

Bloom Biology Olympiad Sample Paper

Maximum Time : 60 Minutes

Maximum Marks : 60

INSTRUCTIONS

1. There are 50 Multiple Choice Questions in this paper divided into two sections :

Section A 40 MCQs; 1 Mark each

Section B 10 MCQs; 2 Marks each

2. Each question has Four Options, out of which **ONLY ONE** is correct.
3. All questions are compulsory.
4. There is no negative marking.
5. No electric device capables of storing and displaying visual information such as calculator and mobile is allowed during the course of the exam.

Roll No.

Student's Name

Section-A (1 Mark each)

1. Genetic engineering has been successfully used for producing
- (a) transgenic cow Rosie, which produces high fat milk for making ghee
 - (b) animals like bulls for farm work as they have super power
 - (c) transgenic mice for testing safety of polio vaccine before use in humans
 - (d) transgenic models for studying new treatments for certain cardiac diseases

2. Mouse is mostly preferred animal for studies on gene transfer because

- I. short oestrus cycle.
- II. long gestation period.
- III. short generation time.
- IV. production of one or two offspring per progeny.

Codes

- (a) I and III
 - (b) I and II
 - (c) Only IV
 - (d) III and IV
3. If the F_1 -generation produced by a cross between axial and terminal flower-bearing plants produces only axial flowers. The F_2 -progeny produced by the self-crossing of F_1 will also produce only axial flowers.
- (a) True
 - (b) False
 - (c) Cannot be determined
 - (d) None of these
4. Which of the following is not associated with rabies disease?
- I. Brain degeneration.
 - II. Infantile paralysis.
 - III. Inability to swallow.
 - IV. Hydrophobia.
 - V. Respiratory paralysis.
 - VI. Caused by Rhabdoviridae family virus.

Codes

- (a) I and IV
 - (b) II and V
 - (c) III and VI
 - (d) II and VI
5. Match the following columns and choose the correct option from the codes given below.

Column I	Column II
A. Primary sludge	1. Large aeration tank
B. Primary treatment	2. Physical removal of articles from the sewage
C. Activated sludge	3. Settleable solids
D. Biological treatment	4. Bacterial flocs

Codes

	A	B	C	D
(a)	3	2	4	1
(b)	3	2	1	4
(c)	1	4	3	2
(d)	4	3	1	2

- 6.** Which of the following is the correct option regarding biopsy?
- (a) Thick sections of living tissues are studied under the microscope
 - (b) Normal tissues of the infected individual are studied
 - (c) Histopathological studies are done by an ophthalmologist
 - (d) Suspected tissues are studied under the microscope
- 7.** The pathogen *Microsporum* responsible for ringworm disease in humans belongs to the same kingdom of organisms as that of
- (a) *Taenia*, a tapeworm
 - (b) *Rhizopus*, a mould
 - (c) *Ascaris*, a roundworm
 - (d) *Wuchereria*, a filarial worm
- 8.** Large holes in Swiss cheese are due to the production of a large amount of X by a bacterium named Y. Identify the X and Y in the given option.
- (a) X-Ethanol, Y-*S.cerevisiae*
 - (b) X-CO₂, Y-*Lactobacillus casei*
 - (c) X-Proteins, Y-*Clostridium butylicum*
 - (d) X-CO₂, Y-*Propionibacterium shermanii*
- 9.** The product of which of the following organisms has been commercialised as blood cholesterol lowering agent.
- (a) *Aspergillus niger*
 - (b) *Monascus purpureus*
 - (c) *Trichoderma polysporum*
 - (d) *Saccharomyces cerevisiae*
- 10.** Cyclosporin-A and statins are the useful drugs produced by microorganisms. Which of the following microorganisms are responsible for the production of these two drugs, respectively?
- I. *Mortierella renispora*
 - II. *Geotrichum candidum*
 - III. *Trichoderma polysporum*
 - IV. *Candida lipolytica*
 - V. *Monascus purpureus*

Codes

- | | |
|---------------|----------------|
| (a) I and IV | (b) III and V |
| (c) I and III | (d) III and IV |

- 11.** Match Column I with Column II on the basis of the names of scientists with their work for *r*DNA technology.

