

Question Paper Code 57/3/2

SECTION – A

(Q. Nos. 1 - 5 are of one mark each)

1. Why are cucurbit plants said to be monoecious?

Ans. Cucurbits have both male and female flowers on the same plant =1

[1 Marks]

2. Name the pollutant attributed to be the cause of 'ozone-hole' over the Antarctica region.

Ans. CFC / Chloroflourocarbon

[1 Mark]

OR

List the greenhouse gases other than carbon dioxide.

Ans. CH_4 , CFC, N_2O / oxides of N_2 (*All three gases = 1Mark*)

(One / Two gases = ½ Mark)

[1 Mark]

3. Write the scientific name of the organism Alexander Fleming worked on and discovered the first antibiotic. Was the organism he worked on a fungus or a bacterium ?

Ans. *Staphylococci* = ½

Bacteria = ½

[1 Mark]

OR

Suggest a method to overcome excessive inbreeding depression.

Ans. Out cross // mating with unrelated superior animal of the same breed

[1 Mark]

4. What is 'Saltation' according to de Vries ?

Ans. Single step large mutation / random and directionless mutation / mutation related to speciation =1

[1 Mark]

5. Differentiate between a DNA and a RNA nucleotide.

Ans.	DNA NUCLEOTIDE	RNA NUCLEOTIDE
	Deoxyribose sugar	Ribose sugar
	Pyrimidine - Thymine	Pyrimidine - Uracil

(Note - corresponding 2 differences)

= 1/2 + 1/2

[1 Mark]

SECTION -B

(Q. Nos. 6-12 are of two marks each)

6. Where exactly is the filiform apparatus present in the embryo-sac of an angiosperm ? State its function.

Ans. In synergids, it guides the entry of pollen tube into the synergid = 1 + 1

[2 Marks]

7. Explain the role of histones in forming a nucleosome.

- Ans. • Histones are positively charged proteins = 1/2
 • they form a unit of eight molecules - Histone Octamer = 1/2
 • negatively charged DNA, is wrapped around the octomer = 1/2 + 1/2

[2 Marks]

8. What is 'Ori' ? State its importance during cloning of a vector.

- Ans. • Specific sequences of DNA where replication starts = 1
 • Helps in the replication of alien DNA when attached to Ori = 1/2
 • controls copy number = 1/2

[2 Marks]

OR

Explain the importance of 'selectable marker', with the help of a suitable example.

Ans. It helps in identifying and eliminating non-transformants, selectively permitting the growth of transformants = 1/2 + 1/2

Genes coding for antibiotic resistance such as ampicillin / tetracycline/kenamycin/chloramphenicol or (any other antibiotic) are used as selectable marker (**Any two**) = 1/2 + 1/2

[2 Marks]

9. What is 'carrying capacity' of a species in a habitat ? Why is logistic growth model considered more realistic ?

Ans. Maximum number of individuals a habitat can support (at given time) = 1

Since resources are limited / finite and sooner or later they become limiting (so logistic growth model is more realistic) = 1

[2 Marks]

10. Why has the Indian Government set up the organisation named GEAC ? Give any two reasons.

Ans. To check the Validity of GM crops , safety of introduction of GM organism for public services

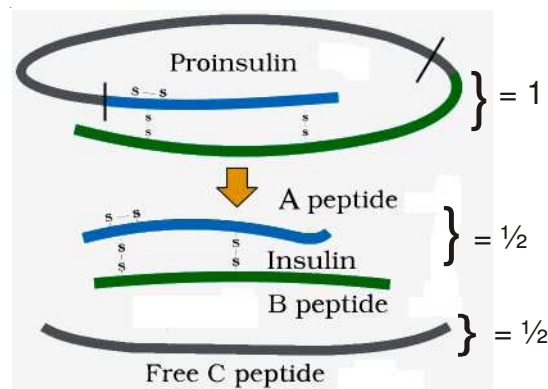
= 1 + 1

[2 Marks]

OR

Give a schematic representation of the transformation of a pro-insulin into insulin.

Ans.



