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Your JEE Guide

MP Board Class XII · Biology

Sample Question Paper 3 · 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:* Which of these is a false fruit? (a) grape (b) tomato (c) mango (d) apple	1
	(ii) Which of the following is a barrier method of contraception? (a) vasectomy (b) condom (c) oral pill (d) CuT	1
	(iii) The phenotypic ratio in the F_2 generation of a dihybrid cross is: (a) 9 : 3 : 3 : 1 (b) 1 : 1 : 1 : 1 (c) 3 : 1 (d) 1 : 2 : 1	1
	(iv) Which of the following is an autoimmune disease? (a) typhoid (b) AIDS (c) rheumatoid arthritis (d) malaria	1
	(v) The insecticidal Bt toxin is coded by the: (a) nif genes (b) lac genes (c) cry genes (d) ori genes	1

	(vi) Which of the following is an example of in-situ conservation? (a) botanical gardens (b) zoological parks (c) seed banks (d) sacred groves	1
2.	**(i)** *Fill in the blanks:* The formation of seeds without fertilisation is called _____.	1
	(ii) The release of sperms from the seminiferous tubules is called _____.	1
	(iii) A single gene affecting several phenotypic traits is called _____.	1
	(iv) The enzyme that synthesises RNA from a DNA template is _____.	1
	(v) Antibodies are produced by _____-lymphocytes.	1
	(vi) The term biodiversity was popularised by the sociobiologist _____.	1
3.	**(i)** *Write True or False:* The tapetum nourishes the developing pollen grains.	1
	(ii) In a 28-day menstrual cycle, ovulation occurs at about the middle of the cycle.	1
	(iii) Colour blindness is more common in women than in men.	1
	(iv) Methanogens produce biogas.	1
	(v) Restriction enzymes are obtained from viruses.	1
	(vi) Tropical regions have less biodiversity than temperate regions.	1
4.	Match each product in column A with the microbe that produces it in column B:	5

Column A	Column B
(i) Statins	(a) Saccharomyces cerevisiae
(ii) Citric acid	(b) Monascus purpureus
(iii) Cyclosporin A	(c) Streptococcus
(iv) Streptokinase	(d) Trichoderma polysporum
(v) Ethanol	(e) Aspergillus niger

5.	**(i)** *Answer in one word or one sentence:* Name the stalk that attaches an ovule to the placenta.	1
	(ii) Name an IUD that releases copper ions.	1
	(iii) Name the sugar present in RNA.	1
	(iv) Which class of antibody is produced in allergic reactions?	1
	(v) What is the functional role of a species in its habitat called?	1
6.	What are outbreeding devices? Give two examples.	2

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7.	Name the three layers of the wall of the human uterus and state the function of the inner layer.	2
8.	What is a monohybrid cross? Write the phenotypic and genotypic ratios of its F_2 generation.	2
9.	What is a transcription unit? Name its three parts.	2
10.	What is metastasis? Why is it dangerous?	2
11.	What is a selectable marker? Give one example.	2
12.	What does the species–area relationship show? What is Z in it?	2
13.	Describe the development of the embryo in a dicotyledonous plant. **OR** Describe the structure of a microsporangium of an anther.	3
14.	A woman who carries the gene for haemophilia marries a normal man. Show, with a cross, the possible genotypes of their children. **OR** Describe the chromosomal basis and two symptoms of (a) Down's syndrome, (b) Turner's syndrome.	3
15.	How does HIV spread? State three ways of preventing AIDS. **OR** State the role of the thymus, the spleen and the lymph nodes in the immune system.	3
16.	What is mutualism? Explain with the examples of (a) the fig and its wasp, (b) orchids and their pollinators. **OR** How do prey species protect themselves from predators? Give three examples.	3
17.	Describe the post-fertilisation events in a flowering plant. **OR** Describe the process of parturition and the role of hormones in lactation.	4
18.	Describe the process of transcription in bacteria. **OR** State the goals of the Human Genome Project and four of its salient findings.	4
19.	Describe three essential tools of recombinant DNA technology. **OR** Describe two applications of biotechnology in agriculture.	4

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20.	Why should we conserve biodiversity? Give narrowly utilitarian, broadly utilitarian and ethical reasons. **OR** Describe the three levels of biodiversity, with one example of each.	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)** apple. *Working:* In the apple the thalamus also forms part of the fruit.

