

**GENERAL INSTRUCTIONS :**

- There are a total of 27 questions and five sections in the question paper. All questions are compulsory.
- **Section – A** contains question numbers 1 to 5, multiple choice questions of one mark each.
- **Section – B** contains question numbers 6 to 12, short answer type I questions of two marks each.
- **Section – C** contains question numbers 13 to 21, short answer type II questions of three marks each.
- **Section – D** contains question numbers 22 to 24, case – based short answer type question of three marks each.
- **Section – E** contains question numbers 25 to 27, long answer type questions of five marks each.
- There is no overall choice in the question paper. However, internal choices are provided in two questions of one mark, one question of two marks, two questions of three marks and all three questions of five marks. An examinee is to attempt any one of the questions out of the two given in the question paper with the same question number.

**SECTION A**

1. In majority of sexually reproducing organisms, the gametes are  
(a) isogametes (b) homogametes (c) hemigametes (d) heterogametes

**OR**

Autogamy is defined as the

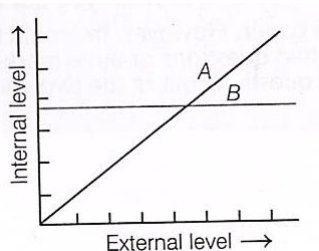
- (a) Transfer of pollen grains from the anther to the stigma of the same flower.
  - (b) Transfer of pollen grains from the anther to the stigma of the different flower.
  - (c) Maturation of anther and stigma at different times.
  - (d) Dehiscence of anther and release of pollen grains
2. Activated sludge should have the ability to settle quickly so that it can
- (a) be rapidly pumped back from sedimentation tank to aeration tank.
  - (b) Be discarded and anaerobically digested
  - (c) Absorb colloidal organic matter
  - (d) Absorb pathogenic bacteria present in waste water while sinking to the bottom of the setting tank.

**OR**

AIDS is caused by HIV. Among the following, which are the modes of transmission of HIV?

- (a) Transfusion of contaminated blood (b) Shaking hands with infected people
  - (c) Sexual contact with infected people (d) Sharing of food with infected people
3. A bacterial cell was transformed with a recombinant DNA that was generated using a human gene. However, the transformed cell did not produce the desired protein. Reason could be.
- (a) human protein is formed but degraded by bacteria
  - (b) human gene may have intron which bacteria cannot process
  - (c) amino acid codons for humans and bacteria are different
  - (d) all of the above

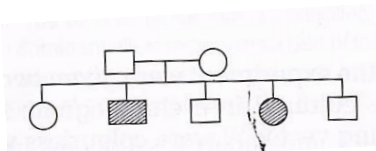
4. Identify organisms A and B that are shown in the diagram if organismic response below



- (a) Organism A – Conformer; Organism B – Regulator
  - (b) Organism A – Regulator ; Organism B – Partial regulator
  - (c) Organism A – Conformer; Organism B – Partial regulator
  - (d) Organism A – Partial regulator ; Organism B – Conformer
5. An antibiotic resistance gene in a vector usually helps in the selection of
- (a) recombinant cells
  - (b) competent cells
  - (c) transformed cells
  - (d) None of these

**SECTION B**

6. A lake near a village is suffering from heavy mortality of fishes within the last few days. Consider the following reasons for this.
- I. Lots of urea and phosphate fertilisers were used in the crops in the vicinity.
  - II. the area was sprayed with DDT by an aircraft.
  - III. the lake water turned green and stinky.
  - IV. Phytoplankton populations in the lake declined initially thereby greatly reducing photosynthesis.
- Which of the above given reasons can be reconciled together to explain the main cause of fish mortality in the lake?
7. The pedigree chart given below shows a particular trait which is absent in parents but presents in the next generation irrespective of sexes. Draw your conclusion on the basis of the pedigree.



- 8. Sterilisation techniques are generally considered as the full proof contraceptive method with least side effects. Then, why couples keep this as the last option for contraception?
- 9. A haploid organism produces gametes by mitosis. Does that mean, meiosis never occur in such organism? Explain.

**OR**

Human placenta acts a structural and functional unit between the foetus and maternal body. Explain the statement by giving any two basic functions it performs.

- 10. How are sticky ends formed on a DNA strand? Why are they so called?
- 11. Suggest why only 1% of the genetic information gets transcribed into functional RNA sequences in most of the mammalian cells.
- 12. Due to improper functioning, thymus gland was removed from the body of a 15 - year -old person. Can you predict the effects that will be observed in the immune functions of this individual?

**SECTION C**

13. Students while performing the experiment were given two different vectors for two different bacterial colonies that were cultured in a chromogenic substrate, they observed that the bacterial colonies with cloning vector ‘A’ were colourless while those with cloning vector ‘B’ were blue in colour. Explain the phenomenon and the procedure behind the change in colour.

**OR**

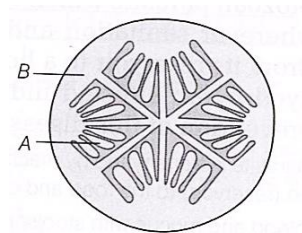
A mixture of fragmented DNA was electrophoresed in an agarose gel. After staining the agarose gel with ethidium bromide, no DNA bands were observed. What could be the reason?

14. A non – haemophilic couple was informed by doctor that there is a possibility of a haemophilic child to be born to them. Suggest and substantiate the basis on which doctor conveyed this information. Also, identify the genotype of parents.

**OR**

In pea plants, the colour of the flower is either violet or white, whereas human skin colour shows many gradations. Explain giving reason, how it is possible.

15. (i) list any two conditions on which the development of a diploid cell depends.  
 (ii) if the number of chromosomes present in the meiocyte of a plant is 24, then workout the number of chromosomes in the gamete and zygote of this plant.
16. Refer to the diagram given below and answer the questionsthat follows.