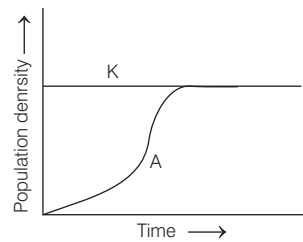
Column I	Column II
A. Cohen and Boyer	1. Plasmids
B. Alec Jeffreys	2. Restriction endonucleases
C. Arber, Smith and Nathan	3. DNA fingerprinting
D. Hayes and Lederberg	4. Recombinant DNA

Codes

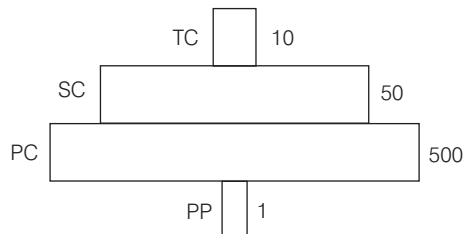
	A	B	C	D
(a)	4	3	2	1
(b)	2	1	4	3
(c)	1	4	2	3
(d)	3	1	4	1

- 12.** A human skull was dug out from a research field during excavation. A small fragment of the scalp tissue was still attached to it. Only little DNA could be extracted from it. If the genes of the ancient man need to be analysed the best way of getting sufficient amount of DNA from this extract is
- hybridising the DNA with or DNA probe
 - subjecting the DNA to get electrophoresis
 - subjecting the DNA to polymerase chain reaction
 - treating the DNA with restriction endonucleases
- 13.** A population growing in a habitat with limited resources shows four phases of growth in the following sequence.
- Acceleration → deceleration → lag phase → asymptote
 - Asymptote → acceleration → deceleration → lag phase
 - Lag phase → acceleration → deceleration → asymptote
 - Acceleration → lag phase → deceleration → asymptote
- 14.** A researcher conducted an experiment with pollen grain of flowering plant. He focused a laser beam and kills the generative cell of pollen grain. After one to two days, he noticed that pollen germinated and pollen tube arised towards the ovary. What could be the reason behind it?
- Laser beam stimulates pollen germination and pollen tube growth
 - Laser beam does not damage the region from where tube emerge
 - The content of killed generative cell permits germination and pollen tube growth
 - The vegetative cell has not been damaged

15. What does the line A in the given graph indicates?

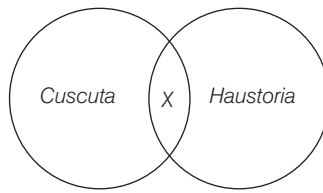


- (a) Decreasing growth
 - (b) Sigmoidal growth
 - (c) Exponential growth
 - (d) J-shaped
- 16.** The sperm of an animal species 'X' cannot normally fertilise the ovum of another species 'Y'. Which of the following option is best suitable for the above statement?
- (a) Antifertilizin of 'X' and fertilizin of 'Y' are not compatible
 - (b) Fertilizin of 'X' and antifertilizin of 'Y' are not compatible
 - (c) Fertilizin of 'X' and 'Y' are not compatible
 - (d) Antifertilizin of 'X' and 'Y' are not compatible
- 17.** A flower have single ovule in the ovary and is packed into inflorescence. It can be usually pollinated by
- (a) bee
 - (b) water
 - (c) bat
 - (d) wind
- 18.** Given below is an imaginary pyramid of numbers. What could be one of the possibilities about certain organisms at some of the different levels?



- (a) Level PC is 'insects' and level SC is 'small insectivorous birds'
 - (b) Level P is 'phytoplanktons' in sea and 'whale' on top level TC
 - (c) Level on PP is 'pipal trees' and the level SC is 'sheep'
 - (d) Level PC is 'rats' and level SC is 'cats'
- 19.** Which one of the following processes during decomposition is correctly described?
- (a) Catabolism-Last step in the decomposition under fully anaerobic condition
 - (b) Leaching-Water soluble inorganic nutrients rise to the top layers of soil
 - (c) Fragmentation-Carried out by organisms such as earthworm
 - (d) Humification-Leads to the accumulation of a dark coloured substance humus which undergoes microbial action at a very fast rate

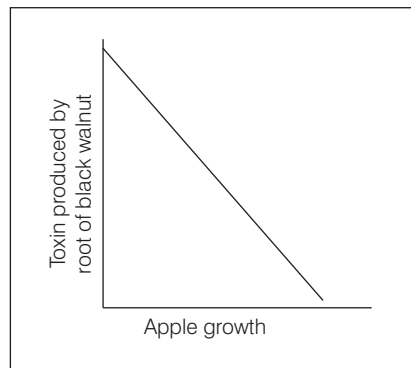
20. Consider the following Venn diagram.



