Sample Question Paper
Class XII (2017-18)
Biology (044)

Time allowed: 3hrs. **Maximum Marks: 70**

General Instructions:

1. **There are a total of 26 questions and five sections in the question paper. All questions are compulsory.**
2. **Section A contains question number 1 to 5, Very Short Answer type questions of one mark each.**
3. **Section B contains question number 6 to 10, Short Answer type I questions of two marks each.**
4. **Section C contains question number 11 to 22, Short Answer type II questions of three marks each.**
5. **Section D contains question number 23, Value Based Question of four marks.**
6. **Section E contains question number 24 to 26, Long Answer type questions of five marks each.**
7. **There is no overall choice in the question paper, however, an internal choice is provided in one question of two marks, one question 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. A tissue, of a tobacco plant, infected with TMV was used to obtain a new plant. Identify the technique used and reason out the possibility of obtaining a new healthy plant. 1

2. State a method of cellular defense which works in all eukaryotic organisms 1

3. In case of an infertile couple, the male partner can inseminate normally but the mobility of sperms is below 40 percent. Which kind of ART is suitable in this situation to form an embryo in the laboratory conditions, without involving a donor? 1

4. Write the two components of the first artificial recombinant DNA molecule constructed by Cohen and Boyer. 1

5. A cross was carried out between two pea plants showing the contrasting traits of height of the plant. The result of the cross showed 50% of parental characters. Name the type of cross. 1

Section B

6. The alarming population growth is leading to scarcity of basic requirements. Suggest with reasons, any two population control measures other than contraception to address the situation. 2

7. During a cytological study conducted on the chromosomes of the insects, it was observed that only 50% of the sperms had a specific structure after spermatogenesis. Name the structure and write its significance in sex determination of insects. 2

8. To reduce the percentage of population suffering from hunger and malnutrition, microbes are grown on a large scale to act as food supplements. Mention any two microbes used as food supplement and suggest their role. 2

OR

Success rate of artificial insemination in cattle is fairly low. Identify any other technique to improve the successful production of hybrids. State two advantages of this technique.

9. (a) A patient who had an organ transplant was given cyclosporin– A. Mention the microbial source and state the reason for administration of this bioactive molecule. 2
   (b) Bottled fruit juices bought from the market are clearer as compared to those made at home. Give reason.

10. Evaluate the effect of loss of biodiversity in a region. Mention any four such effects. 2

Section C

11. Draw the diagram of microsporangium of an Angiosperm and label any four parts State the function of its innermost wall layer. 3

12. Give reason : - 3
   (a) A liverwort plant is unable to complete its life cycle in a dry environment.
   (b) Number of male gametes produced is much more than the female gametes produced.
   (c) Organisms exhibiting external fertilization show great synchrony between the sexes and release a large number of gametes into surrounding medium.

13. (a) Name the different gases contained in the flask used as an experimental setup by S.L. Miller. 3
   (b) On the basis of composition of gases in this experiment, what was the condition in the flask?
   (c) Write the conclusion drawn from this experiment.

14. When a snapdragon plant bearing pink colour flower was selfed, it was found that, 69 plants were having red coloured flowers. What would be the number of plants bearing pink flower and white flower. Show with the help of Punnett square. Identity the principle of inheritance involved in this experiment 3

15. Refer to the figure given below and answer the questions that follow:

Wolf Tasmanian wolf

(a) Explain the process by which Tasmanian wolf evolved.
(b) Name the process that has resulted in evolution of wolf and Tasmanian wolf. 1+1+1
(c) Compare and contrast the two animals shown?

