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Your JEE Guide

ISC Class XII · Biology Paper 1 (Theory)

Sample Question Paper 1 · Session 2026-27

Time allowed: 3 hours (plus 15 minutes reading time) **Maximum marks: 70**

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This is an original practice paper written to the CISCE 2027 specimen paper format; it is not issued by CISCE.

General instructions:

1. You are allowed an additional fifteen minutes for only reading the question paper. You must NOT start writing during the reading time.
2. The paper has eighteen questions in all. Answer all questions.
3. There are four sections: A, B, C and D. Internal choices have been provided in two questions each in Sections B, C and D.
4. Section A consists of one question with twenty subparts of one mark each.
5. While answering Multiple Choice Questions in Section A, you are required to write only one option as the answer.
6. Section B consists of seven questions of two marks each. Section C consists of seven questions of three marks each. Section D consists of three questions of five marks each.
7. Diagrams should be drawn wherever necessary, using a pencil only.
8. The intended marks for questions are given in brackets [ ].

Section A (20 marks)

1.	**(i)** Which of the following is an autosomal recessive disorder? (a) sickle-cell anaemia (b) Klinefelter's syndrome (c) haemophilia (d) Down's syndrome	1
	(ii) In a population of 1000 individuals in Hardy–Weinberg equilibrium, 160 show the recessive phenotype (aa). The frequency of allele A is: (a) 0.4 (b) 0.84 (c) 0.6 (d) 0.16	1
	(iii) Which hormone is produced in women only during pregnancy? (a) oxytocin (b) follicle-stimulating hormone (c) luteinising hormone (d) human chorionic gonadotropin (hCG)	1
	(iv) The restriction enzyme EcoRI recognises the palindromic sequence: (a) 5′–GTCGAC–3′ (b) 5′–GAATTC–3′ (c) 5′–GGATCC–3′ (d) 5′–AAGCTT–3′	1

	(v) Which of the following is an example of commensalism? (a) barnacles growing on the back of a whale (b) Balanus and Chthamalus on a rocky shore (c) a fig tree and its pollinating wasp (d) Cuscuta growing on hedge plants	1
	(vi) Given below are two statements marked Assertion and Reason. Read both the statements carefully and choose the correct option. **Assertion:** In the lac operon, lactose acts as an inducer. **Reason:** It binds the repressor protein and prevents it from binding to the operator. (a) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion. (b) Both Assertion and Reason are true, but Reason is not the correct explanation for Assertion. (c) Assertion is true and Reason is false. (d) Both Assertion and Reason are false.	1
	(vii) Given below are two statements marked Assertion and Reason. Read both the statements carefully and choose the correct option. **Assertion:** The concentration of DDT increases at successive trophic levels of an aquatic food chain. **Reason:** DDT is rapidly broken down and excreted by animals. (a) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion. (b) Both Assertion and Reason are true, but Reason is not the correct explanation for Assertion. (c) Assertion is true and Reason is false. (d) Both Assertion and Reason are false.	1
	(viii) Name the stage of Plasmodium that enters the human body when an infected female Anopheles mosquito bites.	1
	(ix) State the function of the filiform apparatus of the synergids.	1
	(x) Expand GEAC and state its role.	1
	(xi) What kind of immunity does colostrum give a newborn baby?	1
	(xii) A double-stranded DNA segment of 200 base pairs contains 120 cytosine bases. How many adenine bases does it contain?	1
	(xiii) In which phase of the menstrual cycle does the corpus luteum form?	1
	(xiv) What does a high BOD of a water body indicate?	1
	(xv) Name the bacterium from which the genes for Bt toxin are obtained.	1
	(xvi) Which codon starts translation, and which amino acid does it code for?	1
	(xvii) A tall pea plant with genotype Tt is self-pollinated. What fraction of the offspring is expected to be dwarf?	1

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	(xviii) Name the fungus from which the immunosuppressant cyclosporin A is obtained.	1
	(xix) Name the technique used to separate DNA fragments according to their size.	1
	(xx) In a pond there are 80 lotus plants. In a year, 8 new plants are added by reproduction. Calculate the birth rate.	1