Which of the following population interaction is shown by 'X'?

- (a) Endoparasites
- (b) Ectoparasites
- (c) Competition
- (d) Mutualism

21. Consider the following graph.



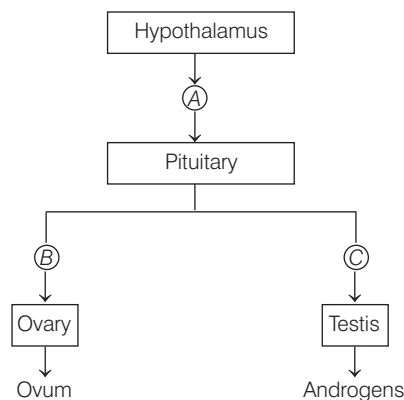
Which of the following interaction is shown in above graph?

- (a) Commensalism
- (b) Neutralism
- (c) Ammensalism
- (d) Parasitism

22. Select the incorrect match.

- (a) Bears - Hibernation
- (b) Snail - Aestivation
- (c) Phytoplankton - Diapause
- (d) Seeds - Dormancy

23. Identify the hormones, 'A', 'B' and 'C' that are labelled in the given flowchart.



- (a) A-GnRH, B-PRL, C-ICSH
- (b) A-GnRH, B-ICSH, C-ISH
- (c) A-GnRH, B-FSH, C-LH
- (d) A-GH, B-FSH, C-LH

24. Which of the following features is/are common to both wind and water pollinated flowers?

- I. Pollen grains are long and ribbon-like.
- II. Stigma is large and feathery.
- III. The flowers are not colourful.
- IV. The flowers do not produce nectar.

Codes

- | | |
|----------------|----------------|
| (a) II and III | (b) III and IV |
| (c) I and II | (d) Only I |

25. At what rate does decomposition occurs when detritus is rich in nitrogen and sugars?

- (a) Slower
- (b) Faster
- (c) Moderate
- (d) Neutral

26. Identify the correct statement.

- (a) DNA is dependent on RNA for the synthesis of proteins
- (b) DNA and RNA both function as genetic material
- (c) DNA being more stable, is the preferred genetic material but for the transmission of genetic information RNA is better
- (d) All of the above

27. Which of the following pair approaches does not give the defined action of contraceptive?

(a)	Hormonal contraceptives	Prevent retard entry of sperms, prevent ovulation and fertilisation
(b)	Vasectomy	Prevents spermatogenesis
(c)	Barrier methods	Prevents fertilisation
(d)	Intrauterine devices	Increase phagocytosis of sperms, suppress sperm motility and fertilising capacity

28. If the carbon atoms fixed by producer already have passed through three species, the trophic level of the last species would be

- (a) scavenger
- (b) tertiary producer
- (c) tertiary consumer
- (d) secondary consumer

29. *Azolla pinnata* has been found to be an important biofertiliser for paddy crops. This quality is due to the presence of

- | | |
|----------------------------|---------------------------------|
| (a) N_2 -fixing bacteria | (b) N_2 -fixing cyanobacteria |
| (c) Mycorrhizae | (d) All of these |

- 30.** The most abundant prokaryotes helpful to humans in making curd from milk and in the production of antibiotics are the ones categorised as
- archaebacteria
 - cyanobacteria
 - heterotrophic bacteria
 - chemosynthetic autotrophs

- 31.** The area where wild population, traditional lifestyle and genetic resources are protected is
- core zone
 - buffer zone
 - biosphere reserve
 - manipulation zone

- 32.** Choose the incorrectly matched pair from the following options given below.

(I)	Endemism	Region with very low levels of species richness
(II)	Hotspots	Khasi and Jaintia hills
(III)	Alien species	Water hyacinth
(IV)	Sacred groves	Indo-Burma

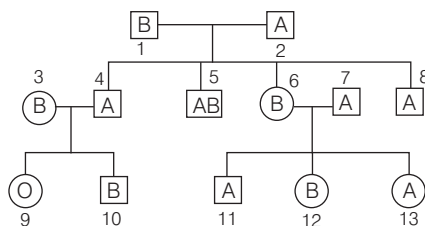
Codes

- I, II and IV
 - II and IV
 - Only I
 - III and IV
- 33.** The finch species of Galapagos island are grouped according to their food sources. Which of the following is not a finch's food?
- Tree buds
 - Insects
 - Carrion
 - Seeds
- 34.** Observe the following diagram given below and identify the X, Y and Z regarding transcription process in bacteria.