[2 Marks]

11. Explain the relationship between B-lymphocytes and T-lymphocytes in developing an immune response.

Ans. **B-lymphocytes**- produce antibodies to fight pathogen= 1

T - lymphocytes - do not produce antibodies but help B cells to produce them /

can also destroy pathgen directly = 1

[2 Marks]

12. "The pyramid of biomass is not always upright." Explain the statement.

Ans. Pyramid of biomass is usually upright in terrestrial Ecosystem as the biomass keeps on decreasing from first Trophic level (producers) to the last trophic level (Top Carnivores) = 1
Whereas in aquatic ecosystem , it is inverted as the Biomass of the Phytoplanktons (Producers) is very little (because they are short lived) in comparison to that of fishes (consumers) = 1

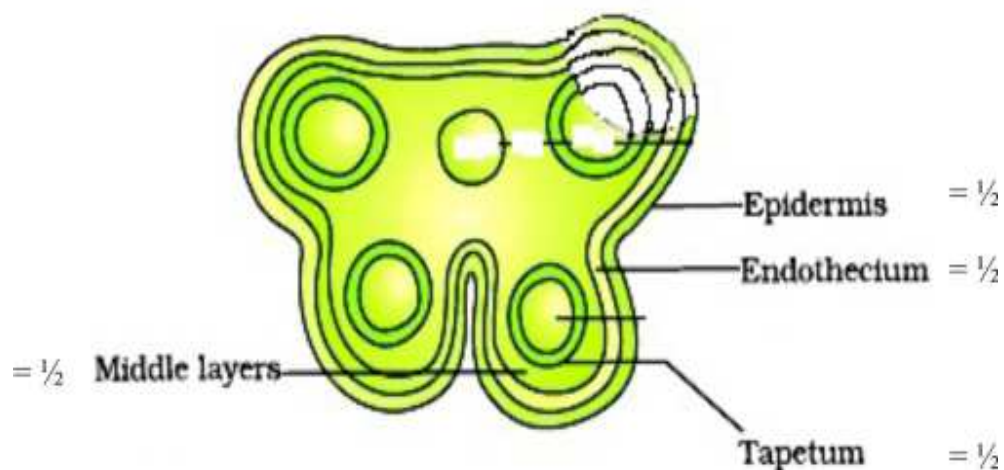
[2 Marks]

SECTION –C

(Q. Nos. 13-24 are of three marks each)

13. Draw a T.S. of a young anther of an angiosperm. Label the different layers of the wall and write their functions.

Ans.



(Correct diagram with labelling of four wall layers)

Function

Epidermis , Endothecium, Middle layers – protection and dehiscence = 1/2

Tapetum – nourishment of developing pollen grains = 1/2

[3 Marks]

14. (a) Why should a bacterium be made 'competent' ?
(b) Explain the role of `microinjection' and 'gene gun' in biotechnology.

Ans. (a) The bacterial cell must be made competent in order to receive the hydrophilic rDNA /

plasmid , which cannot otherwise pass through the cell membrane = $\frac{1}{2} + \frac{1}{2}$

(b) **Microinjection** - rDNA is directly injected into the animal cell nucleus = 1

Biolistics (gene gun) - Plant cells are bombarded with high velocity microparticles of gold / tungsten coated with rDNA = 1

[1 + 2 = 3 Marks]

15. How do desert lizards cope with the variations in their environment ? Explain.

Ans. - They cope up with high temperature of desert by behavioural changes (manage to keep body temperature fairly constant) = 1

- they bask in sun and absorb heat when body temperature drops below the comfort zone / move to shade when ambience temperature rises / Some species burrow into the soil
(Any two points) = 1+1

[3 Marks]

16. a) Name and explain the mode of action of any two types of IUDs.

(b) List the advantages of using 'Saheli' as a contraceptive.

