

SECTION A

1. Which one of the following is *not* the product of transgenic experiments?

- (A) Pest-resistant crop variety
- (B) High nutritional value in grains
- (C) Production of insulin by rDNA technique
- (D) Drought-resistant crops

Ans. (No correct answer in the choices-Every one gets one mark)

[1 Mark]

2. The diagnostic test that confirms typhoid in humans is

- (A) ELISA
- (B) Widal
- (C) MRI
- (D) Amniocentesis

Ans. (B)/Widal

[1 Mark]

3. The bioactive molecule used as an immunosuppressive agent during organ transplant is

- (A) Tetracyclin
- (B) Cyclosporin-A
- (C) Statin
- (D) Streptomycin

Ans. (B)/Cyclosporin-A

[1 Mark]

OR

‘Blue revolution’ refers to

- (A) construction of water dams for conservation of water
- (B) production of fish in large quantities
- (C) sewage treatment
- (D) controlling algal bloom

Ans. (B)/ Production of fish in large quantities

[1 Mark]

4. **Cleistogamous flowers are self-pollinated because**
- (A) they are bisexual flowers which do not open at all.
  - (B) they are bisexual and open flowers.
  - (C) they are unisexual.
  - (D) their stigma matures before the anthers dehisce.

Ans. (A)/ Bisexual Flower which do not open at all

[1 Mark]

OR

**Asexual reproduction by zoospores is observed in**

- (A) Penicillium
- (B) Hydra
- (C) Sponge
- (D) Chlamydomonas

Ans. (D)/ Chlamydomonas

[1 Mark]

5. **In Bryophyllum, vegetative propagation occurs by**
- (A) Stem cuttings
  - (B) Axillary buds
  - (C) Root hair
  - (D) Leaf buds

Ans. (D) / Leaf buds

[1 Mark]

### SECTION B

6. **Write the cause of Down's Syndrome in humans. List any three identifying symptoms of this disorder.**

Ans. Cause: presence of an additional copy of the chromosome number 21 /trisomy of chromosome 21 =  $\frac{1}{2}$

Symptoms: short statured small round head/ furrowed tongue partially open mouth/ Palm is broad with characteristic palm crease /Physical psychomotor and mental development is retarded. (any three) =  $\frac{1}{2} \times 3$

[2 Marks]

7. **Write the ploidy and number of chromosomes in human (a) meiocytes, and (b) gametes.**

Ans. (a) (meiocytes)  $2n$ ,  $46 = \frac{1}{2} + \frac{1}{2}$

(b) (Gametes)  $n$ ,  $23 = \frac{1}{2} + \frac{1}{2}$

[2 Marks]

8. Write the start codon along with the amino acid it codes for and any two stop codons required during the process of translation.

Ans. AUG, Methionine =  $\frac{1}{2} + \frac{1}{2}$

Stop codon: UAA/UAG/UGA (any two) =  $\frac{1}{2} + \frac{1}{2}$

[2 Marks]

OR

Taking an example of homologous organs in plants, write the types of evolution they are based on, giving a reason.

Ans. Thorns of Bougainvillea and Tendrils of Cucurbita are homologous organs/ any other appropriate example =  $\frac{1}{2}$

Divergent Evolution =  $\frac{1}{2}$

They have same origin/ common ancestry, but perform different functions =  $\frac{1}{2} + \frac{1}{2}$

[2 Marks]

9. Name the type of immunity the mother provides the newborn baby. How does it happen?

Ans. Passive immunity = 1

Colostrum has (abundant) antibodies / IgA present = 1

[2 Marks]

10. (a) Identify any *two* marsupials from the list given below :

(i) Lemur

(ii) Spotted cuscus

(iii) Flying phalanger

(iv) Bobcat

(v) Tasmanian wolf

(vi) Mole

(b) "Australian marsupials exhibit adaptive radiation." Justify the statement.