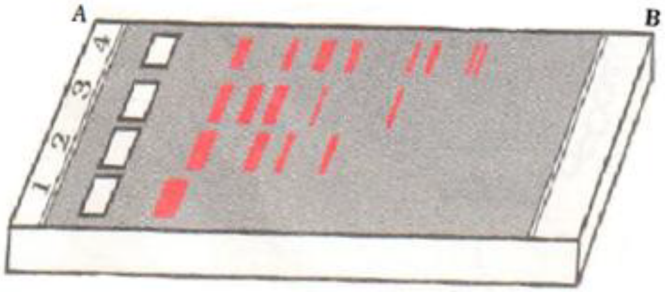
16. Your classmate complains of headache and cough. On the basis of certain symptoms, the doctor confirms that he is suffering from Pneumonia and not common cold. List these symptoms. Mention any two precautions to be followed to prevent the spread of this disease. 3

17. Cow dung and water is mixed and this slurry is fed into the biogas plant for digestion by microbes. The person performing the process shares that there is no need to provide any inoculum for it. Give reason. What is the role of microbes at the source? Under which condition will they be most active and effective? 3

18. A person is born with a weakened immune system due to deficiency of an enzyme which is a hereditary disease. Suggest a technique to completely cure this disease, identify the deficient enzyme and explain the technique used, for cure. 3

19. A doctor prescribed morphine as a sedative and pain killer to your cousin who had undergone a surgery. Even after recovery, he indiscriminately took the medicines and later craved for the same. What do you conclude about his condition? What measures will you suggest to him to overcome this problem? Briefly explain any two. 3

20. Given below is the diagram of agarose gel kept under UV light: 3



(a) Mention the positive and negative terminals.
(b) What is the charge carried by DNA molecule and how does it help in its separation?
(c) How are the separated DNA fragments finally isolated?

1+1+1

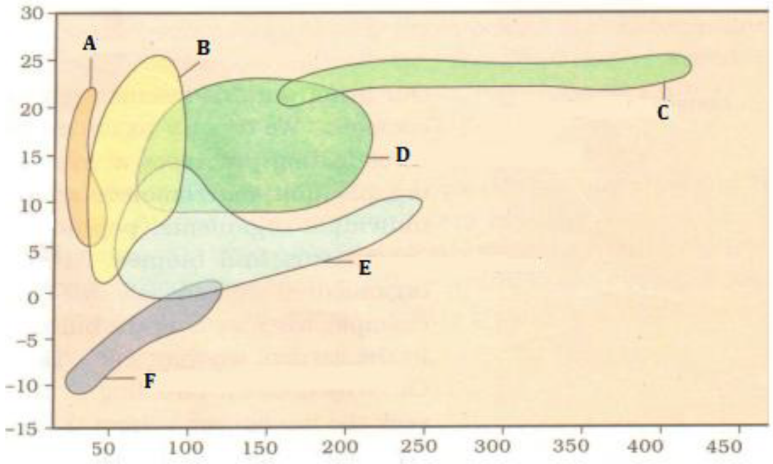
OR

*CrylAb*is introduced in a plant to prevent infestation by corn borer.
(a) What is the resultant plant referred as?
(b) Summarize the action of the gene introduced

½ +2½

21. (a) In pBR322, foreign DNA has to be introduced in tet^Rregion. From the restriction enzymes given below, which one should be used and why: PvuI, EcoRI, BamHI 2+1
(b) Give reasons, why the other two enzymes cannot be used.

22. The graph given below shows the distribution of biomes: 1+1+1



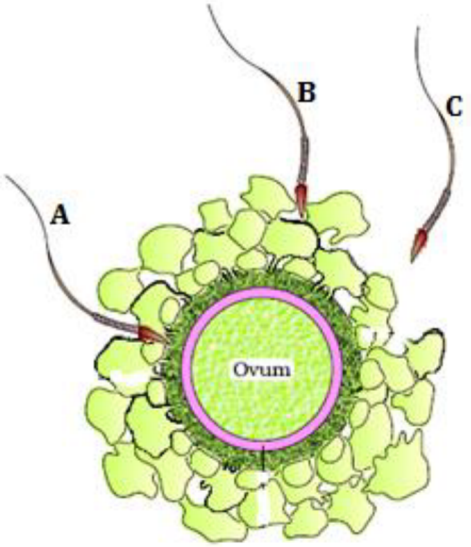
(a) What do the 'X' and 'Y' axis represent?
(b) Identify the 'grassland' and 'coniferous forest' biomes, from the above figure.
(c) Why is 'F' located at the given position in the graph?