Ans. (a) • Non-medicated (e.g. lippes loop) , phagocytosis of sperms = $\frac{1}{2} + \frac{1}{2}$

• Copper releasing IUDs (CuT , Cu7, Multiload 375) , suppress sperm motility / reduces fertilizing capacity of sperm = $\frac{1}{2} + \frac{1}{2}$

• Hormone releasing IUDs (Progestasert , LNG - 20) , makes uterus unsuitable for implantation / cervix hostile to sperms = $\frac{1}{2} + \frac{1}{2}$

(Any two)

Advantages of Saheli

(b) Non-steroidal /once a week / high contraceptive value / less side effects (Any two) = $\frac{1}{2} + \frac{1}{2}$

[2+1 = 3 Marks]

17. (a) Write the scientific name of the source plant and the part from which opioids are extracted. What is it commonly and chemically called ?

(b) Where in the human body are its specific receptors located ? How do opioids affect the human body ?

Ans. (a) *Papaver somniferum*, latex (from the fruit) = $\frac{1}{2} + \frac{1}{2}$

Common name:

Heroin / smack = 1/2

Chemical name

diacetylmorphine = 1/2

(b) CNS / GI tract = 1/2

Depressant / slows down body function = 1/2

[2+1 = 3 Marks]

18. (a) How does the human body respond when vaccine is introduced into it ?

(b) It is said that vaccinations are a must for a healthy society. Justify.

Ans. (a) B-cells assisted by T-cells produce antibodies against weakened antigens (Vaccine) and neutralise the pathogens (during actual infection), also generate memory B and T cells
= 1 + 1

(b) These B & T memory cells recognise the pathogen (in case of actual infection/pathogen), and produce antibodies (to kill the pathogen) thus the population will remain healthy = 1/2 × 2

[2 + 1 = 3 Marks]

19. What is heterogamety ? Explain the mechanism of sex determination in *Drosophila*.

Ans. • Heterogamety is production of two different types of gametes (either in male / female) = 1

• Sex determination in *Drosophila* XX / XY type = 1/2

Sex determination in *Drosophila* XX (female) / XY (male) type = 1/2

Female (XX) produces only one type of gamete with X chromosome but the male produces two different types of gametes with either X or Y chromosome = 1/2

When a male gamete with X fuses with the female gamete it produces a female progeny (XX)
= 1/2

When a male gamete with Y fuses with the female gamete it produces male progeny (XY) = 1/2

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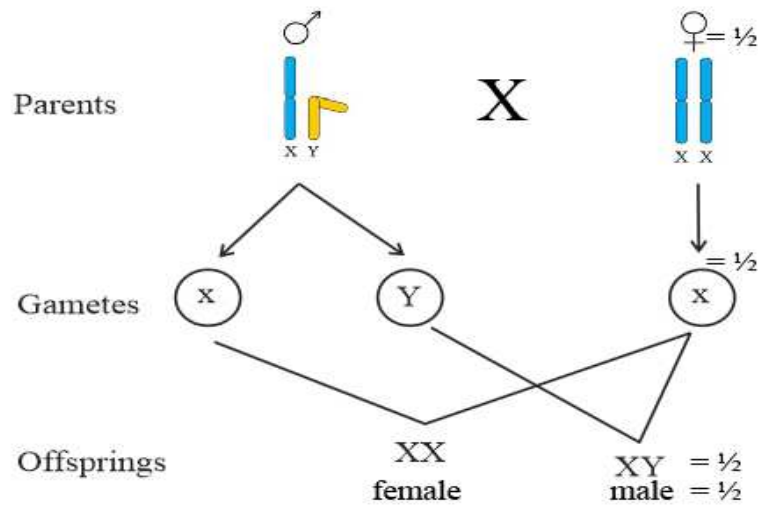


Diagram / explanation = 2

[3 Marks]