Section B (14 marks)

2.	A population of 2500 flowering plants is in Hardy–Weinberg equilibrium. 225 plants have white flowers (recessive, aa). Calculate (i) the frequency of the dominant allele, (ii) the number of heterozygous plants.	2
3.	Why is Taq polymerase used in the polymerase chain reaction? Name the three steps repeated in each cycle.	2
4.	Saheli, a once-a-week oral contraceptive, was developed at the Central Drug Research Institute, Lucknow. How do oral contraceptive pills prevent pregnancy? **OR** What is lactational amenorrhoea? State one limitation of relying on it as a contraceptive method.	2
5.	A pea plant heterozygous for round, yellow seeds (RrYy) is crossed with a plant with wrinkled, green seeds (rryy). Write the phenotypic ratio of the offspring. What does the result show?	2
6.	Distinguish between homologous and analogous organs, with one example of each. Which kind of evolution does each show?	2
7.	Why are biofertilisers preferred to chemical fertilisers? Name one cyanobacterium used as a biofertiliser in paddy fields. **OR** Name the product obtained from each microbe and give one use of it: (a) Aspergillus niger, (b) Streptococcus.	2
8.	Why is a pyramid of energy always upright? Roughly what fraction of the energy at one trophic level passes to the next?	2

Section C (21 marks)

9.	Draw a neat, labelled diagram of a human sperm. **OR** Draw a neat, labelled diagram of a mature embryo sac of a flowering plant.	3
10.	Describe the three steps of transcription in a bacterium.	3

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11.	What is insertional inactivation? How does it help in selecting recombinant colonies when the gene for β-galactosidase is used as a marker?	3
12.	Distinguish between exponential and logistic growth of a population. Write the equation for each. What is carrying capacity? **OR** Explain the following interactions with one example each: (a) mutualism, (b) parasitism, (c) amensalism.	3
13.	Describe how HIV multiplies in the human body after infection and how it leads to AIDS.	3
14.	A woman with normal colour vision, whose father was colour blind, marries a colour-blind man. Work out the expected genotypes and phenotypes of their sons and daughters.	3
15.	(a) Why are cleistogamous flowers always self-pollinated? (b) State one advantage and one disadvantage of cleistogamy to the plant. (c) Why are emasculated flowers covered with a bag in artificial hybridisation?	3

Section D (15 marks)

16.	(a) Describe the experiment of Meselson and Stahl and explain how it showed that DNA replicates semi-conservatively. *[3]* (b) Why is one strand at a replication fork synthesised in short pieces? *[2]*	5
17.	(a) Describe the hormonal control of the menstrual cycle. *[3]* (b) What is the role of hCG in early pregnancy? *[1]* (c) Why does menstruation stop during pregnancy? *[1]* **OR** (a) Describe how human insulin was produced by recombinant DNA technology. *[3]* (b) Why is the C-peptide absent from mature insulin? *[1]* (c) Give one advantage of this insulin over insulin from animals. *[1]*	5
18.	(a) State the Hardy–Weinberg principle and name four factors that upset this equilibrium. *[3]* (b) What is the founder effect? *[1]* (c) Give an example of stabilising selection. *[1]* **OR** (a) Write the species–area relationship on a logarithmic scale and state the usual range of the slope Z. *[2]* (b) Describe two causes of loss of biodiversity. *[2]* (c) Give one example each of in-situ and ex-situ conservation. *[1]*	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 (20 marks)

Question 1

(i) **(a)** sickle-cell anaemia. *Working:* Haemophilia is X-linked; the two syndromes are chromosomal disorders.

(ii) **(c)** 0.6. *Working:* $q^2 = 160/1000 = 0.16$, so $q = 0.4$ and $p = 1 - 0.4 = 0.6$.

(iii) **(d)** human chorionic gonadotropin (hCG). *Working:* hCG is made by the placenta.

(iv) **(b)** 5′–GAATTC–3′. *Working:* GGATCC is the BamHI site, AAGCTT is HindIII and GTCGAC is SalI.

(v) **(a)** barnacles growing on the back of a whale. *Working:* The barnacle benefits and the whale is neither harmed nor helped. The others show parasitism, mutualism and competition.