Ans. a. ii) / Spotted cuscus,

iii) / Flying phalanger

v) / Tasmanian wolf

(Any two) =  $\frac{1}{2} + \frac{1}{2}$

b. Australian marsupials each differ from the other evolved from an ancestral stock, all within the Australian island continent. =  $\frac{1}{2} + \frac{1}{2}$

[2 Marks]

11. Name the two primary lymphoid organs. State the importance of T-lymphocytes.

Ans. Thymus, Bone marrow =  $\frac{1}{2} \times 2$

Functions : help B-cells in production of antibody , mediate CMI , responsible for graft rejection (any one)=1

[2 Marks]

12. Name any two water/food borne diseases. Mention any two measures essential for controlling these diseases.

Ans. Ascariasis , Typhoid , Amoebiasis , Cholera , Jaundice (any two) =  $\frac{1}{2} + \frac{1}{2}$

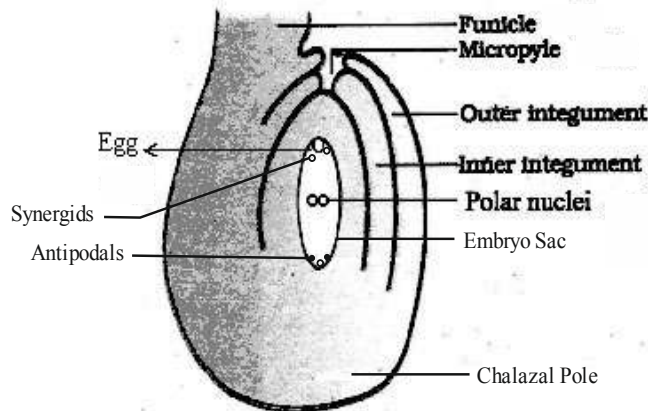
Two measures: standard practice in public catering / consumption of clean drinking water / periodic cleaning and disinfection of water reservoirs / tank / cesspool (any two) =  $\frac{1}{2} + \frac{1}{2}$

[2 Marks]

### SECTION C

13. Draw a diagram of a mature anatropous ovule of an angiosperm, indicating the chalazal end. Label any three parts of the ovule and two parts of the embryo sac.

Ans. chalazal end =  $\frac{1}{2}$



Any three correctly labelled part of ovule =  $\frac{1}{2} \times 3$

Any two correctly labelled part of embryo sac =  $\frac{1}{2} \times 2$

[ $\frac{1}{2} \times 6 = 3$  Marks]

14. Global carbon is fixed in the biosphere through photosynthesis.

(a) Explain any two ways by which carbon is returned to the atmosphere through natural processes.

(b) List any two human activities that have influenced the carbon cycle in nature.

Ans. (a) Natural process - Respiration by plants and animals , decomposition (bacteria , fungi) = 1+1

(b) Human activities - burning of fossil fuel / burning of forest fuel wood / burning of leaves (any two) =  $\frac{1}{2} + \frac{1}{2}$

[3 Marks]

15. Write the scientific names of the source organism and the function of each one of the following bioactive molecules :

(a) Cyclosporin A

(b) Streptokinase

(c) Statin

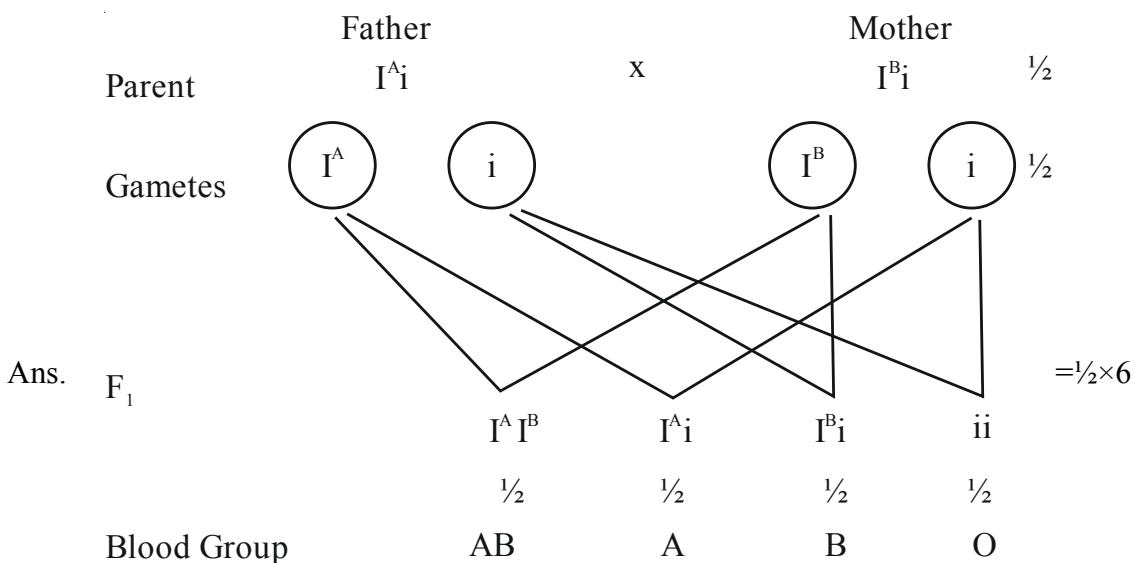
Ans. (a) Cyclosporin A - *Trichoderma polysporum*, is used as an immuno suppressive agent in organ transplant patients =  $\frac{1}{2} + \frac{1}{2}$