OR

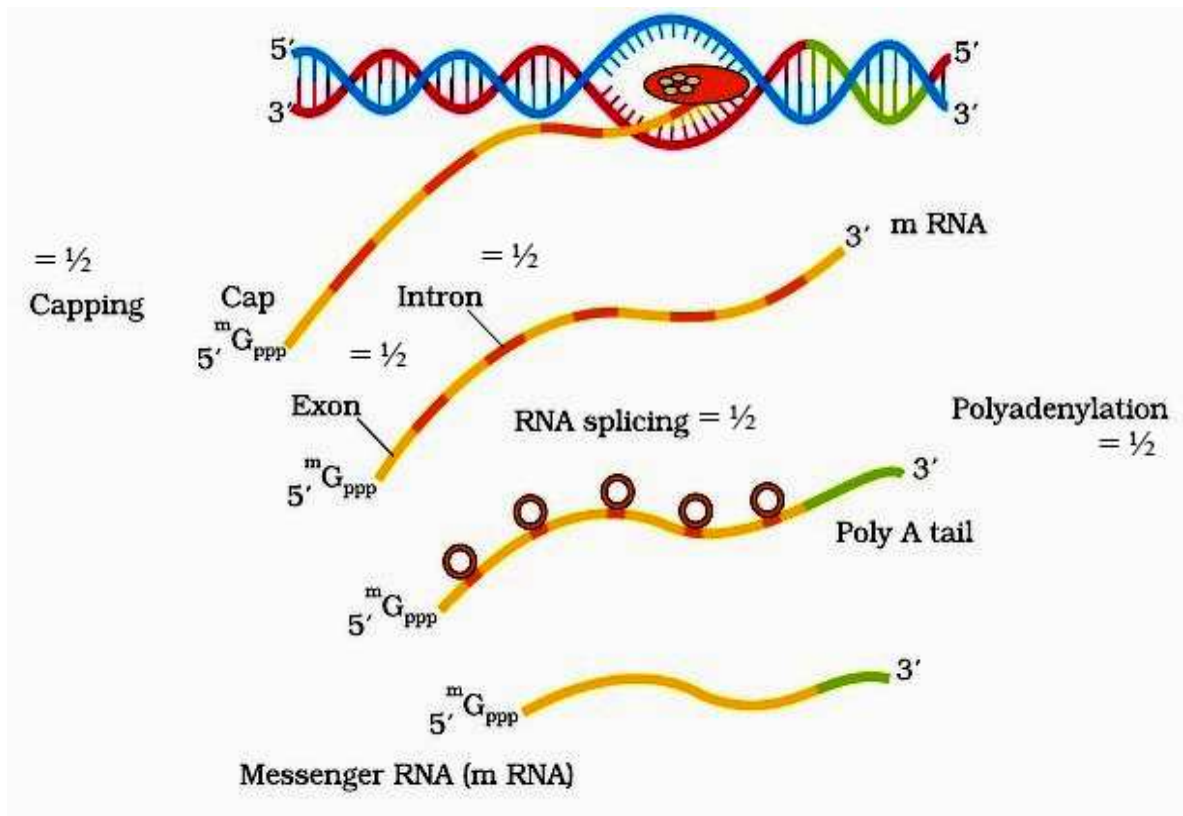
Explain the process of making heterogeneous nuclear RNA (hnRNA) into a fully functional mRNA in eukaryotes. Where does this process occur in the cell ?

- Ans. • hnRNA undergoes capping at 5' end (methyl guanosine triphosphate) and tailing at 3' end (with poly A tail) = 1
- Further Splicing is carried out , where the non-coding sequences called introns are removed , and coding sequences called exons are joined together in a defined manner

= 1/2 × 3

(either explanation or diagram)

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Site of processing of hnRNA

- This process occurs in the Nucleus = $\frac{1}{2}$

[3 Marks]

20. Write any six salient features of the human genome as drawn from the human genome project.

- Ans. (i) The human genome contains 3164.7 million nucleotide bases
- (ii) The average gene consists of 3000 bases but sizes vary greatly with the largest known human gene being dystrophin at 2.4 million bases
- (iii) The total number of genes is estimated at 30,000 - much lower than previous estimates
- (iv) Almost all (99.9 per cent) nucleotide bases are exactly the same in all people
- (v) The functions are unknown for over 50 per cent of discovered genes
- (vi) Less than 2 per cent of the genome codes for proteins

- (vii) Repeated sequences make up very large portion of the human genome
- (viii) Repetitive sequences are thought to have no direct coding function but they shed light on chromosome structure dynamics and evolution
- (ix) Chromosome 1 has most genes (2968) and the Y has the fewest (231)
- (x) Scientists have identified about 1.4 million locations where single base DNA difference (SNPs - single nucleotide polymorphism, pronounced as 'snips') occurs in humans and this information promises to revolutionise the processes of finding chromosomal locations for disease - associated sequences and tracing human history

Any six features ($\frac{1}{2} \times 6$)

[3 Marks]

21. "Appearance of melanised moths post-industrialisation in England is a classic example of evolution by natural selection." Explain.

