b*) plasmid

(*c*) bacteriophage (*d*) *Agrobacterium*

Ans. (*d*)

11. Streptomycin originates from

(*a*) S. cerevisiae (*b*) S. venezuelae

(*c*) S. rimosus (*d*) Streptomyces griseus

Ans. (*d*)

12. The T_i plasmid used for producing transgenic plants is found in

(*a*) *Azotobacter* (*b*) *Rhizobium* (*c*) *Azospirillum* (*d*) *Agrobacterium*

Ans. (*d*)

13. Passive immunity is a type of immunity that can be given to a person directly through

(*a*) Antitoxins (*b*) Vaccines (*c*) Colostrum (*d*) Both (*a*) and (*c*)

Ans. (*d*)

14. In vaccination, what type of pathogen is used?

(*a*) Inactivated and weakened pathogenic antigens.

(*b*) Activated and strong pathogenic antigens.

(*c*) Preformed antibodies

(*d*) Hyperactive and strong pathogen.

Ans. (*a*)

15. Which of the following statement is incorrect:

(*a*) Osmoconformers are able to maintain osmotic concentration of their cells by either physiological/behavioural means.

(*b*) Most vertebrates, except the birds and mammals are unable to thermoregulate.

(*c*) Success of mammals is mainly due to their ability to thermoregulate and live comfortably whether they are in antarctica/in sahara desert.

(*d*) None of these

Ans. (*a*)

16. Does it really matter to us if single species become extinct?

(*a*) Not really because a single species will not affect much.

(*b*) Yes it matters because organisms are dependent on each other.

(*c*) May or may not be

(*d*) Not determined yet

Ans. (*b*)

17. What would happen if tree frog species is lost from western ghat?

(*a*) Insects population increases

(*b*) Ecosystem will be less functional

(*c*) Third trophic level population decreases

(*d*) All of these

Ans. (*d*)

18. Which sort of immunisation is provided by antitoxin injection in tetanus?

(*a*) Auto-Immunisation (*b*) Humoral-Immunisation

(*c*) Active-Immunisation (*d*) Passive-Immunisation

Ans. (*d*)

19. IPM(Integrated Pest Management) opposes the excessive usage of

(*a*) Mechanical methods (*b*) Biological methods

(*c*) Chemical pesticides (*d*) All of these

Ans. (*c*)

20. Rivet popper hypothesis was proposed by:-

(*a*) Alexander von Humboldt (*b*) David Tilman

(*c*) Paul Ehrlich (*d*) Edward Wilson

Ans. (*c*)

21. Which is not a biopesticide?

(*a*) *Trichoderma harzianum* (*b*) *Bacillus thuringiensis*

(*c*) *Nucleopolyhedrovirus* (*d*) *Xanthomonas campestris*

Ans. (*d*)

22. *E. coli* is used in the production of

(*a*) Rifampicin (*b*) LH (*c*) Ecdysone (*d*) Interferon

Ans. (*d*)

23. The word 'antitoxin' refers to a substance that contains

(*a*) Weakened pathogen (*b*) Inactivated T-lymphocytes

(*c*) Antibodies to the toxin (*d*) B-lymphocytes and T-lymphocytes

Ans. (*c*)

24. The restriction enzyme(s) used in recombinant DNA technology making staggered cuts in DNA leaving sticky ends is/are:

(*a*) EcoRI (*b*) Hind III (*c*) BamHI (*d*) All of the above

Ans. (*d*)

SECTION–B

Section - B consists of 24 questions (Sl. No. 25 to 48). Attempt any 20 questions from this section. The first attempted 20 questions would be evaluated.

Question No. 25 to 28 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) Both A and R are true and R is the correct explanation of A

(*b*) Both A and R are true and R is not the correct explanation of A

(*c*) A is true but R is false

(*d*) A is False but R is true

25. **Assertion (A):** When an alien or recombinant DNA is ligated at the Pvu I site of the *E. coli* cloning vector, pBR 322, the recombinant loses resistance to ampicillin.

Reason (R): The Pvu I site lies within the coding sequence of ampicillin resistance gene.

Ans. (*a*) Both A and R are true and R is the correct explanation of A

26. **Assertion (A):** Retroviruses are used efficiently as vectors in *r*DNA technological experiments.