(b) Streptokinase - *Streptococcus*, used as a 'clot buster' / for removing clots from the blood vessels of patients who have undergone myocardial infraction leading to heart attack =  $\frac{1}{2} + \frac{1}{2}$

(c) Statin- *Monascus purpureus*, blood-cholesterol lowering agents. =  $\frac{1}{2} + \frac{1}{2}$

[3 Marks]

16. A couple has four children with blood groups A, B, AB and O , respectively. The father of the children has blood group A and the mother has blood group B. Work out a cross to show how it is possible.



[3 Marks]

17. (a) Write how parasites have evolved with adaptation to co-exist with their hosts in an ecosystem.

(b) Parasites are host specific and tend to co-evolve. How would the parasite respond if the host evolves a certain mechanism to resist or reject the parasite ?

Ans. a) Loss of unnecessary sense organs, presence of adhesive organs / suckers , loss of digestive system , high reproductive capacity. =  $\frac{1}{2} \times 4$

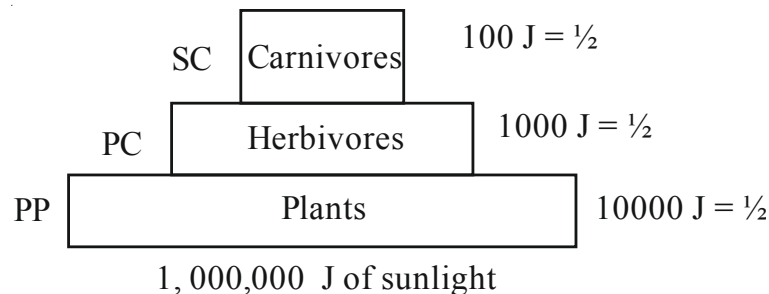
b) (If the host evolves special mechanism for rejecting or resisting a parasit) the parasite has to evolve a mechanism to counteract and neutralize them. = 1

[3 Marks]

OR

- (a) Name an ideal pyramid existing in an ecosystem. Construct it up to its three trophic levels along with their names.
- (b) The sun provides 1,000,000 J of sunlight (solar energy) to an ecosystem. Write the amount of energy that is available to the first and third trophic levels, respectively.

Ans. a) Pyramid of energy is the ideal pyramid =  $\frac{1}{2}$



=  $\frac{1}{2} \times 4$

- b) (from sun to primary producer 1%)

10,00,000J from sun, (1%) = 10,000 J

10,000 J     $\longrightarrow$     1000J     $\longrightarrow$     100 J

First trophic level  
=  $\frac{1}{2}$

Third trophic level  
 $\frac{1}{2}$

[2 + 1 = 3 Marks]

18. When *Bacillus thuringiensis* enters a certain insect's body, the insect gets killed, but itself remains unaffected. Explain how it is possible.

Ans. *B. thuringiensis* forms protein crystals which contain a toxic insecticidal protein, Bt toxin protein remains as inactive protoxin, once an insect ingests the inactive toxin, it is converted into an active form of toxin due to alkaline pH of the gut, the activated toxin binds to midgut epithelial cells, and creates pores that cause swelling and lysis of the cells. =  $\frac{1}{2} \times 6$

[3 Marks]

19. Mention any two advantages of micropropagation technique. Write how its process is carried out in the laboratory. Name any two important food plants grown commercially by this method.