Ans. Before industrialisation more white winged moth than dark winged moth existed in England , post industrialisation tree trunks became dark as smoke and soot deposited , lichens could not grow due to pollution , due to higher predation of white winged moth on a darker background , dark winged moth survived , nature selected the fittest organism = $\frac{1}{2} \times 6$ (*Correct sequence*)

[3 Marks]

22. Explain any three remedial measures to overcome the acute air pollution in our cities.

Ans. Electrostatic precipitators to remove particulate matter present in the exhaust from thermal power plant / Scrubber to remove SO₂ from the exhaust of thermal power plant/ Alternative sources of energy in place of petrol / Lead free petrol or diesel / Catalytic convertors - to reduce lead pollution / Use of CNG / Use of low sulphur petrol and diesel / Phasing out of old vehicles /Stringent enforcement of pollution level norms (*Any three*)

[3 Marks]

OR

Write any three ways by which noise pollution affects the human body adversely. List any three steps that should be followed in order to reduce noise pollution.

Ans. Sleeplessness / Increased heart beat / Altered breathing pattern /Damage hearing ability / Damage ear drum (*Any three*) = $\frac{1}{2} \times 3$

Three steps to be followed to reduce noise pollution

Following of stringent laws laid down in relation to noise level / Delimitation of horn free zones around hospitals and schools / To adopt permissible sound level of crackers and loudspeakers /

Adhering to time limit for loudspeakers beyond which it cannot be played / Use of sound absorbent material in industries / muffling of noise (**Any three**) = $\frac{1}{2} \times 3$

[3 Marks]

23. (a) What is the primary productivity of an ecosystem and how is it expressed ?

(b) Explain what does the equation given below show : $NPP = GPP - R$

Ans. (a) • Primary Productivity is defined as Rate of biomass production = 1

• Expressed as $g^{-2}yr^{-1} / (kcal\ m^{-2})yr^{-1} = \frac{1}{2}$

(b) • Gross primary productivity minus respiratory loss is the net primary productivity = 1

• Which is available to the next trophic level = $\frac{1}{2}$

[$1\frac{1}{2} + 1\frac{1}{2} = 3$ Marks]

OR

(a) Name the type of detritus that decomposes faster. List any two factors that enhance the rate of decomposition.

(b) Write the different steps taken in humification and mineralisation during the process of decomposition.

Ans. (a) • Detritus rich in N_2 , water soluble substance like sugar = $\frac{1}{2} + \frac{1}{2}$

• **Factors -**

Warm temperature / moist environment / availability of oxygen (**Any two**) = $\frac{1}{2} + \frac{1}{2}$

(b) **Humification** - Accumulation of dark coloured amorphous substance called humus which is resistant to micorbial action and undergoes decomposition at a very slow rate = $\frac{1}{2}$

Mineralisation - humus is further degraded by microbes releasing inorganic nutrients = $\frac{1}{2}$

[2+1 = 3 Marks]

24. Write any two biochemical/molecular diagnostic procedures for early detection of viral infection. Explain the principle of any one of them.

Ans. ELISA, PCR = 1 + 1

ELISA – antigen antibody interaction / PCR – amplification of nucleic acid for its identification

(**Any one**) = 1

[3 Marks]

OR

Describe the steps that are followed during secondary treatment of sewage.