(vi) **(a)** Both Assertion and Reason are true, and Reason is the correct explanation for Assertion. *Working:* With the repressor removed, RNA polymerase can transcribe the structural genes.

(vii) **(c)** Assertion is true and Reason is false. *Working:* DDT is not broken down or excreted easily; it accumulates in fatty tissue, which is why it is biomagnified.

(viii) Sporozoites.

(ix) It guides the pollen tube into the synergid.

(x) Genetic Engineering Approval Committee; it decides on the validity of GM research and the safety of introducing GM organisms for public use.

(xi) Passive (naturally acquired) immunity, through IgA antibodies.

(xii) G = C = 120, so A + T = 400 − 240 = 160 and A = 80.

(xiii) The luteal (secretory) phase.

(xiv) A large amount of biodegradable organic matter, i.e. heavy organic pollution.

(xv) Bacillus thuringiensis.

(xvi) AUG; methionine.

(xvii) One-quarter (tt).

(xviii) Trichoderma polysporum.

(xix) Agarose gel electrophoresis.

(xx) 8/80 = 0.1 offspring per lotus plant per year.

Section B (14 marks)

2. (i) $q^2 = 225/2500 = 0.09$, $q = 0.3$, so $p = 0.7$ (1). (ii) $2pq = 2 \times 0.7 \times 0.3 = 0.42$; $0.42 \times 2500 = 1050$ plants (1).

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3. It comes from the bacterium Thermus aquaticus and is thermostable, so it is not destroyed when the DNA is heated to separate the strands (1). Denaturation, annealing (of primers) and extension (1).

4. They inhibit ovulation and implantation (1), and alter the quality of the cervical mucus so that sperms cannot enter (1).

OR Absence of menstruation (and ovulation) during intense breastfeeding after childbirth (1). It is effective only up to about six months after parturition, and only while the mother breastfeeds fully (1).

5. Round yellow : round green : wrinkled yellow : wrinkled green = 1 : 1 : 1 : 1 (1). The dihybrid forms four kinds of gametes in equal numbers, showing that the two gene pairs assort independently (1).

6. Homologous organs have the same basic structure and origin but different functions, e.g. forelimbs of whales and bats; they show divergent evolution (1). Analogous organs have different structures but the same function, e.g. wings of birds and butterflies; they show convergent evolution (1).

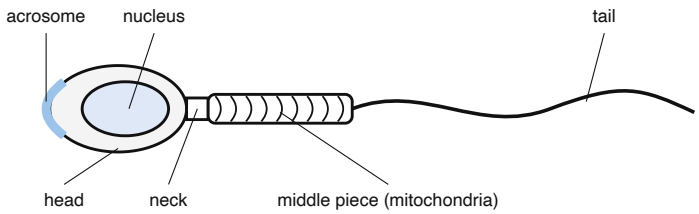
7. They add nutrients such as fixed nitrogen naturally and improve soil fertility without polluting soil and water (1). Anabaena or Nostoc (1).

OR (a) Citric acid, used in food and drinks (1). (b) Streptokinase, used as a “clot buster” to remove blood clots in heart-attack patients (1).

8. At each level much energy is lost as heat in respiration, so less is available to the next level; energy flow is one-way (1). About 10% (the 10 per cent law) (1).

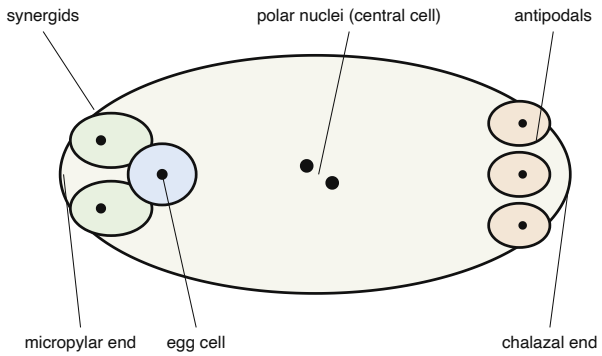
Section C (21 marks)