Reason (R): *Agrobacterium tumefaciens* is the most commonly used vector for transformation of plant cells.

Ans. (*b*) Both A and R are true and R is not the correct explanation of A

27. **Assertion (A):** A single stranded DNA or RNA labelled with a radioactive molecule, is called a probe.

Reason (R): A probe is used to detect mutations in HIV-infected cells.

Ans. (*c*) A is true but R is false

28. **Assertion (A):** *cry* genes isolated from *Bacillus thuringiensis* are incorporated into crop plants, to make them pest-resistant.

Reason (R): *cryIAb* and *cryIIAb* provide resistance to cotton bollworms.

Ans. (*c*) A is true but R is false

29. Biolistics (gene gun) is suitable for

(*a*) introducing *r*DNA into plant cells (*b*) introducing *r*DNA into animal cells

(*c*) disarming the pathogen vectors (*d*) DNA fingerprinting.

Ans. (*a*)

30. Which is the best method for permanent treatment of ADA deficiency?

(*a*) Bone marrow transplantation (*b*) Enzyme replacement therapy

(*c*) Gene therapy at early embryonic stages (*d*) None of these

Ans. (*c*)

31. Anti-venom injections are given against snake venom which contains

(*a*) Antigenic proteins (*b*) Attenuated pathogen

(*c*) Preformed antibodies (*d*) All of these

Ans. (*c*)

32. Shrews and humming birds are rarely found in polar regions because

(*a*) Small body volume makes internal heat production very difficult

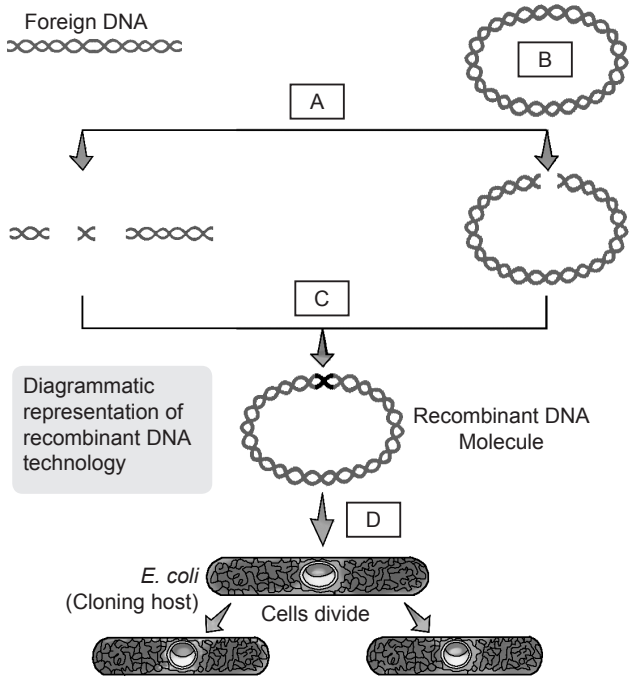
(*b*) Small animals have a smaller surface area relative to their volume, so they lose body heat very fast when it is cold outside.

(*c*) Small animals have a larger surface area relative to their volume, so they lose body heat very fast when it is cold outside.

(*d*) None of these

Ans. (*c*)

33. Identify A, B, C and D in the following figure:



(*a*) A-Restriction endonuclease, B-Restriction exonulease, C-DNA ligase, D-Transformation

(*b*) A-Restriction exonuclease, B-Restriction endoonulease, C-Nuclease, D-Transformation

(*c*) A-Restriction endonuclease, B-Restriction exonulease, C-Hydrolase, D-Transformation

(*d*) A-Restriction endonuclease, B-Restriction endonulease, C-DNA ligase, D-Transformation

Ans. (*d*)

34. An animal generates heat at a rate proportional to its volume but he lost heat at a rate proportional to its surface area, which of the following organism would be best at maintaining internal temperature in a cold climate?

