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Your JEE Guide

MP Board Class XII · Biology

Sample Question Paper 2 · Session 2026-27

Time allowed: 3 hours **Maximum marks: 70**

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This is an original practice paper written to the MPBSE 2027 sample question paper pattern; it is not issued by MPBSE.

General instructions:

1. All questions are compulsory.
2. Questions 1 to 5 are objective questions (28 in all): choose the correct option, fill in the blanks, true/false, match the columns and answer in one word or sentence. Each sub-question carries 1 mark.
3. Questions 6 to 12 are very short answer questions of 2 marks each. Answer each in about 30 words.
4. Questions 13 to 16 are short answer questions of 3 marks each. Answer each in about 75 words.
5. Questions 17 to 20 are long answer questions of 4 marks each. Answer each in about 120 words.
6. Internal options are given in questions 13 to 20.
7. Draw neat and labelled diagrams wherever necessary.

1.	**(i)** *Choose the correct option and write it:* The outer wall layer of a pollen grain is the: (a) tapetum (b) intine (c) endothecium (d) exine	1
	(ii) In humans, the blastocyst becomes implanted in the: (a) ovary (b) endometrium of the uterus (c) cervix (d) Fallopian tube	1
	(iii) Which of the following is a Mendelian disorder? (a) Klinefelter's syndrome (b) Down's syndrome (c) phenylketonuria (d) Turner's syndrome	1
	(iv) The antibody found in the largest amount in colostrum is: (a) IgA (b) IgE (c) IgG (d) IgM	1
	(v) Which bacterium is used as a natural vector to transfer genes into dicot plants? (a) Rhizobium (b) Escherichia coli (c) Agrobacterium tumefaciens (d) Lactobacillus	1

	(vi) Which ecological pyramid is always upright? (a) the pyramid of energy (b) the pyramid of numbers (c) none of these (d) the pyramid of biomass	1
2.	**(i)** *Fill in the blanks:* The _____ apparatus guides the pollen tube into a synergid.	1
	(ii) A surge of the hormone _____ in the middle of the menstrual cycle causes ovulation.	1
	(iii) A segment of DNA that codes for a polypeptide is called a _____.	1
	(iv) Ringworm in humans is caused by _____.	1
	(v) The A and B chains of insulin are linked by _____ bridges.	1
	(vi) The number of different species in a region is called its species _____.	1
3.	**(i)** *Write True or False:* Wind-pollinated flowers produce very large amounts of pollen.	1
	(ii) Human females are the heterogametic sex.	1
	(iii) Interferons protect non-infected cells from viral infection.	1
	(iv) Plasmids are found in the nucleus of bacterial cells.	1
	(v) Barnacles growing on the back of a whale is an example of parasitism.	1
	(vi) The Western Ghats is a biodiversity hotspot.	1
4.	Match each disease in column A with its causative organism in column B:	5

Column A	Column B
(i) Typhoid	(a) rhinovirus
(ii) Pneumonia	(b) Streptococcus pneumoniae
(iii) Common cold	(c) Salmonella typhi
(iv) Ascariasis	(d) Microsporum
(v) Ringworm	(e) Ascaris

5.	**(i)** *Answer in one word or one sentence:* Which part of the embryo develops into the shoot?	1
	(ii) Name the once-a-week oral contraceptive pill developed at CDRI, Lucknow.	1
	(iii) Expand HGP.	1
	(iv) Name the technique used to make millions of copies of a DNA segment in the laboratory.	1

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	(v) Which type of conservation is carried out in national parks?	1
6.	Why would apomixis be useful to farmers growing hybrid crops?	2
7.	What is the menstrual cycle? Name its main phases.	2
8.	Distinguish between dominant and recessive characters, with an example.	2
9.	Why is DNA replication called semi-conservative?	2
10.	What is cancer? Name two agents that can cause it.	2
11.	What is gene therapy? Name the first disease for which it was used.	2
12.	Define commensalism and give one example.	2
13.	Name three agents of cross-pollination and give one adaptation of the flowers for each. **OR** Draw a labelled diagram of the longitudinal section of an anatropous ovule.	3
14.	Explain, with a chart, how sex is determined in humans. **OR** What are linkage and crossing over? How do they affect the inheritance of genes?	3
15.	How are antibiotics useful? Name the scientist who discovered penicillin and the fungus that produces it. **OR** What are biofertilisers? Give three examples.	3
16.	Explain natality, mortality and sex ratio as attributes of a population. **OR** Draw the three types of age pyramids of human populations and state what each indicates.	3
17.	Describe the structure of the human female reproductive system. **OR** What is in-vitro fertilisation? Explain any two assisted reproductive technologies.	4
18.	State four salient features of the genetic code. **OR** Describe the double helix model of DNA proposed by Watson and Crick.	4
19.	Explain how human insulin is produced by recombinant DNA technology. **OR** Explain how ELISA and PCR are used in the early diagnosis of diseases.	4