9. Diagram showing the head with acrosome and nucleus, the neck, the middle piece with mitochondria, and the tail (3).

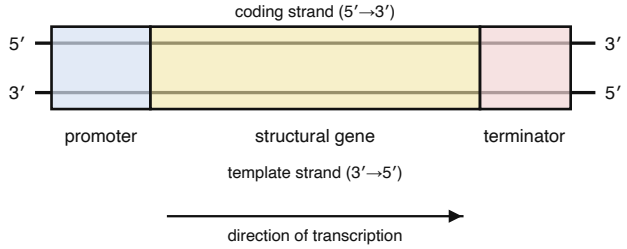


OR Diagram showing the egg apparatus (egg cell and two synergids with filiform apparatus) at the micropylar end, the central cell with two polar nuclei, and three antipodal cells at the chalazal end (3).

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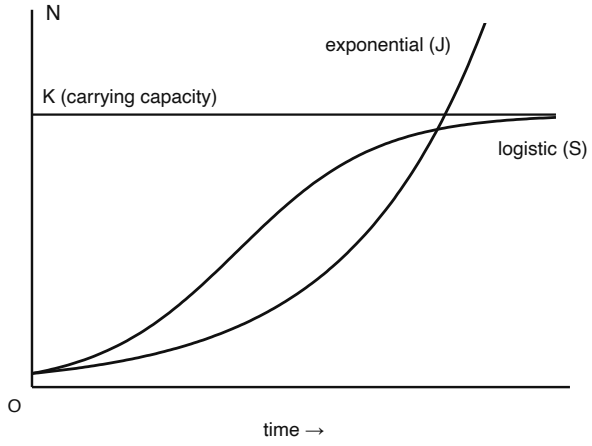


10. Initiation: RNA polymerase, with the σ factor, binds the promoter and starts the process (1). Elongation: the enzyme moves along the template strand, joining ribonucleoside triphosphates complementary to it (1). Termination: at the terminator, the ρ factor causes the enzyme to release the RNA (1).



11. Inserting foreign DNA inside the coding sequence of a marker gene inactivates that gene (1). Colonies with the vector alone make β-galactosidase and turn blue on a chromogenic substrate (1). Recombinant colonies cannot make the enzyme and stay white, so they are easily picked out (1).

12. Exponential growth occurs when resources are unlimited: dN/dt = rN, a J-shaped curve (1). Logistic growth occurs with limited resources: dN/dt = rN(K – N)/K, an S-shaped curve that levels off (1). Carrying capacity (K) is the maximum population that the habitat can support (1).



OR (a) Both species benefit, e.g. the fungus and alga of a lichen (1). (b) One benefits and the other is harmed, e.g. Cuscuta on hedge plants (1). (c) One is harmed and the other is unaffected, e.g. Penicillium inhibiting bacterial growth (1).

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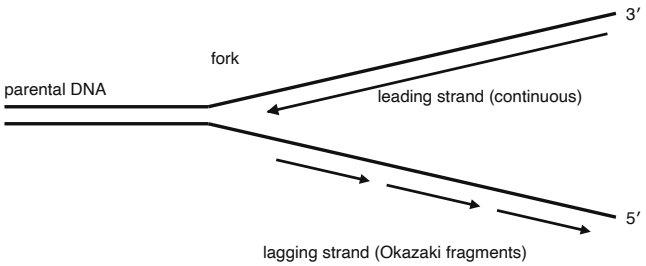
13. HIV enters macrophages, where its RNA is copied into viral DNA by reverse transcriptase and inserted into the host DNA; infected macrophages go on producing viruses (1). The viruses then enter helper T-lymphocytes, multiply and destroy them (1). The number of helper T cells falls steadily, so the person cannot fight even ordinary infections (1).

14. Woman X^cX (carrier) × man X^cY (1). Daughters: X^cX^c (colour blind) and X^cX (carrier, normal vision) in equal numbers (1). Sons: X^cY (colour blind) and XY (normal) in equal numbers (1).

