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Your JEE Guide

ISC Class XII · Biology Paper 1 (Theory)

Sample Question Paper 5 · 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 pair of parents can NOT have a child of blood group AB? (a) A and AB (b) O and AB (c) AB and AB (d) A and B	1
	(ii) An mRNA has 300 nucleotides between the start codon (included) and the stop codon (not included). The number of amino acids in the polypeptide it codes for is: (a) 100 (b) 99 (c) 900 (d) 300	1
	(iii) A culture starts with 10^6 bacteria, which divide every 20 minutes. After 2 hours the number of bacteria is about: (a) 3.2×10^7 (b) 1.28×10^8 (c) 6.4×10^7 (d) 1.2×10^7	1
	(iv) In artificial hybridisation, an emasculated flower is covered with a bag to: (a) speed up fertilisation (b) protect the stigma from sunlight (c) prevent the ovary from drying (d) prevent contamination by unwanted pollen	1

	(v) In a pond, a population of 50 frogs had 10 births and 5 deaths in a year. The growth rate of the population, per frog per year, is: (a) 0.3 (b) 0.05 (c) 0.1 (d) 0.2	1
	(vi) Given below are two statements marked Assertion and Reason. Read both the statements carefully and choose the correct option. **Assertion:** E. coli cells carrying pBR322 with a foreign gene inserted into the BamHI site cannot grow on a medium containing tetracycline. **Reason:** The BamHI site lies within the tetracycline-resistance gene, which is inactivated by the insertion. (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:** Heroin is a stimulant drug. **Reason:** Heroin speeds up the functions of the body. (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) The coding strand of a gene reads 5′–ATGCCA–3′. Write the sequence of the mRNA transcribed from this gene.	1
	(ix) The surge of which hormone causes ovulation?	1
	(x) A true-breeding tall, red-flowered plant (TTRR) is crossed with a dwarf, white-flowered one (ttrr). What fraction of the F_2 will be dwarf with red flowers?	1
	(xi) At which stage does the human embryo implant in the uterus?	1
	(xii) What is the minimum number of meiotic divisions needed to form 40 seeds?	1
	(xiii) How many nuclei are there in a mature embryo sac of a typical flowering plant?	1
	(xiv) A man of blood group O marries a woman of blood group AB. Can they have a child of blood group A?	1
	(xv) Which white blood cells does HIV destroy, leading to AIDS?	1
	(xvi) From which plant is “smack” obtained?	1

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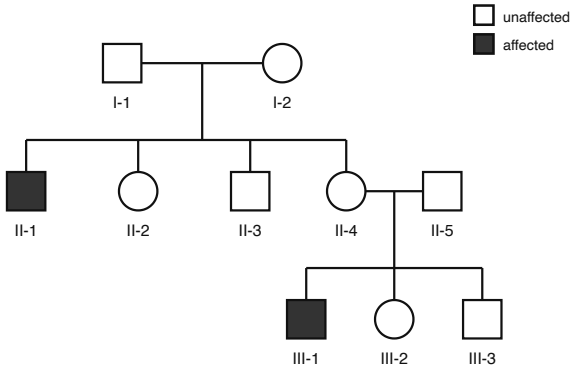
	(xvii) What is the role of the promoter in transcription?	1
	(xviii) In a closed population, the birth rate equals the death rate. How will the population size change?	1
	(xix) Name the insect that pollinates Yucca.	1
	(xx) In which state of India are the sacred groves of the Khasi and Jaintia Hills found?	1

Section B (14 marks)

2.	In one of Mendel's crosses, the F_2 plants had 705 violet and 224 white flowers. What ratio do these numbers show? What does it tell you about the inheritance of flower colour?	2
3.	The template strand of a short DNA segment reads 3′–TACGGATTC–5′. Write the mRNA transcribed from it and the polypeptide it codes for. (AUG = Met, CCU = Pro, AAG = Lys) **OR** Why is the genetic code said to be nearly universal? Give one exception.	2
4.	Why are home pregnancy tests based on detecting hCG in urine?	2
5.	Bacterial cells normally do not take up foreign DNA. Describe two ways of introducing recombinant DNA into host cells.	2
6.	Why are people living near swampy areas more likely to get malaria? State two ways of controlling the spread of the disease. **OR** State two ways in which cancer cells differ from normal cells.	2
7.	When Paramecium aurelia and Paramecium caudatum are grown together in the same culture, one species is eventually eliminated. Explain.	2
8.	Two groups of a species are separated by a mountain range for thousands of years. Explain how they may become separate species.	2

Section C (21 marks)

