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Your JEE Guide

CBSE Class XII · Biology (044)

Sample Question Paper 1 · Session 2026-27

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

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This is an original practice paper written to the official CBSE 2026-27 design; it is not issued by CBSE.

General instructions:

1. All questions are compulsory.
2. The question paper has five sections and 33 questions.
3. Section A has 16 questions of 1 mark each; Section B has 5 questions of 2 marks each; Section C has 7 questions of 3 marks each; Section D has 2 case-based questions of 4 marks each; and Section E has 3 questions of 5 marks each.
4. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
5. Wherever necessary, neat and properly labelled diagrams should be drawn.

Section A

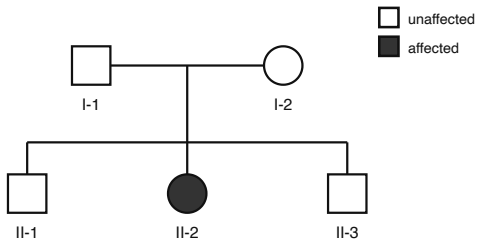
1.	In a flowering plant, the embryo sac develops from the: (A) integuments (B) nucellus (C) functional megaspore (D) megaspore mother cell	1
2.	A typical mature embryo sac of an angiosperm is: (A) 7-celled and 7-nucleate (B) 7-celled and 8-nucleate (C) 8-celled and 8-nucleate (D) 8-celled and 7-nucleate	1
3.	Ovulation in the human female is induced by a surge of: (A) LH (B) FSH (C) relaxin (D) progesterone	1
4.	Fertilisation in humans normally takes place in the: (A) cervix (B) uterus (C) infundibulum of the fallopian tube (D) ampullary region of the fallopian tube	1
5.	Which of the following is a copper-releasing intrauterine device? (A) Lippes loop (B) Saheli (C) Multiload 375 (D) diaphragm	1

6.	A pea plant heterozygous for height (Tt) is crossed with a dwarf plant (tt). The phenotypic ratio of the progeny is: (A) 1 : 1 (B) 3 : 1 (C) 9 : 3 : 3 : 1 (D) 1 : 2 : 1	1
7.	Sickle-cell anaemia is caused by the substitution of: (A) lysine by valine at the sixth position of the β-globin chain (B) glutamic acid by valine at the sixth position of the β-globin chain (C) glutamic acid by valine at the sixth position of the α-globin chain (D) valine by glutamic acid at the sixth position of the β-globin chain	1
8.	The enzyme used to join DNA fragments with matching sticky ends is: (A) exonuclease (B) restriction endonuclease (C) RNA polymerase (D) DNA ligase	1
9.	In the lac operon of E. coli, the inducer is: (A) lactose (B) the repressor protein (C) galactose (D) glucose	1
10.	The thorns of Bougainvillea and the tendrils of Cucurbita are an example of: (A) vestigial organs (B) analogous organs (C) homologous organs (D) convergent evolution	1
11.	The recognition sequence of EcoRI (5′→3′) is: (A) GTCGAC (B) GAATTC (C) AAGCTT (D) GGATCC	1
12.	A national park is an example of: (A) cryopreservation (B) a seed bank (C) ex situ conservation (D) in situ conservation	1
13.	**Assertion (A):** Pollen grains are well preserved as fossils. **Reason (R):** The exine of the pollen grain is made of sporopollenin, one of the most resistant organic materials known. (A) Both A and R are true, and R is the correct explanation of A. (B) Both A and R are true, and R is not the correct explanation of A. (C) A is true but R is false. (D) A is false but R is true.	1
14.	**Assertion (A):** A couple with genotypes I^Ai and I^Bi can have a child with blood group O. **Reason (R):** The alleles I^A and I^B are codominant. (A) Both A and R are true, and R is the correct explanation of A. (B) Both A and R are true, and R is not the correct explanation of A. (C) A is true but R is false. (D) A is false but R is true.	1