- X- σ -factor, Y-RNA polymerase, Z-RNA
 - X- ρ -factor, Y-RNA polymerase, Z-RNA
 - X- σ -factor, Y-RNA, Z-RNA polymerase
 - X- ρ -factor, Y-RNA, Z-RNA polymerase
- 35.** During transcription, holoenzyme RNA polymerase binds to a DNA sequence and the DNA assumes a saddle-like structure at that point. What is that sequence called?
- TATA box
 - AAAT box
 - GGTT box
 - CAAT box

- 36.** Which of the following mutagens increases distance between the neighbouring N₂ base-pair (from 3.4 Å to 6.8 Å) and causes frameshift mutation?
- (a) Proflavine (b) 5-Bromouracil
(c) 2-Aminopurine (d) Methanesulphonate
- 37.** Choose the incorrectly match paired Mendelian disorders given below.
- (a) Haemophilia–X-linked recessive
(b) Sickle-cell anaemia–Autosome linked recessive
(c) Phenylketonuria–Autosome linked dominant
(d) Thalassaemia–Autosome linked recessive
- 38.** A diploid organism is heterozygous for 4 loci. How many types of gametes can be produced from the following?
- (a) 32 (b) 8
(c) 16 (d) None of these
- 39.** The hypothesis that the early atmosphere, combined with an energy source, produced organic monomer was developed in the 1920s by
- (a) Miller and Urey (b) Oparin and Haldane
(c) Cuvier and Pasteur (d) Fox and Pauling
- 40.** Study the pedigree chart given below, showing the inheritance pattern of blood groups in a family and answer the following questions.



Which antigens will be present on the plasma membrane of the RBC of individuals 5 and 9?

- (a) 5-no antigen : 9-antigen A and B (b) 5-A antigen : 9-antigen A and B
(c) 5-B antigen : 9-no antigen (d) 5-antigen A and B : 9-no antigen

Section-B (2 Marks each)

Direction (Q. Nos. 41-44) Each of these questions contains two statements : Assertion and Reason. Each of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

- (a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true, but 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)** Fimbriae are finger-like projections of the infundibulum part of the oviduct which is closest to ovary.
Reason (R) They are important for the collection of ovum after ovulation from ovary.
- 42. Assertion (A)** The consumption of golden rice by men can make up the deficiency of vitamin-A preventing night blindness.
Reason (R) Golden rice is a transgenic rice which have gene for β -carotene.
- 43. Assertion (A)** Interferon help in the elimination of viral infections.
Reason (R) Interferon released by infected cells, reach nearby unaffected cells and make them resistant to viral infection.
- 44. Assertion (A)** According to Hardy- Weinberg equilibrium, allele frequencies in a population remains constant from generation to generation.
Reason (R) Allele frequencies remains constant even in the presence of disturbing factors.
- 45.** Read the following statements and choose the correct option.
Statement I The basmati rice variety traditionally belongs to India.
Statement II Insulin was obtain from slaughtered cattles and pigs.
 (a) Both statement I and statement II are correct
 (b) Both statement I and statement II are incorrect
 (c) Statement I is correct, but statement II is incorrect
 (d) Statement I is incorrect, but statement II is correct
- 46.** Read the following statements and choose the correct option.
Statement I Speciation is a process in which pre-existing advantageous mutations are selected and results in new phenotypes.
Statement II Natural selection is a process in which species are disabled to reproduce and leave lower number of progeny.
 (a) Both statement I and statement II are correct
 (b) Both statement I and statement II are incorrect
 (c) Statement I is correct, but statement II is incorrect
 (d) Statement I is incorrect, but statement II is correct
- 47.** Which of the following statements are incorrect?
 I. Mobile genetic elements, transposons were visualised by Barbara McClintock.
 II. Genetic maps of chromosomes are based on the frequency of translocation.
 III. In pedigree analysis, a person immediately affected by an action is called propositus.
 IV. RNA polymerase III transcribes tRNAs.
 V. Viral genome incorporated into host DNA is called bacteriophage.

