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FOR CBSE CLASS 12 PREPARATION

CBSE Class 12 Sample Paper 2027 Solution (Marking Scheme) for Biology

EXAM	YEAR	TYPE	SUBJECT
CBSE Class 12	2027	Solutions	Biology

BIOLOGY CODE NO. 044
MARKING SCHEME
CLASS – XII (2026–27)

Q. No.	Answer	Marks
	Section - A	
1	C. It ensures cross-pollination	1
2	A. Blockage of sperm transport into the ejaculatory duct and urethra	1
3	B. It provides essential nutrients to developing embryo and helps in its implantation.	1
4	C. Directional selection as giraffes with longer neck lengths are selected. *For Visually impaired students* B. Nature selects for fitness.	1
5	D. A - Promoter, B - RNA polymerase, C - Sigma factor, D-DNA helix *For Visually impaired students* B. 5′ (upstream) end and 3′ (downstream) end, respectively of the transcription unit	1
6	A. No transformation *For Visually impaired students* C. Both (A) and (B)	1
7	A. 25% hybrid and 75% light	1
8	B. Sickle cell anaemia *For Visually impaired students* D. Sex-linked recessive	1
9	B. Inflammation or fluid buildup in the lungs	1
10	C. 40,000 bp and $13{,}600 \times 10^{-9}$ m	1
11	C. Ensuring sterile handling, sterilised equipment, and aseptic transfer before and during fermentation.	1
12	C. Adding spores of *Glomus* to the soil	1
13	A. Both **Assertion** (A) and **Reason** (R) are true, and **Reason** (R) is the correct explanation of **Assertion** (A).	1
14	D. A is false but R is true.	1
15	C. A is true but R is false.	1
16	B. Both A and R are true but R is not the correct explanation of A.	1

	Section - B	
17	***Attempt either option A or B.*** A. Geitonogamy involves transfer of pollen grains from the anther to the stigma of another flower of the same plant. (1) Although geitonogamy is functionally cross-pollination involving pollinating agents, genetically it is similar to autogamy since the pollen grains come from the same plant. (1) **OR** B. Mohit can emasculate (remove anthers) from selected flowers before pollen release and then manually pollinate them with pollen from the chosen male parent, followed by bagging. (1) This prevents self-pollination and unwanted pollen and ensures that only the desired cross produces seeds. (1)	2
18	There were in South America mammals resembling horse, hippopotamus, bear and rabbit. Due to continental drift, when South America joined North America, these animals were overridden by North American fauna. (1) Due to continental drift, a number of Australian marsupials, each different from the other, evolved from an ancestral stock, but all within the Australian island continent. These pouched mammals of Australia survived because of lack of competition from any other mammals. (1)	2
19	A. As tumor size increases, glucose levels decrease, suggesting that larger tumors consume more glucose due to higher metabolic demand, possibly indicating a more aggressive growth pattern. (1) B. As tumor size increases, the viability of neighboring cells decreases suggesting that growing tumors create a hostile microenvironment, due to nutrient competition and less oxygen is available leading to stress or death of surrounding normal cells. /As these cells actively divide and grow they also starve the normal cells by competing for vital nutrients. (1)	2
20	***Attempt either option A or B.*** A. I. Normal cow's milk (~0.1 g/L) is least suitable. Reason: Very low α-lactalbumin compared to human milk. (1) II. (i) Going beyond morality genetical modification of organisms can have long term unpredictable results. (ii) patenting for resource (iii) loss of genetic diversity of natural cows (iv) economic exploitation Any one (1) **OR** B. (i) Increased pesticide use due to lack of pest resistance. (ii) Lower yield under abiotic stress conditions. (iii) Faster depletion of soil nutrients due to inefficient mineral usage. Any two (1+1)	2

21	***Attempt either option A or B.*** A. I. Region X will have greater species diversity/Tropical region because Temperatures are near-constant across seasons in X (27–28–27–26 °C), which supports stable conditions / higher diversity/ Higher productivity/GPP 3500/ higher NPP in X vs lower productivity in Y. (1) II. NPP of Region X = GPP − R = 3500 − 1300 = 2200 g/m²/year. Net primary productivity is the available biomass for the consumption to heterotrophs (herbiviores and decomposers) (1) **OR** B. I. P3 → drop of over 50 percentage points without main pollinator/ other plants show comparatively less drop in seed set without pollinator. (1) II. The relationship is Mutualism as both species benefit; here, plants gain pollination and pollinators obtain nectar/food. (1)	2
	Section – C	
22	ART 1: Intracytoplasmic Sperm Injection (ICSI) Justification: ICSI is required to address Male B's low sperm count. It is an advanced procedure to form the embryo in vitro, where a sperm is directly injected into the ovum. (1.5) ART 2: In vitro fertilisation followed by Intrauterine Transfer (IUT) Justification: IVF followed by IUT is required to address Female A's blocked fallopian tubes. Since the natural path for the egg is blocked, the embryo (formed via IVF/ICSI) must be transferred directly to the uterus. (1.5)	3
23	A. Structure P (Zygote) is diploid and Structure Q (Primary Endosperm Nucleus) is triploid. (1) B. The statement is False. The Primary Endosperm Nucleus (PEN/'Q') divides much earlier than zygote ('P') to form the endosperm tissue for nutrition of embryo. (1) C. The cells of endosperm tissue are filled with reserve food materials which act as the primary source of nutrition for the developing embryo. (1) - - - - - - - - - - - - - - - - - - - *For Visually impaired students* A. Zygote/Embryo and Primary Endosperm Nucleus/Endosperm. (1) B. Zygote/Embryo is diploid and Primary Endosperm Nucleus/Endosperm is triploid. (1) C. The Primary Endosperm Nucleus (PEN) divides much earlier than zygote to form the endosperm tissue. The cells of endosperm tissue are filled with reserve food materials which act as the primary source of nutrition for the developing embryo. (1)	3