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15.	**Assertion (A):** Vaccination is a method of passive immunisation. **Reason (R):** In vaccination, inactivated or weakened pathogens or their antigenic proteins are introduced, which generate memory B and T cells. (A) Both A and R are true, and R is the correct explanation of A. (B) Both A and R are true, and R is not the correct explanation of A. (C) A is true but R is false. (D) A is false but R is true.	1
16.	**Assertion (A):** Agrobacterium tumefaciens is used to deliver desirable genes into many dicot plants. **Reason (R):** Agrobacterium tumefaciens is a virus that infects plant cells. (A) Both A and R are true, and R is the correct explanation of A. (B) Both A and R are true, and R is not the correct explanation of A. (C) A is true but R is false. (D) A is false but R is true.	1

Section B

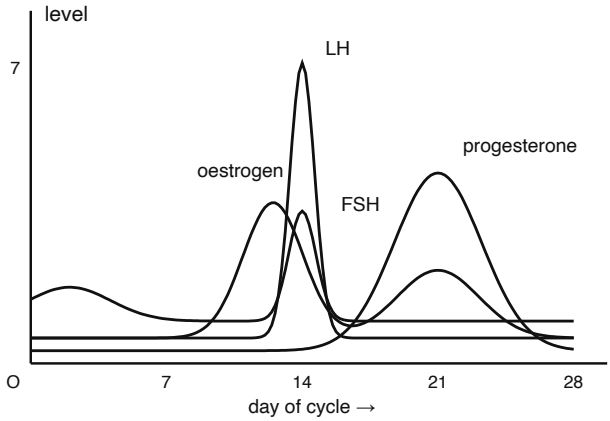
17.	Distinguish between geitonogamy and xenogamy. Which of the two is genetically similar to autogamy, and why? **OR** What is apomixis? Why is it of interest to the hybrid seed industry?	2
18.	Name two hormones that are produced in a woman only during pregnancy. State one function of the placenta other than hormone production.	2
19.	Study the pedigree given below. Is the trait dominant or recessive? Is it autosomal or X-linked? Give a reason for each. 	2
20.	The Bt toxin protein kills certain insects but does not kill the Bacillus thuringiensis bacterium that makes it. Explain. **OR** How has RNA interference been used to make tobacco plants resistant to the nematode Meloidogyne incognita?	2
21.	Define mutualism and commensalism, giving one example of each. **OR** Name the four basic processes that change the density of a population, and write the equation for the population density at time t + 1.	2

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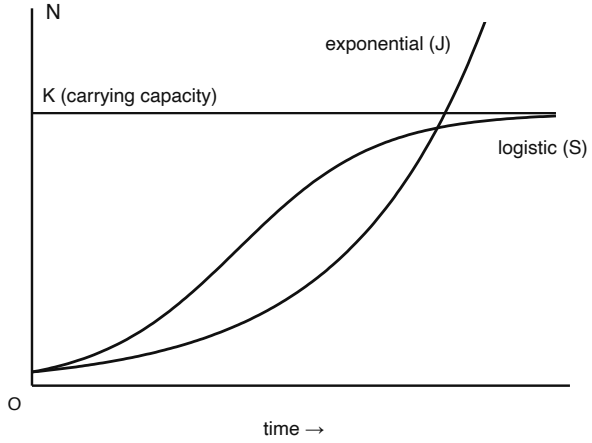
Section C

22.	Describe the hormonal control of spermatogenesis in human males.	3
23.	Give two reasons for performing a medical termination of pregnancy (MTP). During which period is it considered relatively safe? Why is the misuse of MTP a concern?	3
24.	A pea plant with round yellow seeds (RRYY) is crossed with one having wrinkled green seeds (rryy). Give the genotype and phenotype of the F_1, the phenotypic ratio of the F_2, and the law illustrated by this cross.	3
25.	What is the basis of DNA fingerprinting? List the main steps of the technique.	3
26.	Explain how industrial melanism in the peppered moth (Biston betularia) in England supports natural selection.	3
27.	In the life cycle of Plasmodium, name (a) the stage that enters the human body, (b) the toxic substance responsible for the recurring chills and high fever, and (c) the host in which fertilisation of the gametes takes place.	3
28.	What is BOD? Explain the role of microbes in the secondary treatment of sewage.	3

