

BIOLOGY

PAPER 1

(THEORY)

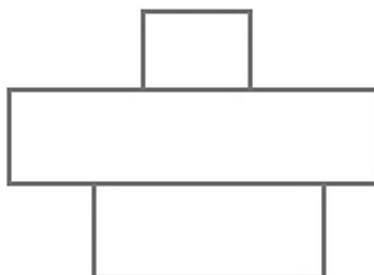
ANSWER KEY

SECTION A – 20 MARKS

Question 1

In answering Multiple Choice Questions, candidates have to write either the correct option number or the explanation against it. Please note that only ONE correct answer should be written.

- (i) (b) Histamine [1]
- (ii) (c) Urn-shaped [1]
- (iii) (a) 1:1 [1]
- (iv) (d) Only (R) and (S) [1]
- (v) (a) Species A (-), Species B (0) [1]
- (vi) (a) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion. [1]
- (vii) (c) Assertion is true and Reason is false. [1]
- (viii) Metastatic tumour [1]
- (ix) Ban Z III [1]
- (x) Legumes have symbiotic association with *Rhizobium* bacteria which fixes the atmospheric nitrogen while cereals do not. [1]
- (xi) Phylum Mollusca [1]
- (xii) [1]



- (xiii) Rho factor [1]
- (xiv) 3' - CCTAGG - 5' [1]

- (xv) Total population = 150×250 [1]
= 37,500
- (xvi) (a) Khadi and Village Industries Commission [1]
(b) Ernest Chain and Howard Florey [1]
- (xvii) Antigen antibody reaction [1]
- (xviii) (a) It prevents illegal misuse for sex-selective abortions (female foeticide). [1]
(b) Gold is inert and non-toxic whereas copper is reactive and toxic. [1]

SECTION B – 14 MARKS

Question 2 [2]

Rivet Popper Hypothesis

Explanation:

- In an airplane (ecosystem), all parts are joined together using thousands of rivets (species)
- If the passengers travelling in it start popping a rivet (causing species to become extinct), it may not affect flight safety (proper functioning of the ecosystem) initially but as more and more rivets are removed, the plane becomes weak over a period.
- If rivets from wings are removed (important species), the flight safety (ecosystem) is affected immediately.

Question 3 [2]

- (i) Tetracycline resistance (Tet^R) gene
- (ii) Insertional inactivation

Question 4 [2]

- (i) Blastocyst
- (ii) Inner cell mass

Question 5 [2]

- (i) Intrauterine device (IUD)
- (ii) Multiload - 375 is a copper releasing IUD. Copper reduces sperm motility. / Increases phagocytosis of sperms

Question 6 [2]

- (i) (a) Frequency of dominant allele (T) $p = 0.8$
- (b) The number of heterozygous pea plants = $2pq = 0.32$ of 9000 = 2880

OR

- (ii) (a) First 49 amino acids will remain unchanged.
- (b) 50th amino acid and all subsequent amino acids are likely to be altered due to frame shift mutation.

Question 7 [2]

- (i) Intracytoplasmic Sperm Injection (ICSI)
- (ii) Abnormality in male's semen: poor sperm motility / abnormal shape of sperm

Question 8 [2]

- (i) (a) Methane
- (b) *Methanococcus*

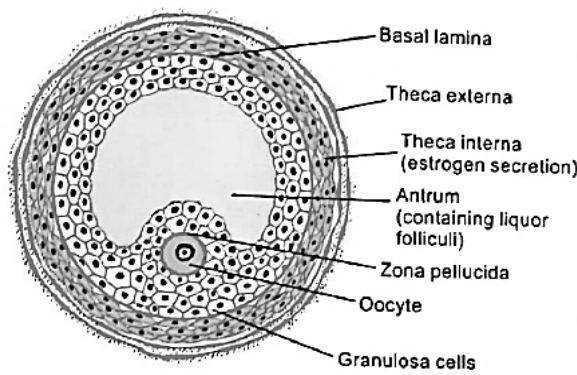
OR

- (ii) (a) Merozoite
- (b) Haemozoin

SECTION C – 21 MARKS

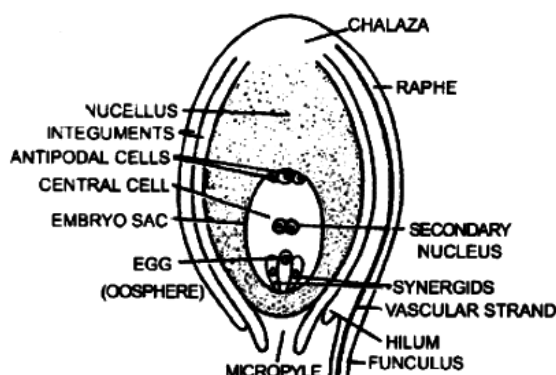
Question 9 [3]

- (i) Diagram of Graafian follicle



OR

- (ii) Diagram of L.S. of anatropous ovule



Question 10

[3]

- (i) (a) Micropropagation / Plant tissue culture
- (b) Major steps:
- Explant is transferred to the culture medium under aseptic conditions.
 - Auxin and cytokinin induce callus formation / differentiation.

OR

- (ii) (a) In the Medium A, only glucose is present and the inducer (lactose) is absent, so the repressor protein remains bound to the operator site, blocking RNA polymerase. Thus, the operon is switched OFF.
- (b) In the Medium B, only lactose is present. It stops the repressor protein from binding to the operator site, allowing RNA polymerase to transcribe the structural genes. The operon gets switched ON.