- (i) Label the parts A and B.  
 (ii) Which parts of flowers develop into seed and fruit?  
 (iii) What is the function of both the labelled parts?
17. (i) Female reproductive organs and associated functions are given below in column I and column II. Fill in the blanks.

<b>Column I</b>	<b>Column II</b>
Ovaries	Ovulation
Oviduct	(i)
(ii)	Pregnancy
Vagina	(iii)

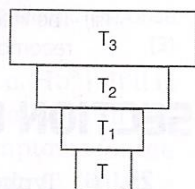
(ii) state the function of the following

- (a) Acrosome                      (b) Sperm tail

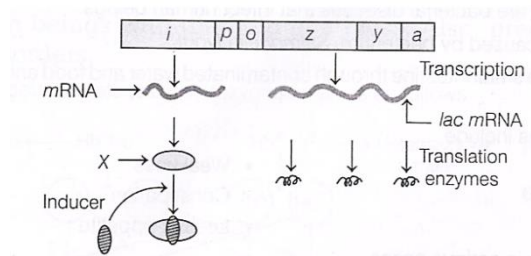
18. When Ankit was diagnosed with AIDS, his colleagues wanted him to leave the workplace due to the fear of spread of AIDS. However, his boss was against their decision. He called a counsellor to setup a meeting with people to clear their misconceptions.
- (i) give the expanded form and causative agent of AIDS.
- (ii) How does transmission of AIDS occur?
- (iii) According to your view, demand of Ankit's colleagues is valid or not? Provide plausible reasons for the same.
19. *Endamoeba histolytica* is a protozoan parasite which causes amoebic dysentery in man. This parasite occurs worldwide wherever sanitation and hygiene are poor. Comment on the transmission of this parasite from its reservoir to a host. Also, identify the symptoms of this disease which will be displayed by an affected individual. What will be your advice for measures to be adopted for prevention of this disease?
20. Appraise yourself with the measures that Indian government has taken to control the vehicular air pollution in Delhi and other cities of India such as introduction of CNG and other alternate fuels, EURO norms, emission regulations, etc. can you compile in your own words, some of the positive outcomes of these regulations on the environment?
21. New species are evolving in a short time scale of months or few years rather than the million years due to increasing anthropogenic actions. Create a situation using an example to predict the outcome of these actions on the evolutionary process.

**SECTION D**

22. The diagrammatic illustration of connection between different trophic levels is given alongside.

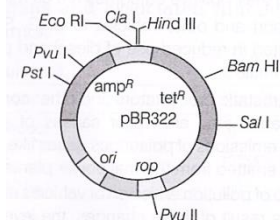


- (i) Identify the type of ecological pyramid and explain what do the base and the apex of this pyramid indicate?
- (ii) Give examples of such type of ecological pyramids with respect to number and biomass.
23. Study the figure given below and answer the following questions.



- (a) identify the molecule 'X' synthesised by 'i' gene. How does this molecule get inactivate?
- (b) Identify the structural gene that codes for  $\beta$  – galactosidase.
- (c) When does the transcription of this gene get stopped?

24.



With reference to the above diagram of E. Coli cloning vector pBR322, answer the following questions.

- (i) In E. Coli cloning vector pBR322, a foreign gene segment is to be introduced into the amp<sup>R</sup> region. From the restriction enzymes given below, which one you would probably use and why? Bam H1, Sal I, Pvu II, Eco RI.
- (ii) Highlight the reasons for why could not you choose the other remaining restriction enzymes for your work.
- (iii) How will the insertion of this enzymes aid in RDT process?

**SECTION E**

- 25. (i) typhoid and pneumonia are bacterial disease that infect human beings. Mention their causative agents and symptoms. Also, mention the way in which both the pathogens infect the human body.

**OR**

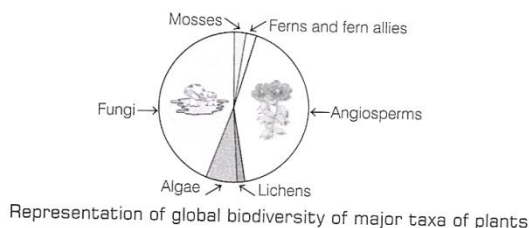
What is an antibody? Give its structure and mention its different types.

- 26. A single mutant allele is responsible for the abnormal form of haemoglobin (i.e. Hb<sup>S</sup>). If it is present in a homozygous state (Hb<sup>S</sup>Hb<sup>S</sup>), person develops sickle – cell anaemia, but if the allele is found in heterozygous state (Hb<sup>A</sup>Hb<sup>S</sup>), the person only shows few symptoms for the disease. On the basis of the above situation, work out a cross for a condition in which a woman, who is homozygous for allele marries a male who is heterozygous for the allele. Assess the probability of having a normal or a diseased child for each of her pregnancies. Also, analyse the advantage that is conferred by the heterozygous condition of gene Hb<sup>S</sup>.

**OR**

Haemophilia and colour blindness are sex – linked recessive disorders determined by the alteration or mutation in the single gene. Evaluate the pattern of inheritance of both disorders in human beings with the help of a cross. Also, predict the type of inheritance shown by these disorders.

- 27. Given below is the type of global biodiversity representing proportionate number of species of major taxa of plants. Observe it carefully and answer the questions that follow.



- (a) Identify the most endangered group of plants among all categories.
- (b) What may be the reason behind such less population of mosses and ferns?
- (c) Name the most advanced and the most primitive group of plants in the biodiversity given above.
- (d) Fungi, in spite of being heterotroph are able to sustain themselves as a large population. Explain.

**OR**

With the help of a flowchart, explain what are the various major approaches to conserve biodiversity.