Section D

29.	**Case study.** The graph shows the relative blood levels of four hormones during a 28-day human menstrual cycle in which fertilisation does not occur.  (i) Which hormone shows a sharp peak around day 14, and what does this peak cause? *[1]* (ii) Which hormone is secreted in large amounts by the corpus luteum? *[1]* (iii) What happens to the corpus luteum and to the endometrium after day 24 in this cycle? Why? *[2]* **OR** (iii) Name the phases of the menstrual cycle, and state which hormone mainly drives the growth of the endometrium in the follicular phase. *[2]*	4

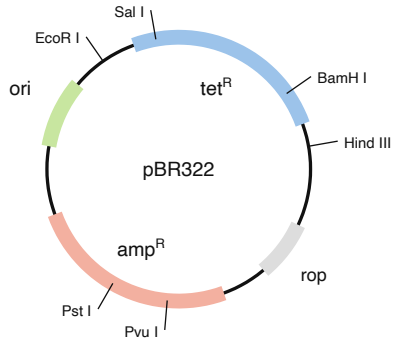
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30.	**Case study.** A biology student plotted two models of population growth. In one model, resources are unlimited; in the other, resources become limiting as the population grows.  (i) Which curve represents growth with unlimited resources? *[1]* (ii) What does K represent? *[1]* (iii) Write the equations for the two models. Which of them is more realistic, and why? *[2]* **OR** (iii) Last year a pond had 20 lotus plants, and 8 new plants were added by reproduction. Calculate the birth rate. *[2]*	4

Section E

31.	(a) Draw a labelled diagram of the mature embryo sac of an angiosperm. (b) Describe double fertilisation. What are the products of syngamy and of triple fusion? **OR** (a) Describe oogenesis in humans from the formation of oogonia to the release of the secondary oocyte. (b) Give two differences between spermatogenesis and oogenesis.	5
32.	(a) Describe the experiment of Meselson and Stahl that proved DNA replication is semi-conservative. (b) Why is replication continuous on one template strand and discontinuous on the other? **OR** (a) Draw a schematic diagram of a transcription unit and label the promoter, structural gene, terminator, template strand and coding strand. (b) Name the three steps of transcription in bacteria. (c) What are capping and tailing of hnRNA in eukaryotes?	5

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33.	The figure shows the E. coli cloning vector pBR322.  (a) State the role of ori and rop. (b) A gene is inserted at the BamH I site. How will you identify the recombinant colonies? (c) Why is selection using a chromogenic substrate and β-galactosidase preferred? **OR** (a) Draw a pyramid of energy for a grassland with four trophic levels. Why is it always upright? (b) What fraction of energy is transferred from one trophic level to the next? (c) Why is the pyramid of biomass in the sea generally inverted?	5

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Answers and Marking Scheme

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

Section A

1. **(C)** functional megaspore. *Working:* Of the four megaspores formed by meiosis, usually one is functional and develops into the female gametophyte (embryo sac).

2. **(B)** 7-celled and 8-nucleate. *Working:* Three antipodals, two synergids, one egg cell and one central cell with two polar nuclei.

3. **(A)** LH. *Working:* The LH surge in the middle of the cycle causes the Graafian follicle to rupture.

4. **(D)** ampullary region of the fallopian tube. *Working:* Sperm and ovum must reach the ampullary region at the same time.

5. **(C)** Multiload 375. *Working:* CuT, Cu7 and Multiload 375 release copper ions; Lippes loop is non-medicated.