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9.	Study the family tree given below, in which shaded symbols show affected individuals. (a) Is the trait most likely autosomal recessive, autosomal dominant or X-linked recessive? Give a reason. (b) Write the genotypes of I-2 and II-4.  **OR** In a sample of 400 people, 120 had blood group M (MM), 200 had MN and 80 had N (NN). The alleles M and N are codominant. Calculate the frequencies of the alleles M and N, and check whether the population is in Hardy–Weinberg equilibrium.	3
10.	State three ways in which genetically modified crops have benefited agriculture. Name the Indian organisation that decides whether GM crops can be released.	3
11.	After the first dose of a vaccine the antibody level in the blood rises slowly and stays low; after a booster dose it rises quickly to a much higher level. Explain, naming the cells involved.	3
12.	In IVF, how does ZIFT differ from IUT? Give one reason why a couple may need these techniques. **OR** Describe the process of parturition and the role of hormones in it.	3
13.	Copy and complete the table, using +, – or 0 to show the effect of each interaction on species A and B: mutualism, competition, predation, parasitism, commensalism, amensalism.	3
14.	The gene for a protein is 5 kb long, but the mature mRNA that codes for it is only 1.5 kb. Explain why.	3
15.	Explain the role of microbes in the making of (a) Swiss cheese, (b) Roquefort cheese, (c) bread dough.	3

Section D (15 marks)

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16.	Two pea plants heterozygous for round, yellow seeds (RrYy) are crossed and give 1600 seeds. (a) Calculate the expected number of seeds of each phenotype. *[2]* (b) How many of the round, yellow seeds are expected to be true-breeding? *[1]* (c) How would these numbers change if the two genes were tightly linked on the same chromosome? *[2]*	5
17.	(a) Describe the steps of artificial hybridisation in a bisexual flower. *[2]* (b) Why is pollen storage important in breeding wheat? *[1]* (c) What is polyembryony? How does it arise in Citrus? *[2]* **OR** (a) Describe the major features of foetal development at the end of the first month, the first trimester and 24 weeks of pregnancy. *[3]* (b) What is the foetal ejection reflex? *[2]*	5
18.	(a) Describe the three steps of the polymerase chain reaction, including the conditions of each. *[3]* (b) Why is PCR useful for diagnosing infections at an early stage? *[2]* **OR** (a) Describe three examples of harm caused by alien species introduced into new areas. *[3]* (b) Why are the Amazon rain forests called “the lungs of the planet”? *[2]*	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) **(b)** O and AB. *Working:* An AB child needs I^A from one parent and I^B from the other; a group O parent (ii) can give only i.

(ii) **(a)** 100. *Working:* Each codon of three nucleotides codes for one amino acid: 300/3.

(iii) **(c)** 6.4×10^7. *Working:* Six doublings in 120 minutes: $10^6 \times 2^6$.

(iv) **(d)** prevent contamination by unwanted pollen. *Working:* Only the chosen pollen should reach the stigma.

(v) **(c)** 0.1. *Working:* (10 − 5)/50 = 0.1.

(vi) **(a)** Both Assertion and Reason are true, and Reason is the correct explanation for Assertion. *Working:* Insertional inactivation of tet^R is used to identify recombinants.

(vii) **(d)** Both Assertion and Reason are false. *Working:* Heroin (smack) is a depressant and slows down body functions; both statements are false.

(viii) 5′–AUGCCA–3′.

(ix) Luteinising hormone (LH).

(x) 3/16.

(xi) The blastocyst stage.

(xii) 50: 40 for the 40 embryo sacs and 10 for the 40 pollen grains.

(xiii) Eight (in seven cells).

(xiv) Yes; the child can be I^Ai (or I^Bi, group B).

(xv) Helper T-lymphocytes.

(xvi) The poppy, Papaver somniferum (smack is diacetylmorphine, made from morphine).

(xvii) It provides the binding site for RNA polymerase and decides which strand is the template.

(xviii) It will stay constant (zero growth).

(xix) A moth (the Yucca moth).

(xx) Meghalaya.

Section B (14 marks)

2. 705 : 224 is about 3 : 1 (1). Flower colour is controlled by one gene with two alleles, violet being dominant over white, and the alleles segregate in the F_1 (1).

3. mRNA: 5′–AUGCCUAAG–3′ (1). Polypeptide: Met–Pro–Lys (1).

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OR The same codon codes for the same amino acid from bacteria to humans (1). Exceptions occur in mitochondrial codons and in some protozoans (1).

4. hCG is made only by the developing placenta (trophoblast) after implantation (1). So its presence in urine indicates pregnancy (1).

5. Bacteria are made competent by treating them with Ca^{2+} ions, then given a heat shock (42 °C) after incubation with the DNA on ice (1). Micro-injection directly into the nucleus of an animal cell, or bombarding plant cells with gold or tungsten particles coated with DNA (biolistics, gene gun) (1).

6. Stagnant water is where Anopheles mosquitoes breed (1). Drain or cover stagnant water and introduce fish such as Gambusia that eat mosquito larvae; use mosquito nets and repellents (1).

OR Normal cells stop dividing when they touch other cells (contact inhibition); cancer cells have lost this property and divide uncontrollably (1). Cancer cells can break away and spread to distant parts of the body (metastasis) (1).