(ii) **(b)** condom. *Working:* It physically prevents sperm from meeting the ovum.

(iii) **(a)** 9 : 3 : 3 : 1. *Working:* Independent assortment of two gene pairs.

(iv) **(c)** rheumatoid arthritis. *Working:* The immune system attacks the body's own cells.

(v) **(c)** cry genes. *Working:* cry genes from Bacillus thuringiensis.

(vi) **(d)** sacred groves. *Working:* They protect species in their natural habitat.

Question 2

(i) apomixis.

(ii) spermiation.

(iii) pleiotropy.

(iv) RNA polymerase.

(v) B.

(vi) Edward Wilson.

Question 3

(i) True.

(ii) True: around day 14.

(iii) False: it is more common in men.

(iv) True.

(v) False: they come from bacteria.

(vi) False: they have more.

4. (i) – (b) Monascus purpureus; (ii) – (e) Aspergillus niger; (iii) – (d) Trichoderma polysporum; (iv) – (c) Streptococcus; (v) – (a) Saccharomyces cerevisiae

Question 5

(i) The funicle.

(ii) CuT (or Multiload 375).

(iii) Ribose.

(iv) IgE.

(v) Its niche.

6. Mechanisms that discourage self-pollination and encourage cross-pollination (1). Any two: release of pollen and receptivity of stigma not synchronised; anther and stigma at different positions; self-incompatibility; unisexual flowers (1).

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7. Perimetrium (outer), myometrium (middle) and endometrium (inner) (1). The endometrium thickens in each cycle to receive the embryo and is shed in menstruation (1).

8. A cross between parents differing in one pair of contrasting characters (1). Phenotypic ratio 3 : 1; genotypic ratio 1 : 2 : 1 (1).

9. The stretch of DNA that is transcribed into RNA, with its controlling sequences (1). Promoter, structural gene and terminator (1).

10. The spread of cancer cells from a tumour to other parts of the body through blood or lymph (1). New tumours start wherever the cells settle, making the cancer much harder to treat (1).

11. A gene in a vector that helps identify and select the host cells that have taken up the vector (1). A gene for resistance to an antibiotic such as ampicillin or tetracycline (1).

12. Within a region, species richness increases with the area explored, but only up to a limit (1). *Z* is the slope of the line (the regression coefficient) on a log–log graph (1).

13. The zygote divides to form the pro-embryo (1). It passes through globular and heart-shaped stages (1). The mature embryo has an embryonal axis with two cotyledons; the part above the cotyledons is the epicotyl ending in the plumule, and below it the hypocotyl ending in the radicle (1).

OR It is nearly circular in section and surrounded by four wall layers (1): the epidermis, endothecium and middle layers protect it and help dehiscence, and the innermost tapetum nourishes the pollen grains (1). The centre has sporogenous tissue, whose cells form microspore tetrads by meiosis (1).

14. Mother X^HX^h × father X^HY (1). Daughters: X^HX^H (normal) and X^HX^h (carrier) (1). Sons: X^HY (normal) and X^hY (haemophilic), each with a 50% chance (1).

OR (a) An extra copy of chromosome 21 (trisomy 21) (1); short stature, a small round head, a furrowed tongue, partly open mouth, retarded physical and mental development (any two) (½). (b) Absence of one X chromosome, 45 chromosomes (XO) (1); sterile females with rudimentary ovaries and lack of secondary sexual characters (½).

15. By sexual contact with an infected person, transfusion of contaminated blood, sharing infected needles, and from an infected mother to her child through the placenta (1½). Use of disposable needles and syringes; testing of blood before transfusion; safe sex using condoms; education about AIDS (any three) (1½).