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20.	Distinguish between in-situ and ex-situ conservation. Give two examples of each. **OR** Why is biodiversity important for the stability of ecosystems? Explain the rivet popper hypothesis.	4

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Answers and Marking Scheme

Marks for each step are shown in brackets. Any correct alternative method gets full credit.

Question 1

(i) **(d)** exine. *Working:* The exine is made of sporopollenin.

(ii) **(b)** endometrium of the uterus. *Working:* Implantation takes place in the uterine lining.

(iii) **(c)** phenylketonuria. *Working:* The other three are chromosomal disorders.

(iv) **(a)** IgA. *Working:* IgA in colostrum protects the newborn.

(v) **(c)** Agrobacterium tumefaciens. *Working:* Its Ti plasmid transfers DNA into plant cells.

(vi) **(a)** the pyramid of energy. *Working:* Energy is lost at each step, so each level has less than the one below.

Question 2

(i) filiform.

(ii) LH (luteinising hormone).

(iii) gene (cistron).

(iv) fungi.

(v) disulphide.

(vi) richness.

Question 3

(i) True.

(ii) False: males (XY) are heterogametic.

(iii) True.

(iv) False: bacteria have no nucleus; plasmids lie free in the cytoplasm.

(v) False: it is commensalism; the whale is not harmed.

(vi) True.

4. (i) – (c) Salmonella typhi; (ii) – (b) Streptococcus pneumoniae; (iii) – (a) rhinovirus; (iv) – (e) Ascaris; (v) – (d) Microsporum

Question 5

(i) The plumule.

(ii) Saheli.

(iii) Human Genome Project.

(iv) Polymerase chain reaction (PCR).

(v) In-situ conservation.

6. Hybrid seeds must be bought every year because the hybrid characters segregate in the next generation (1). If hybrids were apomictic, their seeds would keep the hybrid characters, so

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farmers could use their own seed year after year (1).

7. The cyclical changes in the reproductive organs of human females, about 28 days long, from one menstruation to the next (1). Menstrual phase, follicular phase, ovulation and luteal phase (1).

8. A dominant allele expresses itself even in the heterozygote; a recessive one only when homozygous (1). In pea, tall (T) is dominant over dwarf (t): Tt plants are tall (1).

9. Each new DNA molecule has one strand from the parent molecule (1) and one newly synthesised strand (1).

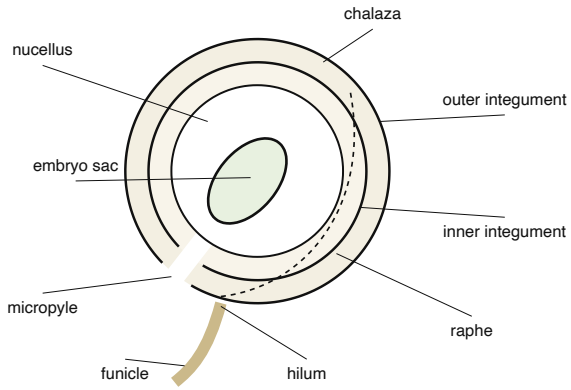
10. Uncontrolled division of cells that may invade other tissues (1). Any two: ionising radiation such as X-rays and γ-rays; UV radiation; chemicals in tobacco smoke; oncogenic viruses (1).

11. Correcting a genetic defect by putting a working gene into the patient's cells (1). Adenosine deaminase (ADA) deficiency (1).

12. An interaction in which one species benefits and the other is neither harmed nor benefited (1). An orchid growing on a mango branch, or barnacles on a whale (1).

13. Wind: light, non-sticky pollen and feathery stigmas (1). Water: pollen carried on or below the water surface; flowers not colourful, e.g. Vallisneria (1). Insects: large, colourful, scented flowers with nectar (1).