Question 11

[3]

- (i) Plasmid acted as a suitable vector.
- (ii) No

Reason: It lacks the T-DNA / vir gene system necessary for transferring DNA into plant cells.

Question 12

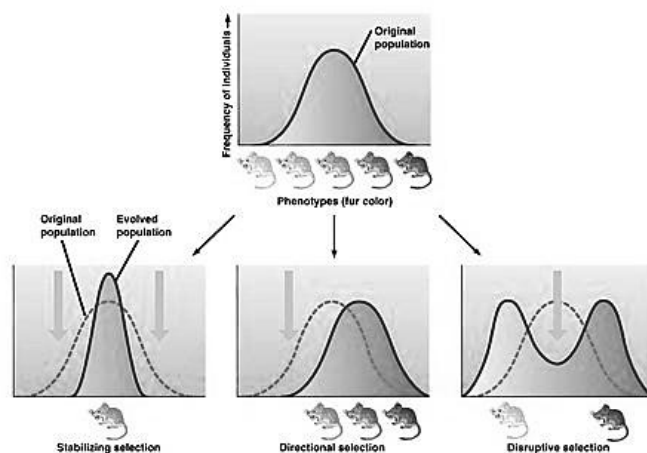
[3]

- (i) Primary productivity decreases with decrease in temperature.
- (ii) $R = \frac{3}{10} \times 2700 = 810 \text{ kg/m}^2/\text{yr}$
- $\text{NPP} = \text{GPP} - R$
- $\text{NPP} = 2700 - 810$
- $\text{NPP} = 1890 \text{ kg/m}^2/\text{yr}$

Question 13

[3]

Types of natural selection



- Stabilising - More individuals acquire mean character value.
- Directional - More individuals acquire value other than the mean character value.
- Disruptive - More individuals acquire peripheral character value at both ends of the distribution curve.

Question 14

[3]

- Due to degeneracy of codon, because one amino acid is coded by more than one codon.
- Genetic code is universal.
- Anticodon sequence 5' UUG AGC CAC 3'

Question 15

[3]

- X: Antibodies, Y: Interferons
- Interferons stimulate the cellular DNA to produce a series of antiviral proteins or enzymes. These enzymes bind to viral mRNA and block their protein synthesis.

SECTION D – 15 MARKS

Question 16

[5]

- (i) (a) Autosomal dominant
(b) Probability of unaffected child = 25%

	A	a
A	AA	Aa
a	Aa	aa

OR

- (ii) Prisha should choose Nucleotide (2).
- The 2-OH group present in the nucleotide (1) is a reactive group. It will make the genetic material unstable and easily degradable.
 - Nucleotide (2) is non-reactive.

Question 17

[5]

- (i) (a) (1)

Leydig cells	Sertoli cells
Located in the interstitial spaces (connective tissue) surrounding the seminiferous tubules.	Located in the seminiferous epithelium within the seminiferous tubules.

- (2)

Corpus luteum	Placenta
Secretes progesterone	Secretes chorionic gonadotropin, estrogen, progesterone, relaxin, hPL

- (b) Without zona pellucida, which prevents adhesion, the morula may prematurely attach to the wall of the Fallopian tube and may lead to ectopic pregnancy.
- (c) Myometrium
It brings about powerful contractions of the uterus during parturition.

OR

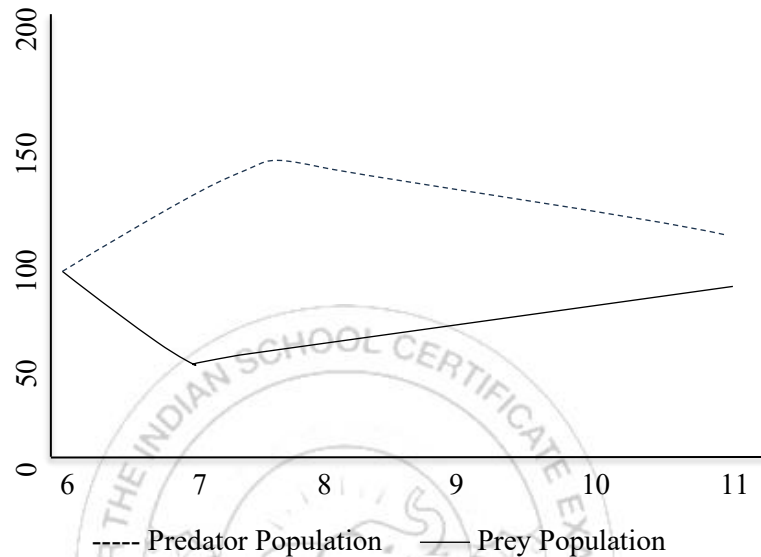
- (ii) (a) Pea plant belongs to the Leguminosae family whose pollen can remain viable for several months and years. But pollens of wheat remain viable for only 30 minutes.
- (b) (1) Fruit X
It will not exhibit genetic variation.
This is so because the embryo develops from the cells of the integument by mitosis and not by fertilisation.

- (2) 'Y' is a parthenocarpic fruit.

Question 18

[5]

- (i) (a)



- (b)
- The abundant prey provides more food, allowing the predator population to recover gradually over the following years.
 - As predators recover, the prey population begins to decline, approaching a new ecological balance.

OR

- (ii) (a) The change in population size after the first year.

$$\frac{dN}{dt} = rN \left(\frac{K - N}{K} \right)$$

$$\frac{dN}{dt} = 0.2 \times 100 \left(\frac{500 - 100}{500} \right)$$

$$\frac{dN}{dt} = 20 \times 0.8 = 16$$

(b)