Section D

23. A son persuades his father to replace his old mobile phone with the latest model launched in the market. He also shares the latest features it has and explains how it can be of a help to him in the modern technological world. Father is reluctant in buying a new one and tries to explain about its environmental impact. How do you think, the biologist father would try to convince his son? Justify the arguments of father and son both, by mentioning positive aspects of the behavior displayed by both of them in the situation concerned (three each). 4

Section E

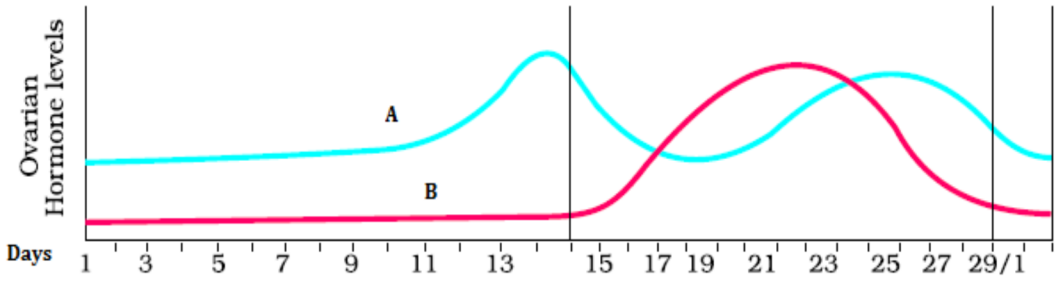
24. Given below is the diagram of a human ovum surrounded by a few sperms. Observe the diagram and answer the following questions: 5



(a) Compare the fate of sperms shown in the diagram.
(b) What is the role of zona pellucid in this process?
(c) Analyze the changes occurring in the ovum during the process.
(d) How is the entry of sperm into the ovum facilitated?
(e) Specify the region of female reproductive system where the event represented in the diagram takes place.

OR

The graph given below shows the variation in the levels of ovarian hormones during various phases of menstrual cycle:



(a) Identify 'A' and 'B'.
(b) Specify the source of the hormone marked in the diagram.
(c) Reason out why A peaks before B.
(d) Compare the role of A and B.
(e) Under which condition will the level of B continue to remain high on the 28thday?

25. Explain the process of protein synthesis from processed m-RNA. 5

OR

Which methodology is used while sequencing the total DNA from a cell? Explain it in detail.

26. Taking the example of a lake as a simple aquatic ecosystem, interpret how various functions of this ecosystem are carried out. Make a food chain that is functional in this ecosystem. 5

5

OR

a) Colonization of a rocky terrain is a natural process. Mention the group of organisms which invade this area first. Give an example.
b) Over the years, it has been observed that some of the lakes are disappearing due to urbanization. In absence of human interference, depict by making a flow chart, how do the successional seres progress from hydric to mesic condition.
c) Identify the climax community of hydrarch and xerarch succession.

1+3½+ ½

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MARKING SCHEME

TIME: 3HOURS **MM:70**

SECTION A

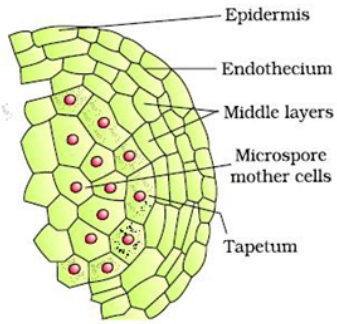
1.	Tissue culture using meristematic tissue as it is virus free	½+ ½ =1
2.	RNA interference	½+ ½ =1
3.	Intra Cytoplasmic Sperm Injection (No marks for abbreviation - ICSI)	½+ ½ =1
4.	The two components are –antibiotic resistant gene and plasmid vector of Salmonella typhimurium.	½+ ½ =1
5.	Test cross	1

SECTION B

6.	Population control measures other than contraception are: - Advertisements in the media, to generate awareness - Statutory raising of marriageable age of the female to 18 years and that of males to 21 years, to delay the number of births - Incentives given to couples with small families, to motivate others to comply (Any two of the above measures with explanation)	2
7.	• X body/ X factor/ X chromosome • In insects the sex chromosome consists of XX female; XO –Males ½ + ½	1+1
8.	Spirulina – Produces large quantities of food rich in protein, minerals, fats, carbohydrates and vitamins. Methylophilus methylotrophus – 250 gm of this microorganism produces 25 tonnes of protein per day 1 x 2 = 2 OR Multiple Ovulation Embryo Transfer Technology 1 increases herd size, in a short time. ½ x 2 = 1	2
9.	a) Source – Trichoderma polysporum Reason – Immuno suppressive agent ½ + ½ b) They are clarified by pectinases and proteases ½ + ½	2