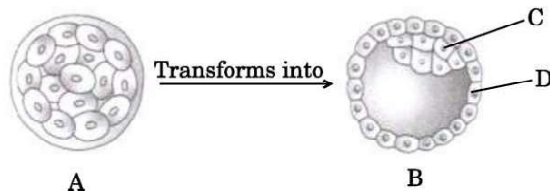
Ans. Used for the production of large number of plants that are genetically identical to the original plant, recovery of healthy plants from diseased plant. =  $\frac{1}{2} + \frac{1}{2}$

Any part of the plant / explant is grown in the test tube under sterile conditions, in specified nutrient media (sucrose, inorganic salts, vitamins, amino acids, growth hormones - Auxin and cytokinin)  
=  $\frac{1}{2} + \frac{1}{2}$

Potato / Banana / sugarcane / tomato / apple (any two) =  $\frac{1}{2} + \frac{1}{2}$

[3 Marks]

20. Study the given diagram:



**A is an embryonic stage that gets transformed into B, which in turn gets implanted in the endometrium in human females.**

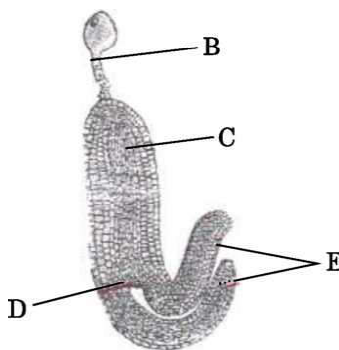
- (a) **Identify A, B and its parts C and D.**  
 (b) **State the fate of C and D in the course of embryonic development in humans.**

- Ans. a) A - Morula ; B - Blastocyst ; C - Inner cell mass / Stem cells , D - Trophoblast =  $\frac{1}{2} \times 4$   
 b) C. (Inner cell mass) forms embryo / differentiates into germ layers (ectoderm / mesoderm / endoderm) , D. Trophoblast helps in attachment of embryo / to endometrium / forms chorionic villi / forms placenta =  $\frac{1}{2} \times 2$

**[2 + 1 = 3 Marks]**

**OR**

- (a) **Identify the figure given below and also identify the parts B, C, D and E.**



**(6 × ½ = 3)**

- (b) **State the function of E.**

- Ans. a) Mature Dicot Embryo,  
 B-Suspensor ; C- Radicle ; D-Plumule ; E-Cotyledon ;  
 b) Storage of food reserves (as in legumes) =  $\frac{1}{2} \times 6$

**[3 Marks]**

- 21. The release of municipal wastewater and industrial waste into our natural water bodies is causing disastrous effect to the aquatic life. Explain the biological treatment that should be given to it before releasing into the natural water bodies.**

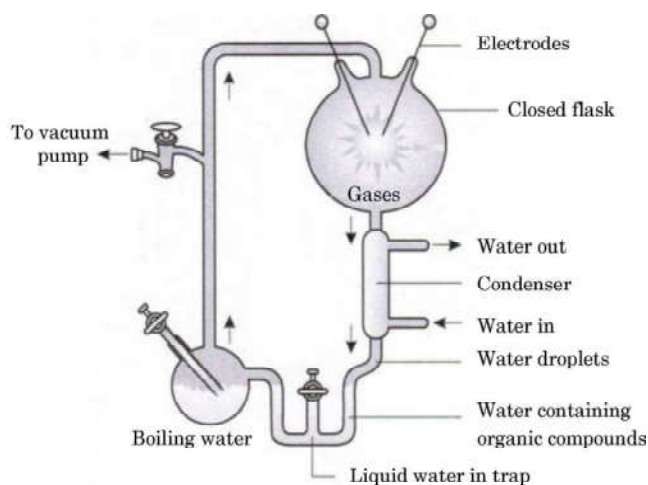
- Ans. The primary effluent is passed into large aeration tanks where it is mechanically constantly agitated and air is pumped into it, this allow growth of useful aerobic microbes into Flocs / masses of bacteria associated with fungal filaments , these microbes consume major part of organic matter in the effluent reducing BOD , effluent is passed into settling tanks where Flocs are allowed to sediment called activated sludge , a small part of this is pumped back into the aeration tank to serve as the

inoculum, The remaining major part of the sludge is pumped into large tanks called anaerobic sludge digesters where anaerobic bacteria digest the bacteria and the fungi in the sludge. (During this digestion, bacteria produce a mixture of gases such as methane, hydrogen sulphide and carbon dioxide.) =  $\frac{1}{2} \times 6$

[3 Marks]

### SECTION D

22. Study the diagrammatic representation of S.L. Miller's experiment given below and answer the questions that follow :



- How did S.L. Miller create the conditions which existed before the origin of any life on Earth ?
- Name the organic compound formed and collected at the end of his experiment.
- Mention the kind of evolution his experiment supports.