OR Thymus: a primary lymphoid organ where T-lymphocytes mature (1). Spleen: filters blood and traps blood-borne micro-organisms (1). Lymph nodes: trap micro-organisms and antigens in the lymph and activate lymphocytes (1).

16. An interaction in which both species benefit (1). (a) The fig is pollinated only by its partner wasp, which in turn lays its eggs in the fig and its larvae feed on the developing seeds (1). (b) Many orchids attract specific pollinators; the Ophrys orchid has a petal resembling a female bee, so male bees pollinate it while trying to mate with it (1).

OR Camouflage, as in some insects and frogs (1). Being poisonous or distasteful, like the monarch butterfly, which takes a poison from its food plant as a caterpillar (1). Plants have thorns,

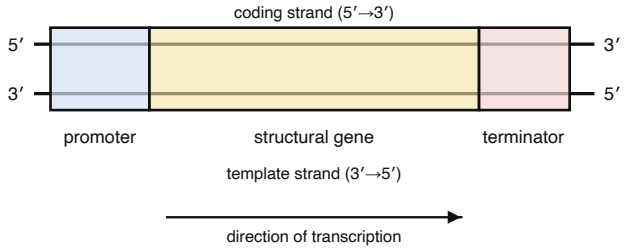
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as in cactus and Acacia, or produce poisonous chemicals such as cardiac glycosides in Calotropis (1).

17. The primary endosperm nucleus divides to form the endosperm, which nourishes the embryo (1). The zygote develops into the embryo (1). The ovule matures into the seed: the integuments form the seed coat and the micropyle remains as a pore (1). The ovary develops into the fruit, its wall becoming the pericarp (1).

OR Signals from the fully developed foetus and the placenta cause mild uterine contractions (foetal ejection reflex) (1). This triggers the release of oxytocin, which causes stronger contractions and the expulsion of the baby (1). The mammary glands start producing milk towards the end of pregnancy (1). The first milk, colostrum, contains antibodies (IgA) that protect the newborn (1).

18. RNA polymerase binds to the promoter, helped by the σ (sigma) factor, to start transcription (1). The DNA unwinds and the enzyme moves along the template strand (3′ → 5′), adding ribonucleotides complementary to it (1). The RNA grows in the 5′ → 3′ direction (1). At the terminator the ρ (rho) factor releases the RNA, and the polymerase leaves the DNA (1).



OR Goals: identify all the human genes and determine the sequence of the 3 billion base pairs (1). Findings: about 3164.7 million base pairs; an average gene has 3000 bases (1); less than 2% of the genome codes for proteins (1); chromosome 1 has the most genes and the Y chromosome the fewest; about 1.4 million single-base differences (SNPs) were found (1).

19. Restriction enzymes cut DNA at specific sites, often leaving sticky ends (1½). Cloning vectors such as plasmids replicate in the host and carry the gene; they have an ori, a selectable marker and cloning sites (1½). Competent host cells, made able to take up DNA, such as E. coli treated with Ca^{2+} (1).

OR Bt crops: genes for Bt toxin make plants such as cotton resistant to insect pests, reducing pesticide use (2). RNA interference: dsRNA from introduced genes silences specific mRNA of a parasite, e.g. tobacco protected from the nematode Meloidogyne incognita (2).

20. Narrowly utilitarian: food, fibre, firewood, construction material and medicines come from nature (1½). Broadly utilitarian: ecosystem services such as oxygen production, pollination and flood control (1½). Ethical: every species has an intrinsic value and we have a moral duty to pass on biodiversity to future generations (1).

OR Genetic diversity: variation within a species, e.g. the many strains of Rauwolfia vomitoria or the thousands of varieties of rice and mango in India (1½). Species diversity: variety of species, e.g. the Western Ghats have more amphibian species than the Eastern Ghats (1½). Ecological diversity: variety of ecosystems, e.g. India’s deserts, rain forests, mangroves, coral reefs and alpine meadows (1).

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