Ans. In Aeration tank effluent agitated mechanically , air pumped allows the growth of flocs , consumes organic matter , reduces BOD , Effluent pumped to settling tank to allow sedimentation of bacterial flocs called activated sludge , a small part of which is used as inoculum and the rest is pumped into anaerobic sludge digester for complete digestion of anaerobic bacteria and effluent is released into the natural water body (*steps should be in correct sequence*) = $\frac{1}{2} \times 6$

[3 Marks]

SECTION –D

(Q Nos. 25-27 are of five marks each)

25. Explain the changes that occur in the ovary and uterus during menstrual cycle in human females. Mention the influence of pituitary and ovarian hormones in bringing these changes.

Phase	Ovary	Uterus
Menstrual	Corpus luteum regenerates and follicular development begins = $\frac{1}{2}$	In absence of fertilisation menstrual flow occurs due to breakdown of endometrial lining of uterus = $\frac{1}{2}$
Follicular / Proliferative	Primary follicle grow and mature into Graafian follicle and rupture during middle phase of the cycle releasing ovum / secondary oocyte = $\frac{1}{2}$	Endometrium regenerates through proliferation = $\frac{1}{2}$
Luteal / Secretory	Follicular cells of the ruptured Graafian follicle transform into corpus luteum which secretes progesterone = $\frac{1}{2}$	Endometrium is maintained (by progesterone) to receive the fertilised egg for implantation = $\frac{1}{2}$

Pituitary hormones-

FSH and LH induces follicular growth (in the beginning of the cycle) = $\frac{1}{2}$
LH induces ovulation (mid cycle) = $\frac{1}{2}$

Ovarian hormones-

(i) Estrogen (from the growing follicle) repairs and induces proliferation of endometrium = $\frac{1}{2}$
(ii) Progesterone (released from corpus luteum) maintains endometrium to enable implantation = $\frac{1}{2}$

[5 Marks]

OR

Compare the characteristic features of insect pollinated and wind pollinated flowers.

Explain how the respective features assist in pollination.

Ans.	Insect Pollination		Wind Pollination	
	Feature	Role	Feature	Role
(i)	Flowers are large/ colourful/fragrant / fowl odour = ½	To attract pollinating agents = ½	Flowers are small/ inconspicuous/ with no fragrance = ½	The pollinating agent is abiotic so no extra adpation = ½
(ii)	Sticky pollen = ½	To be carried by by the pollinator = ½	Pollen light/non-sticky/ large in number = ½	To be easily carried by wind = ½
(iii)	Flowers provide nectar/pollen/safe place to lay eggs (for the pollinator) = ½	as rewards to the pollinator = ½	Well exposed stamens/ feathery stigma = ½	Pollen can be easily dispersed into wind current can easily trap air borne pollen = ½

(Five characteristics with relevent explanation of roles)