(*a*) Shrews (*b*) Rabbit (*c*) Humming bird (*d*) Bear

Ans. (*d*)

35. Polio vaccine is an example of

(*a*) Auto Immunisation (*b*) Simple Immunisation

(*c*) Active -Immunisation (*d*) Passive -Immunisation

Ans. (*c*)

36. The first clinical gene therapy was given in 1990 to a 4 year old girl with enzyme deficiency of

(*a*) adenosine deaminase (ADA) (*b*) tyrosine oxidase

(*c*) monoamine oxidase (*d*) glutamate dehydrogenase

Ans. (*a*)

37. Select the correct statements.

I. Same restriction enzyme is required for cutting vector and foreign DNA.

II. Different restriction enzyme is required for cutting vector and foreign DNA.

III. Different restriction enzyme cut the DNA between different base pairs.

IV. EcoRI cuts the DNA between G and A base pairs.

(*a*) I and III are correct (*b*) II, III and IV are correct

(*c*) I, III, IV are correct (*d*) I and IV are correct

Ans. (*c*)

38. Sexual reproduction occurs in which hosts throughout the plasmodium life cycle?

(*a*) Female *Anopheles* Mosquito (*b*) Male *Anopheles* Mosquito

(*c*) Human (*d*) Both (*a*) and (*c*)

Ans. (*a*)

39. In Rivet popper hypothesis, Airplane and rivet is related to

(*a*) Airplane - Ecosystem, Rivet - Species

(*b*) Airplane - Niche, Rivet - Screws

(*c*) Airplane - Niche, Rivet - Species

(*d*) Airplane - Ecosystem, Rivet - Screws

Ans. (*a*)

40. The parasite that causes amoebic dysentery is

(*a*) *E. Coli* (*b*) *Trichophyton*

(*c*) *Entamoeba histolytica* (*d*) *Streptococcus pneumoniae*

Ans. (*c*)

41. Select the correct statement:

(*a*) DNA fragments move according to size in gel electrophoresis.

(*b*) Smaller DNA fragments move slower.

(*c*) DNA fragments move towards cathode.

(*d*) DNA fragments are colored so can be easily visualised.

Ans. (*a*)

42. Which of the following disorders cannot be treated with antibiotics?

(*a*) Amoebiasis (*b*) Leprosy

(*c*) Plague (*d*) Whooping cough

Ans. (*a*)

43. In some children, ADA deficiency can be cured by

(*a*) Bone marrow transplantation (*b*) Enzyme replacement therapy

(*c*) Both (*a*) and (*b*) (*d*) None of the above

Ans. (*c*)

44. Intestinal parasite that induced intestinal obstruction and whose eggs are expelled in the faeces of diseased people is

(*a*) *Wuchereria bancrofti* (*b*) *Epidermophyton*

(*c*) *Microsporum* (*d*) *Ascaris*

Ans. (*d*)

45. Organisms which show migration in order to avoid unfavourable conditions of

(*a*) temperature (*b*) food availability

(*c*) precipitation (*d*) All of these

Ans. (*d*)

46. Stain used for visualisation of DNA fragments:

(*a*) Methylene blue (*b*) Aceto-orcein (*c*) EtBr (*d*) Eosin Y

Ans. (*c*)

47. The number of species extinct due to the colonisation of tropical Pacific islands is

(*a*) > 2000 (*b*) < 2000

(*c*) < 1000 (*d*) Between 1000 to 2000

Ans. (*a*)

48. Adaptation may be

(*a*) morphological (*b*) physiological

(*c*) behavioural (*d*) All of these

Ans. (*d*)

SECTION–C

Section-C consists of one case followed by 6 questions linked to this case (Q.No. 49 to 54). Besides this, 6 more questions are given. Attempt any 10 questions in this section.

The first attempted 10 questions would be evaluated.

CASE–I

In today's world, more than a quarter of the world's population suffers from hunger and malnutrition. Scientists have discovered strategies for growing microorganisms on a large process as a source of excellent protein from waste water, animal dung, and even sewage. Single cell proteins are one example of such a product. Pure or mixed cultures of algae, yeasts, fungus or bacteria are used to extract biomass or protein. These are an excellent source of nourishment for humans.

49. Why is the term 'single cell protein' used?

(*a*) It is obtained from unicellular edible microbes.

(*b*) It contains only one type of protein.

(*c*) It contains only one type of microorganism.

(*d*) All of these.

Ans. (*a*)

50. Which is a kind of single cell protein?

(*a*) Algae (*b*) Fungi

(*c*) Cyanobacteria (*d*) All of these

Ans. (*d*)

51. Microorganisms can be a valuable food source for the world's growing population because

(*a*) These are easy to harvest.

(*b*) These can grow in water system.