10.	- Decline in plant production/Decline in number of animal species - Lowered resistance to environmental perturbations such as drought - Increased variability in certain ecosystem processes such as plant productivity/ water use / pest & disease cycles - Species may become endangered/increased rate of species extinction	½x4=2

SECTION C

11.	 (Any four of the labels) ½ x 4 = 2 Tapetum nourishes the developing pollen grains 1	3
12.	a) They need water as a medium of gamete transfer for fertilization. b) A larger number of the male gametes fail to reach the female gametes c) To enhance the chances of syngramy	1+1+1
13.	a) CH_4, NH_3, H_2O and H_2 b) Anaerobic / Anoxygenic c) Life come from pro-existing non – living organic malecules and that formation of life was preceded by chemical evolution.	1+1+1
14.	a) There will be 138 pink flower bearning plants and 69 white flower bearing plants. b) Pink (Rr) selfing Gameter / R / r R / RR Red / Rr Pink r / Rr Pink / rr White Phenotypic ratio : red : pink : white 1 : 2 : 1 c) Incomplete dominance	1+1+1
15.	a) Adaptive radiation - The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats). 1 mark b) Convergent evolution1 mark c) Wolf is a placental mammal, whereas Tasmanian wolf is a marsupial mammal 1 mark	3

16.	Doctor confirms pneumonia on the basis of the following symptoms - fever/chills/grey - blue lips and finger nails (any two); ½+½ and not common cold as the following symptoms are not observed - Nasal congestion/sore throat/hoarseness (any two) ½+½ Precautions – 1) Cover the nose when near the patient 2) Do not share glasses and utensils / articles used by the infected person½+½	3
17.	Methanogens are present in Cow dung so there is need to add innoculum.1 mark Breakdown of cellulose1 mark Anaerobic conditions. 1 mark	3
18.	Gene Therapy ½ mark ADA (Adenosine deaminase) deficiency ½ mark Lymphocytes from the blood of the patient are grown in a culture, a functional ADA cDNA is introduced into these lymphocytes, which are subsequently returned to the patient. The permanent cure is done by introducing ADA cDNA into cells at early embryonic stages.2 marks	3
19.	Drug dependence - is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drugs is abruptly discontinued / because of perceived benefits, drugs are frequently used repeatedly from which the person may not be able to get out. 1 mark Measures: - Education and counseling - to face problems and stresses/ to channelize the energy into healthy pursuits like reading, music, yoga and other extracurricular activities - Seeking help from parents - to guide the person appropriately and immediately - Seeking professional and medical help – to help the person to get rid of the problem completely with sufficient efforts and will power (any two) 1 mark each	3
20.	a) Positive terminal - 'B' ½ x 2 = 1 Negative terminal - 'A' b) DNA being negatively charged, moves towards the positive electrode (anode) ½ x 2 = 1 c) By elution - separated bands of DNA are cut out from the agarose gel and extracted from the gel piece ½ x 2 = 1 **OR** a) Bt corn ½ b) Cry I Ab/ Bt toxin gene codes for crystal protein; the Bttoxin protein exists as an inactive protein, but once an insect ingests it, it gets converted into an active form due to the alkaline pH of the gut which solubilizes the crystal. The activated toxin binds to the surface of mid gut and creates pores that cause swelling, lysis and eventually death of the insect. ½ x 5 = 2½	3
21.	a) Bam HI should be used, as restriction site for this enzyme is present in tet^R region 1 mark b) PvuI will not be used, as restriction site for this enzyme is present in amp^R region (not in tet^R) 1 mark	3