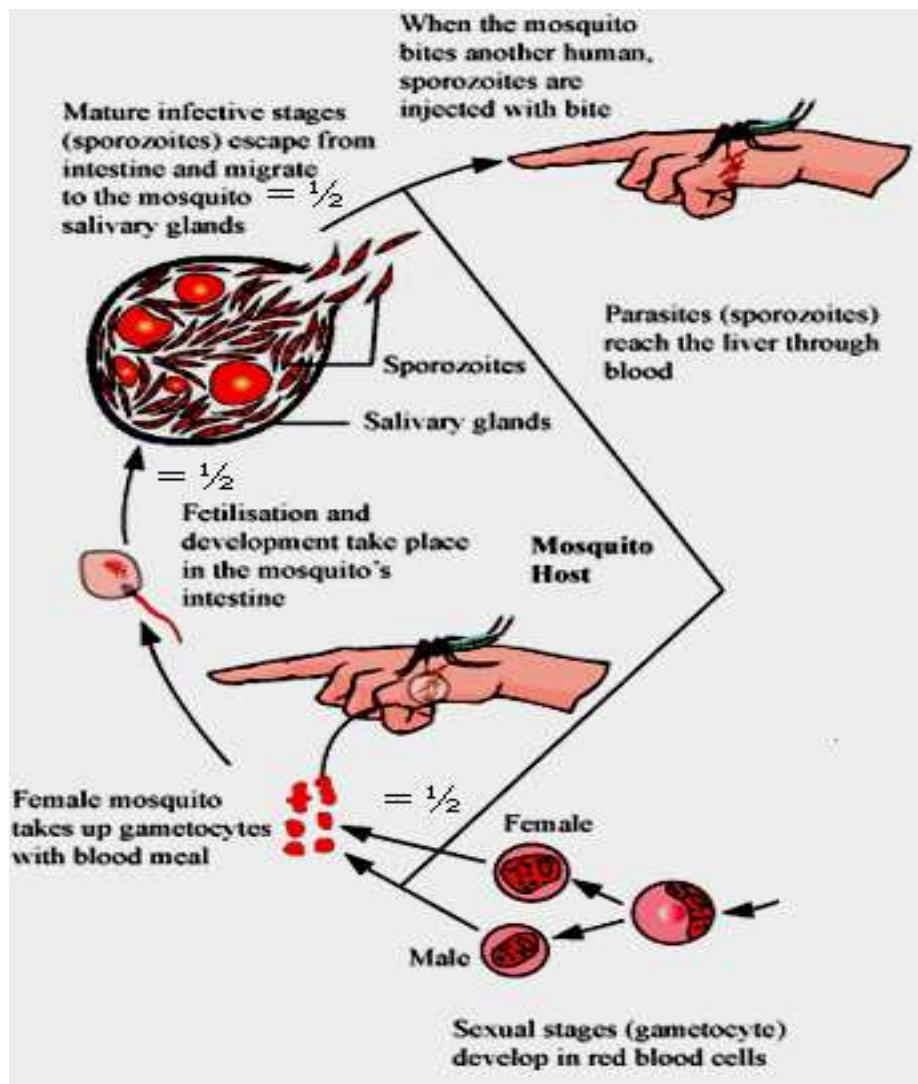
[5 Marks]

26. (a) Write the specific name of the genus *Plasmodium* that causes one of the most serious types of diseases in humans. Name the disease.
- (b) Describe the events in the life cycle of *Plasmodium* which take place in the female *Anopheles*.
- (c) Explain what happens in the RBCs of the humans when *Plasmodium* gains entry into them. How does the human body get affected ?

Ans. (a) *Plasmodium falciparum* , malignant malaria = ½ + ½

- (b) • Gametocytes / Male and Female gametes - enter female *Anopheles* mosquito = ½
- Fertilisatioin and development in the female mosquito gut / stomach = ½
- Sporozoites are transported to salivary glands = ½

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- (c)
- Parasite multiplies asexually in RBC = $\frac{1}{2}$
 - RBC rupture = $\frac{1}{2}$
 - release toxic haemozoin = $\frac{1}{2}$
 - chill and fever recurring every 3 - 4 days = $\frac{1}{2}$
 - parasites enter fresh RBC and repeat the cycle = $\frac{1}{2}$

[1 + $1\frac{1}{2}$ + $2\frac{1}{2}$ = 5 Marks]

OR

Explain the interrelationship between organic farming and biofertilizers, with the help of any three suitable examples.

(b) (i) Incomplete dominance = 1

(ii) Dominance = 1

[3+2= 5 Marks]

OR

(a) **Why did Hershey and Chase use radioactive ^{32}P and ^{35}S in their experiments ? Explain.**

(b) **Following the experiments conducted by them, write what conclusion did they arrive at and how.**

- Ans. (a) • Since bacteriophage contains only DNA and Protein the scientists wanted to identify whether it is DNA or the Protein from the Virus that entered the bacterium during infection =1
- therefore they labelled DNA with ^{32}P and Protein coat with ^{35}S = 1

Conclusion

(b) **Conclusion** - DNA is the genetic material = 1

Experiment

Bacteria which were infected with viruses having radioactive DNA [^{32}P] were found to be radioactive , indicating that DNA was the material that passed from the virus to bacterium