6. **(A)** 1 : 1. *Working:* This is a test cross: Tt × tt gives Tt and tt in equal numbers.

7. **(B)** glutamic acid by valine at the sixth position of the β-globin chain. *Working:* A single base change (GAG → GUG) replaces Glu by Val.

8. **(D)** DNA ligase. *Working:* DNA ligase seals the sugar–phosphate backbone.

9. **(A)** lactose. *Working:* Lactose (strictly, its derivative allolactose) binds the repressor and inactivates it.

10. **(C)** homologous organs. *Working:* Both are modified stems: same origin, different functions (divergent evolution).

11. **(B)** GAATTC. *Working:* EcoRI cuts between G and A, leaving sticky ends.

12. **(D)** in situ conservation. *Working:* Species are protected in their natural habitat.

13. **(A)** Both A and R are true, and R is the correct explanation of A. *Working:* Sporopollenin withstands high temperature, strong acids and alkalis, and no enzyme is known to degrade it.

14. **(B)** Both A and R are true, and R is not the correct explanation of A. *Working:* Both are true. The O child (ii) arises because each parent carries the recessive allele i; codominance explains the AB group, not the O child.

15. **(D)** A is false but R is true. *Working:* A is false: vaccination produces active immunity because the body makes its own antibodies. R is true.

16. **(C)** A is true but R is false. *Working:* A is true (its Ti plasmid is used as a vector). R is false: Agrobacterium is a bacterium.

Section B

17. Geitonogamy: transfer of pollen to the stigma of another flower of the same plant. Xenogamy: transfer of pollen to the stigma of a flower on a different plant (1). Geitonogamy is genetically similar to autogamy because the pollen comes from the same plant (1).

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OR Apomixis is the formation of seeds without fertilisation (1). If hybrids are made apomictic, the hybrid characters do not segregate in the progeny, so farmers can keep using the hybrid seed year after year instead of buying new seed each time (1).

18. Any two of hCG, hPL and relaxin (1). The placenta supplies oxygen and nutrients to the embryo and removes carbon dioxide and excretory wastes produced by the embryo (1).

19. Recessive: both parents are unaffected but have an affected child, so the parents are carriers (1). Autosomal: the affected daughter has an unaffected father; for an X-linked recessive trait her father would also have to be affected (1).

20. The toxin is made as an inactive protoxin, so it does not harm the bacterium (½). In the alkaline gut of the insect it is converted to the active toxin (½), which binds to the epithelial cells of the midgut and creates pores, causing the cells to swell and burst, so the insect dies (1).

OR Using Agrobacterium vectors, nematode-specific genes were introduced into the host plant so that both sense and antisense RNA were produced (1). These form double-stranded RNA, which silences the specific mRNA of the nematode, so the parasite cannot survive in the transgenic host (1).

21. Mutualism: both species benefit, e.g. lichens (fungus and alga) or mycorrhiza (1). Commensalism: one species benefits and the other is neither harmed nor benefited, e.g. an orchid growing on a mango branch, or barnacles on a whale (1).

OR Natality (B), mortality (D), immigration (I) and emigration (E) (1). $N_{t+1} = N_t + [(B + I) - (D + E)]$ (1).

Section C

22. At puberty the hypothalamus increases secretion of GnRH, which acts on the anterior pituitary to release LH and FSH (1). LH acts on the Leydig cells and stimulates synthesis and secretion of androgens, which stimulate spermatogenesis (1). FSH acts on the Sertoli cells and stimulates secretion of factors that help in spermiogenesis (1).

23. To end an unwanted pregnancy, e.g. one resulting from failure of contraception or from rape; or when continuing the pregnancy would be harmful or fatal to the mother or the foetus or both (1). It is relatively safe during the first trimester, i.e. up to 12 weeks of pregnancy (1). It is misused for illegal female foeticide, and abortions by unqualified quacks are unsafe and can be fatal (1).