Ans. (a) (Conditions existed before the origin of life -High temperature, volcanic storms, reducing atmosphere containing  $\text{CH}_4$ ,  $\text{NH}_3$ , etc.)

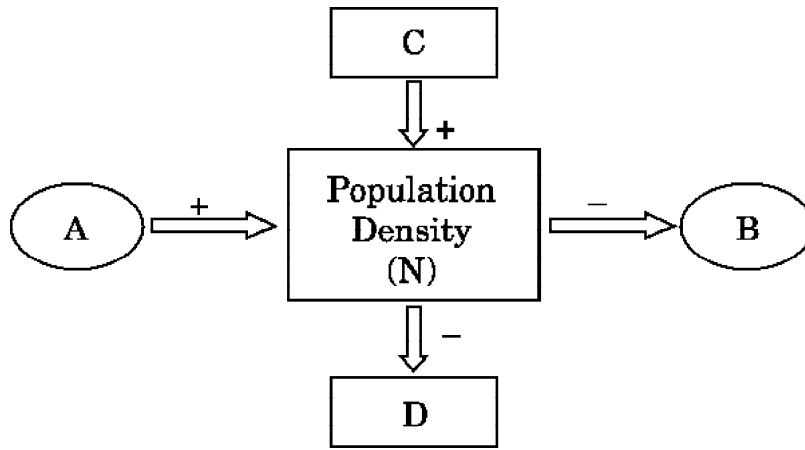
Conditions were created by electric discharge (high temperature) in a closed flask containing  $\text{CH}_4$ ,  $\text{NH}_3$ ,  $\text{H}_2$ , water vapours =  $\frac{1}{2} \times 4$

- amino acids =  $\frac{1}{2}$
- chemical evolution =  $\frac{1}{2}$

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



Q.23



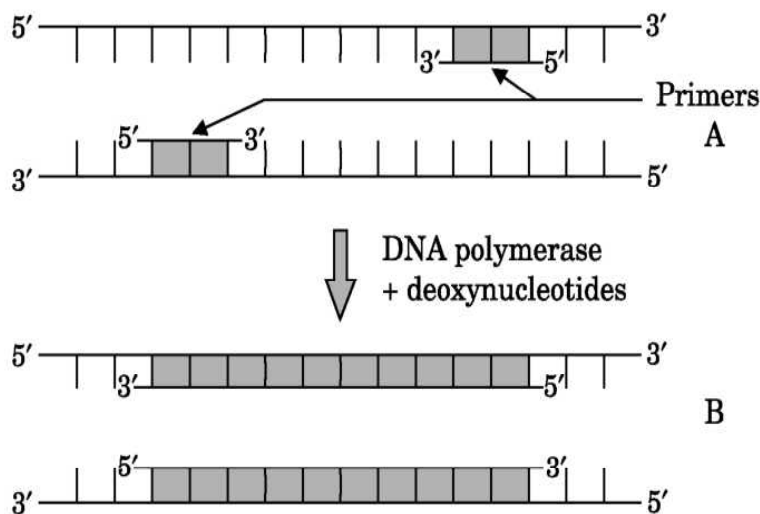
Study the schematic representation given above and answer the following questions:

- Identify A in it.
- Identify D in it.
- When the population density at time  $t$  is  $N$  as shown above, write the population density at time  $t + 1$  in the form of an equation using appropriate symbols.

- Ans. a)  $A = \text{Natality / Immigration}$   
 b)  $D = \text{Emigration / Mortality}$   
 c)  $N(t+1) = Nt + [(B+I) - (D+E)] = 1 \times 3$

[3 Marks]

Q24 (a) Identify steps A and B in a cycle of Polymerase Chain Reaction given below.



- State the specific characteristic feature of the enzyme in carrying step B.