Codes

- | | |
|--------------|----------------|
| (a) I and IV | (b) II and III |
| (c) I and V | (d) II and V |

Direction (Q. Nos. 48-50) Read the following passage and answer the questions that follows
A 23 year old Sahil has been diagnosed with an infection of reproductive tract caused by bacteria. He complains about burning sensation during urination, pus-containing discharge and pain around genitalia. This infection has an incubation period of 2-5 days but cannot be cured.

48. From which disease Sahil is suffering?

- | | |
|---------------|------------------|
| (a) Herpes | (b) Syphilis |
| (c) Gonorrhea | (d) Chlamydiasis |

49. Which among the following reproductive tract infections is transmitted by bacteria?

- | | |
|--------------------|----------------------|
| (a) Trichomoniasis | (b) Syphilis |
| (c) Genital warts | (d) Both (a) and (b) |

50. Given below are techniques of screening STD's.

- I. Gram-staining discharge and culture.
- II. Elisa test.
- III. Antibody detection.
- IV. Antigen test.

Among which of the following technique were used to diagnose Sahil's disease?

- | | |
|--------------|----------------|
| (a) I and II | (b) Only I |
| (c) Only II | (d) II and III |

Explanations

1. (c) Genetic engineering has been successfully used for producing transgenic mice to test safety of polio vaccine before using in humans.
2. (a) Mouse has short gestation period and short oestrus cycle. Also it produces several number of offspring per pregnancy.
3. (b) The F_1 -progeny has only axial flowers, which imply that axial trait is dominant over the terminal trait. However, the F_1 -progeny are heterozygous upon self-crossing, 25% of the F_2 -progeny will be homozygous for the recessive trait, resulting in the formation of 3 : 1 (ratio of axial flower-bearing to terminal flower-bearing plants.)
4. (b) Infantile paralysis and respiratory paralysis are not associated with rabies disease. Rabies is a infectious disease caused by *Rhabdovirus* belonging to Rhabdoviridae family. It causes symptoms like brain degeneration, inability to swallow, excessive salivation, hydrophobia, muscle twitching, etc.
5. (a) A-3, B-2, C-4, D-1. It can be explained as
Primary sludge are settleable solids after primary treatment (physical removal of particles) of sewage. Biological treatment is secondary treatment of sewage in the large aeration tank. Activated sludge is sediment of bacterial flocs.
6. (d) Biopsy is one of the techniques that detects cancer in the suspected individuals. In biopsy, a piece of suspected tissues is cut into thin section and then is stained and examined under the microscope (histopathological studies) by a pathologist.
7. (b) The pathogen *Microsporum* responsible for ringworm disease in humans belong to the same kingdom of organisms as that of *Rhizopus*, a mould because both *Microsporum* and *Rhizopus* belong to kingdom-Fungi.
8. (d) Different varieties of cheese are known by their characteristics texture, flavour and taste, the specificity coming from the microbes used. The large holes in 'Swiss cheese' are due to the production of large amount of CO_2 by a bacterium named *Propionibacterium shermanii*.
9. (b) *Monascus purpureus* is a yeast used commercially in the production of blood cholesterol-lowering agents, i.e. statins.
10. (b) Cyclosporin-A is used as an immunosuppressive agent in organ-transplant patients. It is produced by the fungus *Trichoderma polysporum*. Statins are produced by the yeast *Monascus purpureus* and have been commercialised as blood-cholesterol lowering agents.
11. (a) A-4, B-3, C-2, D-1. It can be explained as
Herbert Boyer along with Stanley Cohen developed recombinant DNA technology to produce medicines and discovered restriction enzymes. Alec Jeffreys was one of the first to discover inherited variation in human DNA, then went on to invent DNA fingerprinting. Arber, Smith and Nathan shared a 1978 Nobel Prize for the discovery of restriction endonucleases. Hayes and Lederberg first discovered the plasmids in 1952.
12. (c) The Polymerase Chain Reaction (PCR) is a technique by which small samples of DNA can be quickly amplified. Starting with only one gene sized piece of DNA, this technique is used to make literally billion copies in only a few hours.
13. (c) A population growing in a habitat with limited resources shows four phases of growth in the following sequence: Lag phase → Acceleration → Deceleration → Asymptote.