24. F_1: RrYy, all round yellow (1). F_2: round yellow : round green : wrinkled yellow : wrinkled green = 9 : 3 : 3 : 1 (1). Law of independent assortment: the two pairs of alleles segregate independently of each other during gamete formation (1).

25. It is based on DNA polymorphism in repetitive (satellite) DNA, the variable number of tandem repeats (VNTRs), which differ from person to person (1). Steps: isolation of DNA; digestion with restriction endonucleases; separation of fragments by gel electrophoresis; transfer (blotting) to a nylon or nitrocellulose membrane; hybridisation with a labelled VNTR probe; detection by autoradiography (2).

26. Before industrialisation, tree trunks were covered with whitish lichens, so the light-coloured moths were camouflaged and survived better than dark ones (1). After industrialisation, soot killed the lichens and darkened the trunks, so the dark moths were now hidden from predatory birds

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and the light ones were picked off (1). The proportion of dark moths rose: the variant better suited to the changed environment left more offspring, which is natural selection (1).

27. (a) Sporozoites, injected by the bite of an infected female Anopheles mosquito (1). (b) Haemozoin, released when infected red blood cells burst (1). (c) The female Anopheles mosquito, where gametes fuse and develop in its gut (1).

28. BOD (biochemical oxygen demand) is the amount of oxygen that would be consumed if all the organic matter in one litre of water were oxidised by bacteria (1). In aeration tanks, aerobic microbes grow as flocs (bacteria with fungal filaments) and consume the organic matter, greatly reducing the BOD (1). The settled flocs form activated sludge; a part is returned to the aeration tank as inoculum and the rest is digested by anaerobic bacteria in sludge digesters, producing biogas (methane, hydrogen sulphide and carbon dioxide) (1).

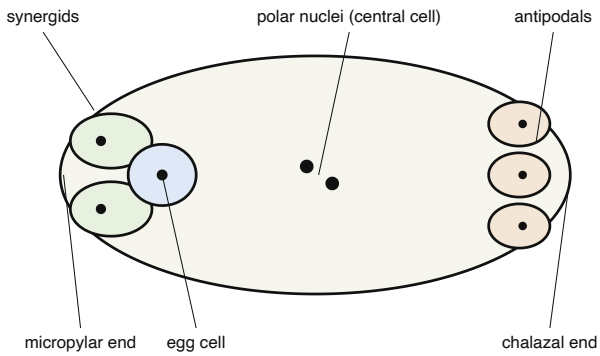
Section D

29. (i) LH; the LH surge induces ovulation (rupture of the Graafian follicle).
(ii) Progesterone.
(iii) Without fertilisation the corpus luteum degenerates, so the level of progesterone falls. The endometrium, which progesterone maintains, then breaks down, and the next menstrual flow begins. **OR** Menstrual, follicular (proliferative), ovulatory and luteal (secretory) phases. Oestrogen, secreted by the growing follicles, drives the regeneration of the endometrium.

30. (i) The exponential (J-shaped) curve.
(ii) The carrying capacity: the maximum population the environment can support.
(iii) Exponential: $\frac{dN}{dt} = rN$. Logistic (Verhulst–Pearl): $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$. The logistic model is more realistic because resources in nature are always finite. **OR** Birth rate = 8/20 = 0.4 offspring per lotus plant per year.

Section E

31. (a) Diagram, labelled: synergids, egg cell, central cell with polar nuclei, antipodals, micropylar and chalazal ends (2), as shown below. (b) The pollen tube releases two male gametes into a synergid. One male gamete fuses with the egg cell (syngamy), forming the diploid zygote (1). The other fuses with the two polar nuclei in the central cell (triple fusion), forming the triploid primary endosperm nucleus (1). As two fusions occur in one embryo sac, the process is called double fertilisation; the zygote develops into the embryo and the PEN into the endosperm (1).