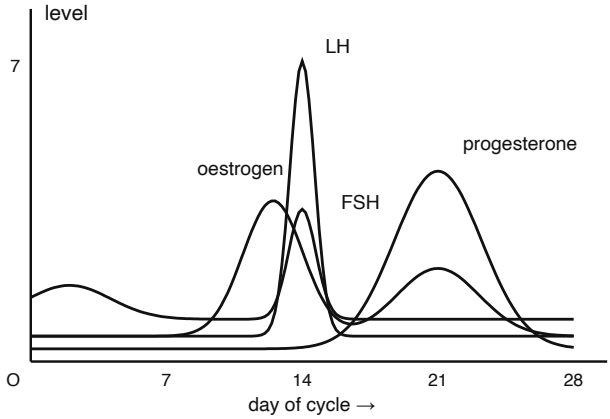
15. (a) They never open, so the anthers and stigma lie close together inside the closed flower (1). (b) Seed is set assuredly even without pollinators; but there is no cross-pollination, so genetic variation is reduced (1). (c) To keep away unwanted pollen, so that only the chosen pollen reaches the stigma (1).

Section D (15 marks)

16. (a) E. coli was grown for many generations in a medium with $^{15}NH_4Cl$, so its DNA became heavy (1). The cells were moved to a ^{14}N medium and DNA extracted after each generation was centrifuged in a CsCl density gradient (1). After one generation all the DNA was of intermediate (hybrid) density; after two generations half was hybrid and half light, as expected if each new molecule keeps one old strand (1). (b) DNA polymerase can add nucleotides only in the 5′ → 3′ direction (1); on the template strand running 5′ → 3′ towards the fork, synthesis is discontinuous, in Okazaki fragments joined by DNA ligase (1).



17. (a) FSH and LH from the pituitary rise in the follicular phase; the growing follicles secrete oestrogen, which rebuilds the endometrium (1). An LH surge in mid-cycle causes ovulation (1). The corpus luteum then secretes progesterone, which maintains the endometrium; without fertilisation it degenerates, progesterone falls and menstruation follows (1).



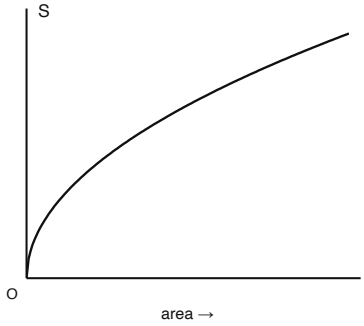
(b) It maintains the corpus luteum and its secretion of progesterone (1). (c) Progesterone levels stay high, keeping the endometrium in place (1).

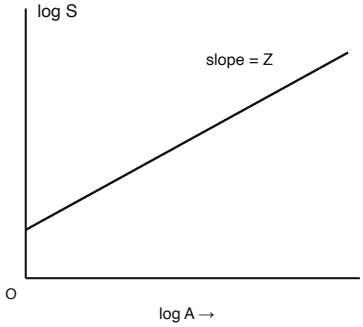
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OR (a) DNA sequences for the A and B chains were prepared separately (1) and introduced into plasmids of E. coli, which made the two chains (1). The chains were extracted and joined by disulphide bonds to give human insulin (1). (b) Insulin is made as pro-insulin, and the C-peptide is removed during maturation (1). (c) It does not cause allergy or other reactions to a foreign protein (1).

18. (a) Allele and genotype frequencies in a large, randomly mating population stay constant from generation to generation, $p^2 + 2pq + q^2 = 1$ (1). Gene migration (gene flow), genetic drift, mutation, genetic recombination and natural selection (any four) (2). (b) When a small group separates from a population, its allele frequencies may differ by chance, and the new population that grows from it carries these differences (1). (c) Human birth weight: babies of medium weight survive better than very light or very heavy ones (1).

OR (a) log S = log C + Z log A, where S is species richness, A area and C the intercept (1). Z is usually 0.1–0.2, but 0.6–1.2 for very large areas such as continents (1).





(b) Habitat loss and fragmentation, e.g. clearing of tropical rain forests (1); over-exploitation, alien species invasion or co-extinctions (1). (c) In-situ: national parks or biosphere reserves; ex-situ: zoos, botanical gardens or seed banks (1).

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