(*c*) They have a high rate of multiplication thus producing huge biomass.

(*d*) They have high level of nucleic acid.

Ans. (*c*)

52. Single cell protein can be produced from

(*a*) Sewage (*b*) Waste water

(*c*) Animal manure (*d*) All of these

Ans. (*d*)

53. **Assertion:** Single-cell protein production lowers pollution.

Reason: Waste water and even sewage can be used to generate single cell proteins.

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

Ans. (*a*)

54. Which of the following choices includes the end products produced by yeast during anaerobic respiration?

(*a*) H_2O and CO_2

(*b*) H_2O, CO_2 and energy

(*c*) H_2S, $C_6H_{12}O_6$ and energy

(*d*) CO_2, C_2H_5OH and energy

Ans. (*d*)

55. According to IUCN, some of the recent extinctions include

(*a*) Quagga (*b*) Thylacine

(*c*) Bali, Javan, Caspian (*d*) All of these

Ans. (*d*)

56. The site of production of ADA in the body is

(*a*) bone marrow (*b*) lymphocytes

(*c*) blood plasma (*d*) monocytes

Ans. (*b*)

57. The term biodiversity is popularised by

(*a*) Edward Wilson (*b*) Odum

(*c*) Herbert Spencer (*d*) Arthur Tansley

Ans. (*a*)

58. Niche is defined as

(*a*) a component of an ecosystem

(*b*) an ecologically adapted zone of a species

(*c*) the physical position and functional role of a species within the community

(*d*) all plants and animals living at the bottom of a water body.

Ans. (*c*)

59. Arrange the steps which are followed during the process of gene therapy while treating a patient of SCID.

I. Retrovirus infects lymphocytes extracted from bone marrow of the patient and cultured

II. Engineered cells are injected into patient's bone marrow

III. Normal allele is inserted into a retrovirus

IV. Retrovirus makes a DNA copy of its RNA. This DNA carrying the normal allele gets inserted

(*a*) III, I, II, IV (*b*) III, I IV, II

(*c*) IV, II, III, I (*d*) IV, III, I, II

Ans. (*b*)

60. Individuals of one kind, i.e., one species occupying a particular geographic area, at a given time form a/an

(*a*) community (*b*) biome

(*c*) population (*d*) deme

Ans. (*c*)

2 | PRACTICE PAPER

[Time Allowed: 90 Minutes] [Maximum Marks: 35]

General Instructions:

(*a*) The Question Paper contains three sections.
(*b*) **Section A** has **24** questions. Attempt any **20** questions.
(*c*) **Section B** has **24** questions. Attempt any **20** questions.
(*d*) **Section C** has **12** questions. Attempt any **10** questions.
(*e*) All questions carry equal marks.
(*f*) There is **no** negative marking.

SECTION–A

Section – A consists of 24 questions. Attempt any 20 questions from this section. The first attempted 20 questions would be evaluated.

1. Large-holes in 'Swiss-Cheese' are due to

(*a*) *Propionibacterium sharmanii* (*b*) *Saccharomyces cerevisiae*
(*c*) *Penicillium chrysogenum* (*d*) *Acetobacter aceti*

Ans. (*d*) or (*a*)

2. Opioids act as

(*a*) depressants (*b*) pain killers
(*c*) euphoria providers (*d*) stimulants

Ans. (*a*)

3. What percentage of mammals facing the threat of extinction?

(*a*) 23% (*b*) 32% (*c*) 28% (*d*) 30%

Ans. (*a*)

4. Animals from colder climates generally have shorter limbs. This is called

(*a*) Allen's rule (*b*) Johnson's rule (*c*) Arber's rule (*d*) Niche rule

Ans. (*a*)

5. The microbes commonly used in kitchen, are

(*a*) *Lactobacillus* and yeast (*b*) *Penicillium* and yeast

(*c*) *Microspora* and *E. coli* (*d*) *Rhizopus* and *Lactobacillus*

Ans. (*a*)

6. The technique that help in early detection of disease is

(*a*) *r*DNA technology (*b*) ELISA

(*c*) PCR (*d*) All of these

Ans. (*d*)

7. How many episodes of mass extinction occurs till now on earth?

(*a*) 5 (*b*) 6 (*c*) 7 (*d*) 4

Ans. (*a*)

8. BOD of waste water is estimated by measuring the amount of

(*a*) total organic matter (*b*) biodegradable organic matter

(*c*) oxygen evolution (*d*) oxygen consumption.