- 14.** (d) The reason behind it is that the vegetative cell has not been damaged. The vegetative cells are involved in the production of pollen tubes, the sperms yielded from the generative cells are involved in fertilisation. While, generative cells are reproductive in nature and vegetative cells are non-reproductive in nature.
- 15.** (b) The given graph is of sigmoidal growth. It is a logistic /S-shaped growth curve. It is obtained due to the finite and limited resources in a population.
- 16.** (a) The sperm contains antifertilizin on its surface and the egg has fertilizin. Fertilizin is composed of glycoproteins and antifertilizin is made up of acidic amino acids. The reaction between fertilizin and antifertilizin is known as agglutination. It is done to ensure that sperm of the same species mates with ova. So, the correct option is antifertilizin of 'X' and fertilizin of 'Y' are not compatible.
- 17.** (d) Flowers that are pollinated by wind have a single ovary and have packed inflorescence. Wind pollination is also known as anemophily.
- 18.** (a) As the number of insects is always greater than the number of its predators in any ecosystem. So, the correct option is level PC is 'insect' and 'level SC' is 'small insectivorous birds'.
- 19.** (c) Process given in option (c) is correctly described as fragmentation is carried out by the organisms such as earthworm. The other options are incorrect and can be corrected as
Catabolism is the third step of decomposition in which decomposers secrete digestive enzyme and breakdown organic complex matter in the detritus to simpler organic or inorganic compounds. Leaching refers to the movement of water soluble inorganic nutrients, present in the fragmented or decomposed detritus, down into the soil horizon and get precipitated as unavailable salts. Humification is the process of decomposition of detritus to form a cellulose and lignin-rich dark coloured, amorphous organic matter called as humus. Which undergo microbial action at an extremely slow rate.
- 20.** (b) In the above Venn diagram, the population interaction shown by X is ectoparasitism. *Cuscuta* has lost its leaves, chlorophyll and roots. It obtains nourishment from host plants with the help of haustoria (sucking adventitious roots).
- 21.** (c) In above graph, the type of interaction shown is ammensalism. The roots and bulbs of black walnut (*Juglans nigra*) produce a chemical named Juglone. It is toxic to apple. More the toxin produced by the walnut, less will be the growth of apples.
- 22.** (c) The incorrect match is given in option (c). It can be corrected as,
Diapause is a phase of dormancy seen in zooplankton.
- 23.** (c) Hypothalamus secretes GnRH (Gonadotropin Releasing Hormone) which stimulates pituitary to release FSH (Follicle Stimulating Hormone) and LH (Lutenizing Hormone). FSH stimulates ovarian follicles to grow while LH stimulates Leydig's cell to secrete testosterone.
- 24.** (b) Long ribbon-like pollens are found in water pollinated plants while feathery stigma is found in wind pollinated flowers. But, both of these type of flowers lack colourful petals and nectar because they do not have to lure insects to carry out pollination.
- 25.** (b) When detritus is rich in nitrogen and sugars, the decomposition occurs at a faster rate. The physical and chemical process of breakdown complex organic remains (dead or decaying organisms) into inorganic substances is called decomposition.