7. Both feed on the same limited food in the same habitat, so they compete (1). The superior competitor survives and the other dies out, as stated by Gause's competitive exclusion principle (1).

8. Without gene flow, different mutations, genetic drift and natural selection in different environments make the gene pools of the two groups diverge (1). In time they become reproductively isolated and can no longer interbreed, forming new species (1).

Section C (21 marks)

9. (a) X-linked recessive: only males are affected, and affected sons are born to unaffected parents, the mother being a carrier (1). (b) I-2: X^HX^h (carrier), since her son II-1 is affected (1). II-4: X^HX^h (carrier), since her son III-1 is affected (1).

OR Number of M alleles = 2 × 120 + 200 = 440 of 800, so p = 0.55; q = 0.45 (1). Expected: MM = 0.3025 × 400 ≈ 121, MN = 2 × 0.55 × 0.45 × 400 ≈ 198, NN = 0.2025 × 400 ≈ 81 (1). The observed numbers are very close to these, so the population is in equilibrium (1).

10. Any three: more tolerance to drought, cold, salt or heat; less dependence on chemical pesticides (pest-resistant crops); fewer post-harvest losses; better use of soil minerals; better nutritional value (2). The Genetic Engineering Approval Committee (GEAC) (1).

11. The first exposure gives a primary response: B and T cells that recognise the antigen multiply slowly (1). Some of them become memory B and T cells (1). On the booster dose these memory cells respond quickly and strongly, giving the higher secondary response (1).

12. In ZIFT, a zygote or early embryo with up to eight blastomeres is transferred into the Fallopian tube (1). In IUT, an embryo with more than eight blastomeres is transferred into the uterus (1). Any one: blocked Fallopian tubes, very low sperm count, or other causes of infertility (1).

OR Signals from the fully developed foetus and placenta cause mild uterine contractions: the foetal ejection reflex (1). This triggers the release of oxytocin from the pituitary (1). Oxytocin

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causes stronger contractions, which cause still more oxytocin to be released, until the baby is expelled (1).

13. Mutualism + / +; competition – / –; predation + / –; parasitism + / –; commensalism + / 0; amensalism – / 0 (½ each).

14. Eukaryotic genes are split genes: the coding sequences (exons) are interrupted by non-coding introns (1). The whole gene is first transcribed into hnRNA (1). The introns are removed and the exons joined (splicing), so the mature mRNA is much shorter (1).

15. (a) Propionibacterium sharmanii produces a large amount of CO_2, which forms the large holes (1). (b) Specific fungi grow on it and ripen it, giving its flavour (1). (c) Baker's yeast, Saccharomyces cerevisiae, ferments sugars and the CO_2 produced makes the dough rise (1).

Section D (15 marks)

16. (a) 9 : 3 : 3 : 1 gives round yellow 900, round green 300, wrinkled yellow 300, wrinkled green 100 (2). (b) Only RRYY, 1/16 of 1600 = 100 (1). (c) Linked genes do not assort independently (1); the parental combinations would be much more frequent and the recombinant types (round green, wrinkled yellow) much rarer than expected (1).

17. (a) The anthers are removed from the flower bud before they dehisce (emasculation), and the flower is covered with a bag (1). When the stigma is receptive, pollen from the chosen male parent is dusted on it and the flower is bagged again (1). (b) Wheat pollen loses viability within about 30 minutes, so stored pollen allows crosses to be made when needed (1). (c) The presence of more than one embryo in a seed (1). Some nucellar cells divide and develop into embryos, in addition to the zygotic embryo (1).

OR (a) End of first month: the heart forms (1). End of first trimester: most major organs, limbs and external genital organs are well developed (1). By 24 weeks: the body is covered with fine hair, the eyelids separate and eyelashes form (1). (b) Mild uterine contractions set off by signals from the fully developed foetus and the placenta (1), which lead to the release of oxytocin and childbirth (1).

18. (a) Denaturation: the DNA is heated (about 94 °C) to separate the strands (1). Annealing: the mixture is cooled so that two primers pair with their complementary sequences (1). Extension: a thermostable DNA polymerase (Taq) extends the primers using dNTPs (about 72 °C); repeating the cycle about 30 times multiplies the DNA a billion-fold (1). (b) It can amplify even a tiny amount of a pathogen's DNA or RNA (1), so infection can be detected before symptoms appear, e.g. HIV in suspected AIDS patients (1).

OR (a) The Nile perch introduced into Lake Victoria led to the extinction of more than 200 species of cichlid fish (1). Parthenium, Lantana and water hyacinth (Eichhornia) have spread and threatened native species (1). The African catfish introduced for aquaculture threatens indigenous catfishes (1). (b) They produce a large share of the earth's oxygen by photosynthesis (1); clearing them reduces this and destroys enormous biodiversity (1).

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