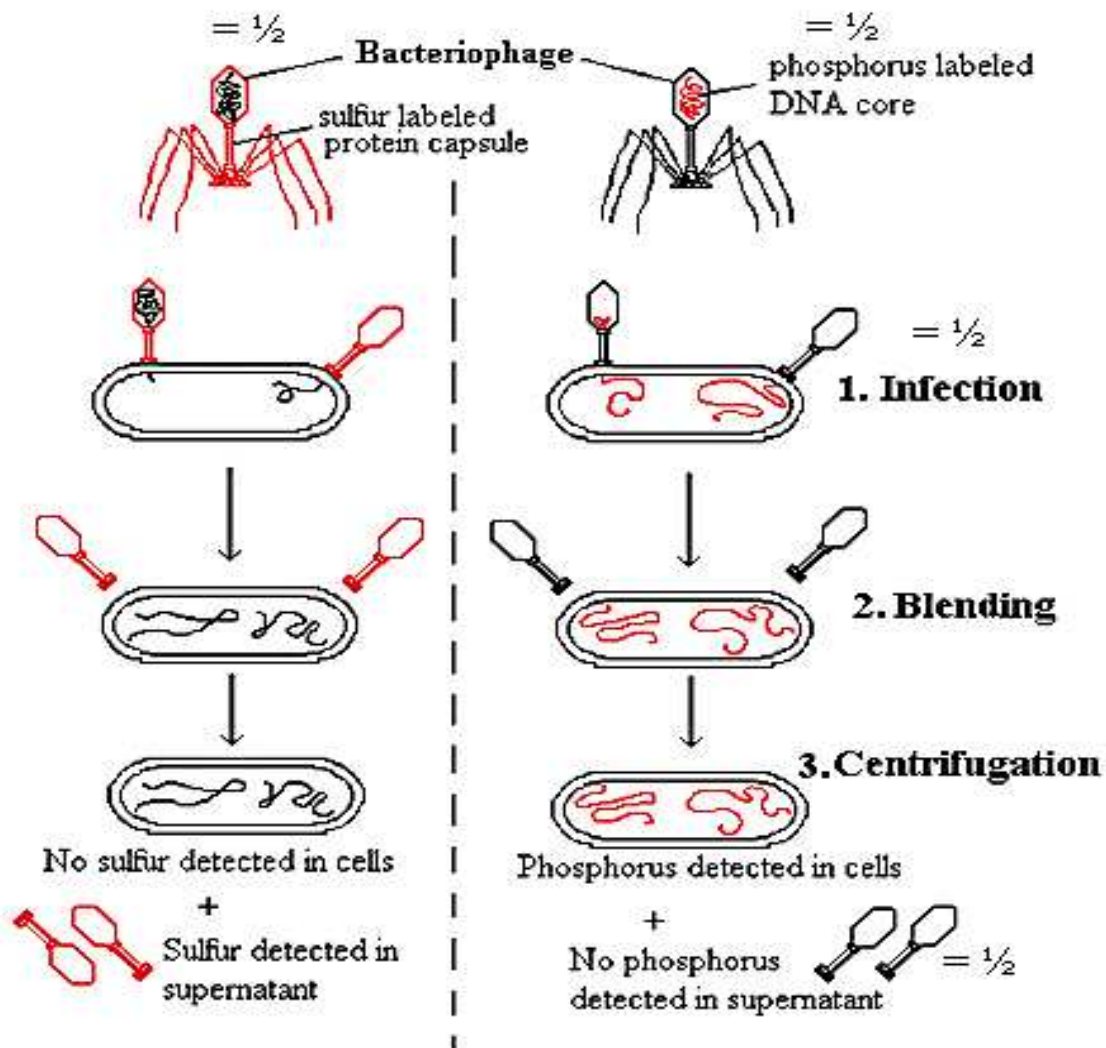
= $\frac{1}{2} + \frac{1}{2}$

Bacteria which were infected with viruses having radioactive protein [^{35}S] were not found to be radioactive , indicating that protein did not enter bacterium from the virus

= $\frac{1}{2} + \frac{1}{2}$

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(diagram in lieu of experiment)



The Hershey-Chase Experiment

[2 + 3 = 5 Marks]