Ans. (*d*)

9. The interspecific interaction in which one partner is benefitted and the other is unaffected (neutral), is called

(*a*) amensalism (*b*) mutualism

(*c*) competition (*d*) commensalism

Ans. (*d*)

10. Elephantiasis is a chronic inflammatory condition that leads to severe deformities is caused by

(*a*) *Ascaris* (*b*) *Wuchereria*

(*c*) *Trichophyton* (*d*) *E. coli*

Ans. (*b*)

11. The primary treatment of waste water involves the removal of

(*a*) dissolved impurities (*b*) stable particles

(*c*) toxic substances (*d*) harmful bacteria.

Ans. (*b*)

12. Niche overlap indicates

(*a*) mutualism between two species

(*b*) active cooperation between two species

(*c*) sharing of one or more resources between the two species

(*d*) two different parasites on the same host

Ans. (*c*)

13. Impact of loss of biodiversity include

(*a*) Decline in plant production

(*b*) Lowered resistance to environmental perturbations

(*c*) Increased variability in certain ecosystem processes like plant productivity etc.

(*d*) All of these

Ans. (*d*)

14. For effective treatment of a disease

(*a*) Early diagnosis is required but understanding of physiological process is not required

(*b*) Early diagnosis is not required but understanding of physiological process is required

(*c*) Early diagnosis and understanding of physiological process is not required

(*d*) Early diagnosis and understanding of physiological process is required

Ans. (*d*)

15. Main cause of sixth mass extinction is

(*a*) Human activities (*b*) Lower organisms

(*c*) Higher organisms (*d*) Climate

Ans. (*a*)

16. A population has more young individuals compared to the older individuals. What would be the status of the population after some years?

(*a*) It will decline (*b*) It will stabilise

(*c*) It will increase (*d*) It will first decline and then stabilise

Ans. (*c*)

17. Appearance of dry, scaly lesions with itching on numerous regions of the body are the symptoms of _____.

(*a*) ringworm (*b*) elephantiasis

(*c*) ascariasis (*d*) amoebiasis

Ans. (*a*)

18. Methanogens, growing anaerobically on cellulosic material, produce

(*a*) methane gas (*b*) methane and carbon dioxide

(*c*) methane and hydrogen (*d*) methane, carbon dioxide, hydrogen.

Ans. (*d*)

19. Which of the following is not a plasmid?

(*a*) Sal I (*b*) YAC

(*c*) BAC (*d*) pBR 322

Ans. (*a*)

20. *Wuchereria bancrofti* infection affects which of the following?

(*a*) Respiratory system (*b*) Lymphatic vessels

(*c*) Nervous system (*d*) Blood circulation

Ans. (*b*)

21. The DNA fragments produced by the use of restriction endonucleases can be separated by

(*a*) polymerase chain reaction (*b*) gel electrophoresis

(*c*) density gradient centrifugation (*d*) any of the above.

Ans. (*b*)

22. *Bacillus thuringiensis* is used to control

(*a*) fungal pathogens (*b*) nematodes

(*c*) bacterial pathogens (*d*) insect pests.

Ans. (*d*)

23. Which disease is spread by female mosquito bite?

(*a*) Amoebiasis (*b*) Pneumonia

(*c*) Typhoid (*d*) Filariasis

Ans. (*d*)

24. Which technique can be used to detect bacteria/virus if its concentration is too low in body?

(*a*) Amplification by PCR (*b*) c-DNA

(*c*) Gene therapy (*d*) RNAi

Ans. (*a*)

SECTION–B

Section - B consists of 24 questions (Sl. No. 25 to 48). Attempt any 20 questions from this section. The first attempted 20 questions would be evaluated.

Question No. 25 to 28 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) Both A and R are true and R is the correct explanation of A

(*b*) Both A and R are true and R is not the correct explanation of A

(*c*) A is true but R is false

(*d*) A is False but R is true

25. **Assertion:** In a genetic engineering process, it is necessary to maintain sterile conditions.

Reason: Sterile condition inhibit the growth of other microbes.

Ans. (*a*) Both A and R are true and R is the correct explanation of A

26. **Assertion:** Asexual reproduction is more important than sexual reproduction in respect to biotechnology.