OR Diagram showing the funicle, hilum, integuments, micropyle, nucellus, embryo sac and chalaza (3).



14. Females are XX and produce only X eggs; males are XY and produce X and Y sperms in equal numbers (1). Fertilisation by an X sperm gives XX (girl); by a Y sperm, XY (boy) (1). So the chance of either sex is 50%, and the father's sperm decides it (1).

OR Linkage: genes on the same chromosome tend to be inherited together (1). Crossing over: exchange of segments between homologous chromosomes in meiosis, producing recombinants (1). The closer two genes are, the more strongly they are linked and the fewer recombinants form (1).

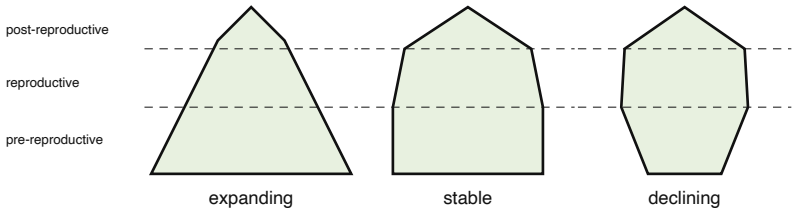
15. Antibiotics kill or stop the growth of disease-causing bacteria, and have greatly reduced deaths from diseases such as plague, whooping cough and diphtheria (1½). Alexander Fleming; Penicillium notatum (1½).

OR Organisms that enrich the nutrient quality of the soil (1). Rhizobium in root nodules of legumes fixes nitrogen; Azotobacter is a free-living nitrogen fixer; cyanobacteria such as Anabaena in paddy fields; mycorrhizal fungi such as Glomus absorb phosphorus (any two) (2).

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16. Natality: the number of births per unit time per individual (1). Mortality: the number of deaths per unit time per individual (1). Sex ratio: the ratio of females to males in the population (1).

OR Diagrams (1½):



Expanding (broad base): a growing population; stable (bell-shaped): no change; declining (urn-shaped): falling population (1½).

17. A pair of ovaries, which produce ova and hormones (1). A pair of Fallopian tubes (oviducts), each with a funnel-shaped infundibulum with fimbriae, an ampulla and an isthmus (1). The uterus, with a wall of perimetrium, myometrium and endometrium, and the cervix opening into the vagina (1). The external genitalia and the mammary glands (1).

OR Fertilisation of the ovum outside the body, followed by transfer of the embryo into the woman (1). ZIFT: an embryo with up to eight blastomeres is transferred into the Fallopian tube (1½). ICSI: a sperm is injected directly into the ovum (or IUI: semen is put into the uterus) (1½).

18. It is a triplet code, three bases making one codon (1). It is degenerate: some amino acids have more than one codon (1). It is unambiguous and universal (with a few exceptions) (1). It is read in a continuous way without punctuation; AUG starts it and UAA, UAG and UGA stop it (1).

OR Two polynucleotide chains run antiparallel, with sugar–phosphate backbones outside (1). The bases pair inside, adenine with thymine (two hydrogen bonds) and guanine with cytosine (three) (1). The chains coil in a right-handed helix of pitch 3.4 nm, with about 10 base pairs per turn (1). The plane of each base pair stacks over the next, stabilising the helix (1).

19. Insulin is made in the body as pro-insulin, which has an extra C-peptide (1). In 1983 Eli Lilly prepared DNA sequences for the A and B chains separately (1) and introduced them into plasmids of E. coli, which made the two chains (1). The chains were extracted and joined by disulphide bonds to form human insulin (1).

OR ELISA is based on the antigen–antibody reaction; it detects the antigens of the pathogen or the antibodies made against it (2). PCR amplifies very small amounts of a pathogen's nucleic acid, so it can detect infections such as HIV even before symptoms appear (2).

20. In-situ conservation protects species in their natural habitats (1). Examples: biosphere reserves, national parks, wildlife sanctuaries, sacred groves (1). Ex-situ conservation protects threatened species outside their habitats (1). Examples: zoos, botanical gardens, seed banks, cryopreservation of gametes (1).

OR Communities with more species tend to be more stable and productive and resist disturbance better (1). Paul Ehrlich compared an ecosystem to an aeroplane and its species to rivets (1). Losing a few rivets may not matter at first, but as more are removed the plane becomes dangerous (1). Losing key species that drive major functions is like removing rivets on the wings (1).

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