- 26.** (d) All the given statements are correct.
Thus, option (d) is correct.
- 27.** (b) Vasectomy does not give the defined action of contraceptives. It is a surgical contraception method performed in males. In vasectomy, a small part of the vas deferens is removed or tied up through a small cut on the scrotum. This prevents sperm transportation.
- 28.** (c) Each trophic level in a food chain is occupied by a particular species. The carbon atoms fixed by the producers are consumed by the primary consumers, which in turn is consumed by the secondary consumers. Thus, if the carbon atoms have passed through three species from a producer it implies the last species would be a tertiary consumer.
- 29.** (b) *Azolla pinnata* is a species of fern known by several common names, including feathered mosquito fern and water velvet. *Azolla pinnata* has been found as an important biofertiliser for paddy crops. Rice farmers sometimes keep this plant in their paddies, because it generates valuable nitrogen via its symbiont, cyanobacteria. The plant can be grown in wet soil and then plowed under, generating a good amount of nitrogen rich fertiliser.
- 30.** (c) Heterotrophic bacteria are the most abundant prokaryotes helpful to human in making curd from milk, e.g. *Lactobacillus*.
- 31.** (c) Biosphere reserve is the site where wild population, traditional lifestyle and genetic resources are protected.
- 32.** (b) II and IV are incorrectly matched pair and can be corrected as
Hotspots are the regions of accelerated habitat loss. These regions are present in Indo-Burma, Western Ghats and Sri Lanka. Sacred groves are found in Khasi hills in Meghalaya.
- 33.** (c) Darwin observed an amazing diversity of creatures on Galapagos island. He realised that there were many varieties of finches in the same island like seed-eating, with altered beaks of insectivorous and vegetarian finches. Carrion are dead bodies, so no finches feed on carrion.
- 34.** (b) In the above diagram, X represents ρ -factor which functions to terminate the process of transcription. Y represents RNA polymerase which catalyse all the three steps, which are initiation, elongation and termination. Z represents nascent RNA which falls off once the polymerases reaches the terminator region.
- 35.** (a) TATA box is a sequence of nucleotides or nitrogen bases present in the core promoter region of the gene. It is a type of promoter sequence, which specifies to RNA polymerase where transcription begins.
- 36.** (a) Proflavine is responsible for the increase in distance between the neighbouring N_2 base-pairs and causes frameshift mutation.
- 37.** (c) The incorrectly matched pair disorder given in option (c). It can be corrected as,
Phenylketonuria is an inborn error of metabolism which is inherited as an autosomal recessive trait. The affected individual with this disorder lacks an enzyme that converts amino acid phenylalanine into tyrosine. As a result, accumulated phenylalanine in brain results in mental retardation.
- 38.** (c) The types of gametes produced can be calculated by 2^n .
Here, n = No. of heterozygotes.
i.e. $2^4 = 2 \times 2 \times 2 \times 2 = 16$ types of gametes.
- 39.** (b) Oparin and Haldane proposed the hypothesis that the early atmosphere, combined with an energy source, produced organic monomer. It was developed in 1920s.

- 40.** (d) In the above pedigree chart, 5th individual have both the antigens on their RBC surface while, 9th individual has O blood group, as it does not have any antigen on the membrane of RBCs.
- 41.** (a) Both A and R are true and R is the correct explanation of A. It can be explained as
The ends of the Fallopian tube close to the ovaries are covered with the finger-like projections called fimbriae. Each of these are covered with tiny hair-like projections called cilia. When an egg cell is released from the ovary, it is swept into the Fallopian tube by the cilia of the fimbriae.
- 42.** (a) Both A and R are true and R is the correct explanation of A. It can be explained as
Golden rice is a variety of rice produced through genetic engineering to biosynthesise β -carotene, a precursor of vitamin-A in the edible parts of the rice. Thus, being rich in vitamin-A, golden rice can prevent night blindness.
- 43.** (a) Both A and R are true and R is the correct explanation of A. It can be explained as
Virus infected cells secrete proteins called interferons, which protects non-infected cells from further viral infection. Thus, interferons help in the elimination of viral infections.
- 44.** (c) A is true, but R is false. R can be corrected as
The Hardy-Weinberg equilibrium state that, in the absence of disturbing factors, the genetic variation in a population will remain constant from one generation to the next. Hence, the allelic frequencies remains constant.
- 45.** (a) Both statement I and statement II are correct. It can be explained as
The patent on basmati rice should not have gone to an American company as, it is a variety that traditionally belongs to India. The patented variety of basmati rice was derived from the Indian farmer's variety and before the invention of recombinant DNA technology, insulin was obtained from slaughtered cattle and pigs.
- 46.** (c) Statement I is correct, but statement II is incorrect. Incorrect statement can be corrected as
Natural selection is a process in which variations are enabling better survival and the species can reproduce and leave a greater number of progenies.
- 47.** (d) Statements II and IV are incorrect and can be corrected as
Genetic maps of chromosomes are based on the frequency of genetic recombination.
Viral genome incorporated into host DNA is called prophage. Prophages are a major source of new genes and often, of new functions in bacterial genomes.
- 48.** (c) Gonorrhea is a sexually transmitted disease which is caused by bacterium *Neisseria gonorrhoeae*. It has symptoms like burning sensation during urination, pain around genitalia, etc.
- 49.** (b) Syphilis is a bacterial STD that is spread from the infected person to a healthy person through a syphilitic sore. It is caused by a bacterium *Treponema pallidum*.
- 50.** (b) The direct gram-staining of a urethral discharge from males with urethritis is a rapid and sensitive screening test for *Neisseria gonorrhoeae* infection.