Reason: Asexual reproduction do not preserve genetic information.

Ans. (*c*) A is true but R is false

27. **Assertion:** The antibody-mediated immune response is known as humoral immune response also.

Reason: The T-lymphocytes are responsible for cell-mediated immunity.

Ans. (*b*) Both A and R are true and R is not the correct explanation of A

28. **Assertion:** The exaggerated response of the immune system to contain antigens present in the environment, is called allergy.

Reason: The use of drugs like adrenaline, antihistamines and steroids quickly reduce the symptoms of allergy.

Ans. (*b*) Both A and R are true and R is not the correct explanation of A

29. Which pairing corresponds to an disorder and the pathogen that causes it?

(*a*) Pneumonia–*Haemophilus pneumoniae*

(*b*) Malaria–*Ascaris lumbricoides*

(*c*) Ringworm–*Entamoeba histolytica*

(*d*) Typhoid–*Salmonella typhi*

Ans. (*d*)

30. PCR used to detect

(*a*) HIV in suspected AIDS patients

(*b*) Mutations in genes

(*c*) Cancer

(*d*) All of the above

Ans. (*d*)

31. The DNA polymerase enzyme used in PCR is obtained from

(*a*) *Thermus aquaticus*

(*b*) *Escherichia coli*

(*c*) *Agrobacterium tumefaciens*

(*d*) *Salmonella typhimurium.*

Ans. (*a*)

32. The letter T in T-lymphocytes refers to

(*a*) tonsil (*b*) thalamus (*c*) thymus (*d*) thyroid

Ans. (*c*)

33. Heroin is a term which is often used as

(*a*) Coke (*b*) Smack (*c*) Crack (*d*) Charas

Ans. (*b*)

34. Which of the following statement is correct regarding ELISA?

(*a*) It is not used for early diagnosis of diseases

(*b*) It is based on principle of antigen-antibody interaction

(*c*) Infection by pathogen can be detected by presence of mutated gene

(*d*) None of these

Ans. (*b*)

35. Which pair of animals are not transgenic?

(*a*) Banded krait, dog

(*b*) Banded krait, sheep

(*c*) Banded krait, rabbit

(*d*) Banded krait, cow

Ans. (*a*)

36. Organic farming does not involve

(*a*) cow dung

(*b*) farmyard manures

(*c*) compost

(*d*) chemical fertilisers

Ans. (*d*)

37. Which of the given statement is correct in the context of observing DNA separated by agarose gel electrophoresis?

(*a*) DNA can be seen in visible light

(*b*) DNA can be seen without staining in visible light

(*c*) Ethidium bromide-stained DNA can be seen in visible light

(*d*) Ethidium bromide-stained DNA can be seen under exposure to UV light

Ans. (*d*)

38. Which of the following is not the product of transgenic experiments?

(*a*) Pest-resistant crop variety

(*b*) High nutritional value in grains

(*c*) Production of insulin by *r*DNA technology

(*d*) Drought-resistant crops

Ans. (*d*)

39. Which one of the following have high copy number per cell:

(*a*) Bacteriophage

(*b*) Plasmid

(*c*) *E.coli*

(*d*) *Agrobacterium tumefaciens*

Ans. (*c*)

40. ELISA technique is based on the principle of

(*a*) DNA replication

(*b*) antigen-antibody interaction

(*c*) pathogen-antigen interaction

(*d*) antigen-protein interaction

Ans. (*b*)

41. Which of the following practices are involved in organic farming?

(*a*) IPM(Integrated Pest Management)

(*b*) Locally developed pest resistant varieties

(*c*) Use of fertilizers and pesticides of biological origin.