	EcoRI will not be used, as restriction site for this enzyme is not present in selectable marker tet^R 1 mark	
22.	a) 'X' axis - Mean annual precipitation (cm) ½ x 2 = 1 'Y' axis - Mean annual temperature (^0C) b) Grassland - B ½ x 2 = 1 Coniferous forest - E c) The mean annual temperature ranges from -12 to 20C (error accepted ± 2) and mean annual precipitation ranges from 10 - 125 cm, these are the optimum conditions in tundra biome ½ x 2 = 1	3

SECTION -D

23.	Father explains that it will lead to generation of e - waste; Difficulty in recycling e - waste / hazardous nature of recycling of e - waste / exposing workers to toxic substances present in e - waste (Any one) 1 Son's wish to update his father with modern techniques, Awareness about trends and technologies, well versed with their applicability in daily life (any other similar / appropriate values) ½ x 3 = 1½ Concern for environment, scientific thinking, inquisitive nature, social awareness, judicious use of money, sense of responsibility (any other similar /appropriate values) ½ x 3 = 1½	4

SECTION –E

24.	a) A is able to penetrate/ fertilize the ovum, whereas B and C are unable to penetrate/ fertilize // B and C will degenerate ½ x 2 = 1 b) Zona pellucida ensures the entry of only one sperm into the ovum 1 c) Induces completion of meiotic division of the secondary oocyte, formation of second polar body and a haploid ovum ½ x 2 = 1 d) Enzymes of acrosome help (½ mark if only 'acrosome' is written) 1 e) Ampullary - isthmic junction of the fallopian tube 1 **OR** a) A - Estrogen ½ x 2 = 1 B - Progesterone b) A - Maturing ovarian follicle / Graafian follicle ½ x 2 = 1 B - Corpus luteum c) Formation of Graaffian follicle (releases estrogen) is followed by the formation of corpus luteum (releases progesterone) 1 d) Role of A (Estrogen) - leads to changes in the ovary and uterus / regeneration of endometrium through proliferation ½ Role of B (Progesterone) - Maintenance of endometrium for implantation of the	5

	fertilized ovum/ maintenance of other events of pregnancy ½ e) In case of pregnancy 1	
25.	For initiation, the ribosome binds to the mature m RNA at the start codon (AUG) that is recognized by the initiator t - RNA. During elongation, charged t RNA sequentially binds to the appropriate codon in m- RNA with the aniticodon present on tRNA. The ribosome moves from one codon to another adding amino acids one after the other to form polypeptide, i.e. translation. During termination, the release factor binds to stop codon (UAA, UAG, UGA), terminating translation and releasing the polypeptide chain. ½ x 10 = 5 **OR** Methodology used - Sequence Annotation - total DNA from a cell is isolated, ½ x 2 = 1 converted into random fragments of relatively smaller sizes ½ and cloned in suitable host using specialized vectors. ½ The cloning results in amplification of each piece of DNA fragment. ½ The fragments are sequenced using automated DNA sequencers, ½ these sequences are then arranged based on some overlapping regions (present in them). ½ This requires generation of overlapping fragments (for sequencing). ½ Specialized computer based programmes are developed, and ½ these sequences are subsequently annotated and assigned to each chromosome. ½	5

26.	i) Productivity - conversion of inorganic into organic material with the help of solar energy by the autotrophs ½ x 2 = 1 ii) Energy flow - unidirectional movement of energy towards higher trophic level (and its dissipation and loss as heat to the environment) ½ x 2 = 1 iii) Decomposition - fragmentation, leaching, catabolism, humification, mineralization by bacteria, fungi and flagellates (abundant at the bottom of lake) ½ x 2 = 1 iv) Nutrient cycling - decomposition of dead matter to release the nutrients back to be re-used by the autotrophs ½ x 2 = 1 Food chain in aquatic ecosystem (lake) 1 Phytoplanktons ⟹ Zooplanktons ⟹ Small fish ⟹ Big fish (Any other appropriate example) **OR** a) Pioneer species, lichen ½ x 2 = 1 b) Phytoplankton - hydric ½ x 7 = 3½ ⇩ Submerged plant stage ⇩ Submerged free floating plant stage ⇩ Reed swamp stage ⇩ Marsh - meadow stage ⇩ Scrub stage ⇩ Forest stage - Mesic c) Forest ½	5