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A. Female mice: Heterozygous for running (Rr) and brown hair (bb), so its genotype is Rrbb. Male mice: Heterozygous for running (Rr) and heterozygous for black hair (Bb), so its genotype is RrBb.
Possible gametes
Female (Rrbb): Rb, Rb, rb, rb Male (RrBb): RB, Rb, rB, rb (1)
Punnett square
<table>
<tr><th></th><th>RB</th><th>Rb</th><th>rB</th><th>rb</th></tr>
<tr><td>Rb</td><td>RRBb</td><td>RRbb</td><td>RrBb</td><td>Rrbb</td></tr>
<tr><td>Rb</td><td>RRBb</td><td>RRbb</td><td>RrBb</td><td>Rrbb</td></tr>
<tr><td>rb</td><td>RrBb</td><td>Rrbb</td><td>rrBb</td><td>rrbb</td></tr>
<tr><td>rb</td><td>RrBb</td><td>Rrbb</td><td>rrBb</td><td>rrbb</td></tr>
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B. Probable phenotypes of the progeny
Running black (RRBb x 2, RrBb x 4,): 6/16
Running brown (RRbb x 2, Rrbb x 4): 6/16
Walking black (rrBb x 2,): 2/16
Walking brown (rrbb x 2): 2/16 Ratio will be 6:6:2:2 OR 3:3:1:1 (1)
C. 24 will show running black phenotype. (1)
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The disease is caused by a single gene mutation resulting in an inborn error of metabolism where the affected individual lacks an enzyme that converts the amino acid phenylalanine into tyrosine. (1)
As a result of this phenylalanine is accumulated and converted into phenyl pyruvic acid and other derivatives. Accumulation of these in the brain results in mental retardation. (1)
In pleiotropy a single gene can exhibit multiple phenotypic expressions by affecting metabolic pathways in different ways. (1)
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Addiction - – Psychological attachment to effects of drugs/alcohol (½) → driven by desire for euphoria/well-being even when not needed (½). (1)
Dependence – Physical tendency of the body → manifests withdrawal symptoms (anxiety, shakiness, nausea, sweating) when drug is stopped. (1)
Reason for increased intake – Repeated drug use increases tolerance level of body receptors → receptors respond only to higher doses for the same effect. (1)
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I. Certain pathogens naturally have the ability to transfer their DNA into host cells. Scientists have modified these pathogens by removing their disease-causing genes, while retaining their ability to deliver DNA, making them useful cloning vectors. (1)
II. In animals, retroviruses have been engineered to remove cancer-causing genes, while keeping their capacity to integrate DNA into the host genome, making them effective vectors for gene delivery. (1)
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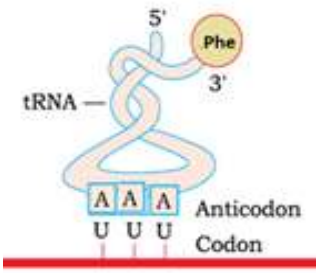
	III. In transgenic plants, nematode-specific genes were introduced via Ti plasmid of *Agrobacterium tumefaciens* to produce dsRNA, which triggered RNA interference (RNAi) and silenced nematode mRNA, protecting the plant from the parasite. (1)	
28	A. If the ant dies too soon, the nematode won't complete its development and won't be transmitted to new hosts. (1) B. Natural selection favors nematodes that keep the ant alive until it can be eaten by a bird, ensuring better dispersal and survival of the nematode. The birds eat only the red-bellied ant. This ensures complete maturation of nematode and its dispersal and protects the other ants from predation. (1) C. Type: Parasitism, Definition: An interaction where one organism benefits and the other is harmed. (1)	3
	Section – D	
29	A. Anaemia due to excessive blood loss. (1) B. Without a distinct LH surge, ovulation may not occur, so no corpus luteum forms to secrete progesterone. As a result, the endometrial lining grows excessively under unopposed estrogen and is then unpredictably or heavily shed, causing irregular and heavy periods. (2) *Attempt either subpart C or D.* C. It suggests lack of ovulation due to hormonal imbalance affecting ovarian function. (1) **OR** D. GnRH secretion from hypothalamus and subsequent LH/FSH secretion from pituitary would be disrupted. (1)	4
30	A. NPV is species-specific and affects only target insect pests, narrow spectrum insecticide; causes no harm to plants, pollinators, mammals, birds, fish, or non-target insects. (1) B. He could have sprayed the spores of Bacillus thuringiensis, in the gut of the larvae, the bacterial toxin is released and the larvae get killed. (2) C. Baculovirus (1) **OR** D. Because it is a biological method for controlling plant diseases and pests. (1)	4
	Section – E	
31	***Attempt either option A or B.*** A. I. The term given to a segment of DNA that codes for a polypeptide is Cistron. (0.5) II. (a) 3'-- TACAAAAAGAAGAAAAAGAAAATT--5'—Point Mutation. (1) (b) 3'—TACAAAAAGAAGAAAAAGAAATT--5'—Deletion / Frameshift mutation. (1)	5