(*d*) All of these

Ans. (*d*)

42. Most important cause of extinction is

(*a*) Habitat loss and fragmentation (*b*) Over exploitation

(*c*) Alien species invasion (*d*) Co-extinction

Ans. (*a*)

43. Which of the following feature is not necessary for cloning vector?

(*a*) Origin of replication (*b*) High copy number

(*c*) Selectable marker (*d*) Cloning sites

Ans. (*b*)

44. Night blindness can be prevented by use of

(*a*) Golden rice (*b*) Transgenic tomato

(*c*) Transgenic maize (*d*) Bt brinjal

Ans. (*a*)

45. Colostrum provides passive immunity to human infants as it contains antibody

(*a*) IgA (*b*) IgM (*c*) IgE (*d*) IgG

Ans. (*a*)

46. Organisms used to improve soil nutrient quality referred to as

(*a*) Biofertilizers (*b*) Biocontrol agents

(*c*) Natural fertilizers (*d*) Synthetic fertilizers

Ans. (*c*)

47. Select the correct statement:

(*a*) Ori stands for Origin of replication

(*b*) Ori is a sequence where replication starts

(*c*) Ori is responsible for controlling the copy number of linked DNA.

(*d*) All of the above.

Ans. (*d*)

48. The World Summit on Sustainable Development (2002) was held in

(*a*) Brazil (*b*) South Africa (*c*) Sweden (*d*) Argentina

Ans. (*b*)

SECTION–C

Section-C consists of one case followed by 6 questions linked to this case (Q.No. 49 to 54). Besides this, 6 more questions are given. Attempt any 10 questions in this section.

The first attempted 10 questions would be evaluated.

CASE – I

Living world is fascinatingly diverse and amazingly complex consisting of a biological hierarchy. Various levels of biological organization are vary from macromolecules to biomes. Ecology deals with interactions among organisms and between organism and its physical environment. The hierarchy in the level of organization connected with ecological grouping of organisms is called ecological hierarchy.

49. Basic unit of ecological hierarchy is

(*a*) Population (*b*) Community

(*c*) Biome (*d*) Individual

Ans. (*d*)

50. The branch of science deals with organisms and their interaction is

(*a*) Ethology (*b*) Ecology

(*c*) Physiology (*d*) Zoology

Ans. (*b*)

51. Identify the correct sequence of levels of biological organization

(*a*) Community — Population — Ecosystem — Biome

(*b*) Population — Community — Biome — Ecosystem

(*c*) Population — Community — Ecosystem — Biome

(*d*) Community — Population — Biome — Ecosystem

Ans. (*c*)

52. Name the scientist who coined the term ecology.

(*a*) William Skinner Cooper (*b*) John Baer

(*c*) Ernst Haeckel (*d*) Heinz Ellenberg

Ans. (*c*)

53. **Assertion (A):** Cow in India and Kangaroo in Australia are ecological equivalents.

Reason (R): The organisms having similar niche in different geographical regions are known as ecological equivalents.

(*a*) Both A and R are true and R is the correct explanation of A.

(*b*) Both A and R are true and R is not the correct explanation of A.

(*c*) A is true but R is false.

(*d*) A is False but R is true.

Ans. (*a*)

54. Characteristics of a terrestrial biomes are strongly influenced by its

(*a*) Climate

(*b*) Flora

(*c*) Fauna

(*d*) All of the above

Ans. (*d*)

55. Biofertilizers are bacteria which involved in

(*a*) improve soil nutrient content

(*b*) maximize environmental benefits

(*c*) reduce the environmental hazards

(*d*) All of these

Ans. (*d*)

56. Which of the following is not a cause for loss of biodiversity?

(*a*) Destruction of habitat

(*b*) Invasion by alien species

(*c*) Keeping animals in zoological parks

(*d*) Over-exploitation of natural resources

Ans. (*c*)

57. C-peptide of human insulin is

(*a*) a part of mature insulin molecule.

(*b*) responsible for formation of disulphide bridges.

(*c*) removed during maturation of pro-insulin to insulin.

(*d*) responsible for its biological activity.

Ans. (*c*)

58. In cotton field, which of the following can be utilised as a biofertilizer?

(*a*) *Streptococcus*

(*b*) *Azolla-Anabaena*

(*c*) *Azotobacter chroococcum*

(*d*) *Azospirillum*

Ans. (*c*)

59. Which of the following enzyme will get inactivated in insertional inactivation?

(*a*) Transacetylase

(*b*) Permease

(*c*) Beta-galactosidase

(*d*) Nucleases

Ans. (*c*)

60. Transplantation of tissues/organs to save certain patients often fails due to rejection of such tissues/organs by the patient. Which type of immune response is responsible for such rejections?

(*a*) Auto-immune response

(*b*) Humoral immune response

(*c*) Physiological immune response

(*d*) Cell-mediated immune response

Ans. (*d*)