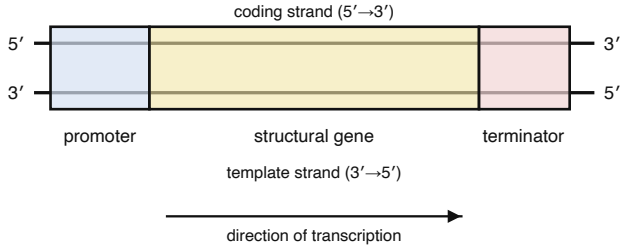


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OR (a) Oogenesis starts during embryonic development, when millions of oogonia form in each foetal ovary; no more are formed after birth (½). Oogonia begin meiosis and are arrested in prophase I as primary oocytes, each surrounded by granulosa cells (primary follicle) (½). Many follicles degenerate, leaving about 60 000–80 000 in each ovary at puberty (½). Primary follicles become secondary follicles (more granulosa layers and a theca) and then tertiary follicles with a fluid-filled antrum (½). The primary oocyte completes meiosis I, forming a large secondary oocyte and a tiny first polar body; the tertiary follicle becomes the mature Graafian follicle, which releases the secondary oocyte at ovulation (1). (b) Any two: one ovum per oogonium against four sperms per spermatogonium; oogenesis begins before birth, spermatogenesis at puberty; oogenesis is cyclic and stops at menopause, spermatogenesis is continuous (2).

32. (a) E. coli was grown for many generations in a medium with $^{15}NH_4Cl$, so its DNA became heavy (^{15}N DNA) (1). The cells were moved to a medium with $^{14}NH_4Cl$ and samples were taken as they divided (every 20 minutes); DNA was separated by CsCl density-gradient centrifugation (1). After one generation all the DNA was of intermediate (hybrid) density; after two generations there were equal amounts of hybrid and light DNA (1). (b) DNA polymerase can add nucleotides only in the 5′→3′ direction (1). So on the template with polarity 3′→5′ synthesis is continuous, while on the other (5′→3′) template it is discontinuous, in short Okazaki fragments later joined by DNA ligase (1).

OR (a) Diagram (2):

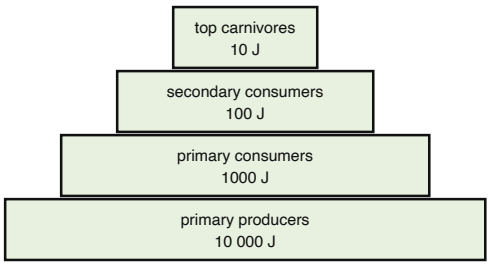


(b) Initiation (RNA polymerase with the σ factor binds the promoter), elongation and termination (with the ρ factor) (1½). (c) Capping: an unusual nucleotide, methyl guanosine triphosphate, is added to the 5′ end of hnRNA. Tailing: 200–300 adenylate residues are added to the 3′ end in a template-independent manner (1½).

33. (a) ori is where replication starts, and it controls the copy number of the plasmid (½); rop codes for proteins involved in the replication of the plasmid (½). (b) The BamH I site lies in the tetracycline-resistance gene, so the insert inactivates it (insertional inactivation) (1). Transformed cells are grown on ampicillin: all transformants grow. Replicas are then grown on tetracycline: recombinants fail to grow on tetracycline but grow on ampicillin (1). (c) With an insert in the β-galactosidase coding sequence, recombinant colonies give no colour (white) on a chromogenic substrate, while non-recombinants give blue colonies (1). Recombinants are identified on a single plate, avoiding the tedious replica plating on two antibiotics (1).

OR (a) Diagram (1½):

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The pyramid of energy is always upright because energy always flows from a lower to a higher trophic level, and some energy is lost as heat at each step (1½). (b) About 10 per cent (1). (c) The biomass of fish is far greater than that of the phytoplankton they depend on, whose standing crop at any time is small although they multiply fast (1).

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