	III. Methionine -Phenylalanine -Phenylalanine -Phenylalanine - Phenylalanine -Phenylalanine –Phenylalanine; 7 amino acids. (2) IV. Degenerate. (0.5) **OR** B. I. AUGACC**GUA**GCGUUU**GUA**UCUUUA**GUA**GUG**GUA**UUA**GUA**GGC Nine amino acids will be translated from the mature or processed RNA. (1) 5'**ACGUCG** ---------- **UAAAAA**3' Location of the untranslated region from the above messenger RNA will be at the 5' end and 3'prime end and their sequences are 5'ACGUCG and 3' end UAAAAA. (2) They are required for efficient translation process. (0.5) II.  (1) 4th triplet codon codes for phenylalanine. (0.5)	
32	***Attempt either option A or B.*** A. I. Plate B fails to show radioactivity because the probe could not hybridise with its DNA sequence, indicating the presence of the mutated β-globin gene (sickle mutation). Plates A and C show signals since their DNA has the normal complementary sequence. (2) II. • Normal individual: Probe binds fully → strong radioactivity observed • Carrier (heterozygote): Both normal and mutated sequences present → partial hybridisation (mixed pattern). • Patient (homozygous mutant): No hybridisation with the probe → no radioactivity seen. (2) III. Insertional inactivation (1) **OR** B. I. Test tube A (bacteria): DNA isolation will fail because bacteria require lysozyme, not cellulase, to digest the peptidoglycan cell wall. • Test tube B (plant): DNA isolation will succeed because plants require cellulase to digest cellulose walls. • Test tube C (fungus): DNA isolation will fail because fungi require chitinase to digest chitin walls. • Correction: Use lysozyme for bacteria, cellulase for plants, and chitinase for fungi. (2)	5

II. The further steps are
- Break open cells → DNA released with RNA, proteins, polysaccharides, and lipids.
- Remove contaminants:
  - RNase digests RNA
  - Protease digests proteins
- Remove polysaccharides and lipids by specific treatments.
- Add chilled ethanol → DNA precipitates as white threads, spooled on a glass rod. (2)

III. Spooled DNA can be used in genetic engineering, PCR amplification, DNA fingerprinting, or sequencing. (1)

33 ***Attempt either option A or B.*** 5

A.

(a)

Biodiversity Threat	**Explanation of the effect it will have**
Overexploitation	Unsustainable sourcing of wild medicinal plants by the cosmetic brand threatens plant species/may lead to depletion and extinction of valuable species. (1)
Invasion by alien species	Ornamental grass from another country spreading aggressively into native grassland/outcompetes native grasses, reduces local biodiversity. (1)
Co-extinction	Disappearance of nesting tree species causing sharp decline in migratory bird population/ disrupts ecological balance, loss of niches. (1)
Habitat loss and fragmentation	Forest fires lead to habitat loss and fragmentation by destroying forest vegetation and breaking continuous habitats into smaller, isolated patches. This forces species to migrate, reduces population sizes, and alters species distribution, often resulting in local extinction and decline in biodiversity. (1)

(b) Example: Declaration of *Green Valley X* as a **protected area** (wildlife sanctuary/national park/biosphere reserve/sacred grove/hotspot). Justification: Maintains species in their natural habitat, preserves ecological interactions, and allows long-term protection of genetic, species, and ecosystem diversity. (1)

OR

B.

I.

Step / Process	**Description**
Fragmentation	Breaking down of waste into smaller particles by detritivores (e.g., earthworms, termites). (1)
Leaching	Soluble inorganic nutrients dissolve in water and percolate into the composting soil. (1)

Catabolism	Enzymatic breakdown of complex organic matter into simpler inorganic substances by bacteria/fungi. (1)	
Humification & Mineralisation	Formation of humus and release of inorganic nutrients into the compost by microbes. (1)	

II. A dry spell would lower moisture content, slowing microbial activity and enzymatic breakdown, thereby reducing the rate of decomposition and delaying the reduction in waste volume. (1)

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