- Ans.. a)  $A = \text{Annealing}; B = \text{Extension} = 1 + 1$

- b) Thermostable (DNA Polymerase)/ remains active at high temperature = 1

[3 Marks]

### SECTION E

25. **There is a great concern all over the world to conserve biodiversity for maintaining ecological balance in nature. Explain giving three reasons. Write different ways that have helped in increasing tiger population in our country.**

Ans. Biodiversity should be conserved for the following three reasons:

- a) Narrowly utilitarian - =  $\frac{1}{2}$

humans derive countless economic benefits from nature-

e.g. food (cereals, pulses, fruits)/ firewood/ fibre/ construction material/ industrial products (tannins, lubricants, dyes, resins, perfumes) / products of medicinal importance. (any one =  $\frac{1}{2}$ )

- b) Broadly utilitarian - =  $\frac{1}{2}$

Play role in many ecological services e.g. production of  $O_2$ / pollination/ Aesthetic pleasures =  $\frac{1}{2}$

- c) Ethical - =  $\frac{1}{2}$

Every species has an intrinsic value/ we have a moral duty to care for their well-being/ pass on our biological legacy in good order to future generations. =  $\frac{1}{2}$

The two approaches to save tiger is

- a) In situ conservation =  $\frac{1}{2}$  – protect the natural habitat the forest where the tiger lives/ protect the whole ecosystem to save tigers =  $\frac{1}{2}$
- b) Ex situ conservation =  $\frac{1}{2}$  – threatened tigers are taken out of their natural habitat and placed in special settings for protection and special care/ e.g. zoological park, wildlife sanctuaries. =  $\frac{1}{2}$

[3 + 2 = 5 Marks]

OR

**What is integrated organic farming? How did Ramesh Chandra Dagar, a farmer from Sonapat, Haryana effectively use this procedure and succeed with zero waste?**

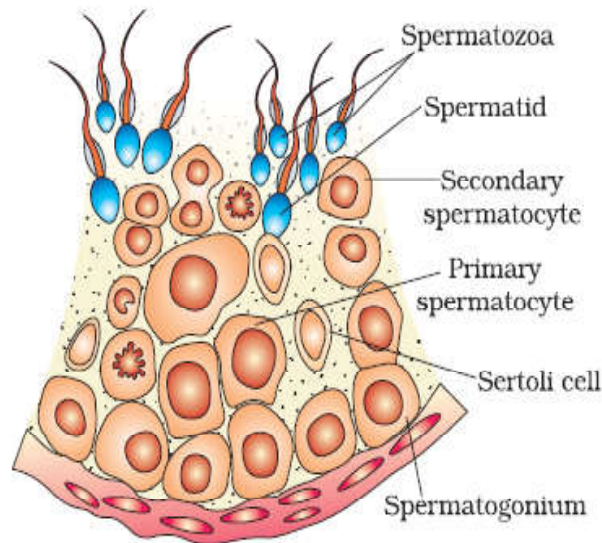
Ans. Integrated organic farming is a cyclical procedure where waste products from one process are cycled in as nutrients for another process,

His farm includes bee-keeping, dairy management, water harvesting, composting, agriculture in a chain of processes, There is no need to use chemical fertilizers, as cattle excreta (dung) is used as manure/ natural fertilizer, Crop waste can be used to create compost, to generate natural gas for satisfying the energy needs of the farm. =  $\frac{1}{2} \times 10$

[5 Marks]

26. (a) **Draw the sectional view of a seminiferous tubule of human. Label its any six parts.**
- (b) **Name the pituitary hormones involved in the process of spermatogenesis. State their functions.**

Ans. (a)



(any 6 parts) =  $\frac{1}{2} \times 6$

- b) Pituitary hormones: Luteinising hormone (LH), follicle stimulating hormone (FSH) =  $\frac{1}{2} + \frac{1}{2}$   
 (LH) Acts at the Leydig cells and stimulates synthesis and secretion of androgens =  $\frac{1}{2}$   
 (FSH) Acts on Sertoli cells and stimulates secretion of some factors which help in the process of spermiogenesis. =  $\frac{1}{2}$

**OR**

- (a) IUDs are said to be effective contraceptives. Name any two commonly used IUDs and write the mode of their actions.  
 (b) When is sterilisation advised to married couples? How is it carried out in a human male and a female, respectively?

- Ans. a) - Lippes Loop, - increases phagocytosis of sperms within the uterus  
 - CuT / Cu7 / Multiload 375, - Cu ions suppress sperm motility/ fertilising capacity of sperms  
 - Progestasert / LNG - 20, - makes uterus unsuitable for implantation / makes cervix hostile to sperms (any two IUDs with their related actions) =  $\frac{1}{2} \times 4$   
 b) Sterilization advised for the male /female partner as terminal method to prevent any more pregnancies = 1  
 In male: part of vas deferens is cut and tied (vasectomy) = 1  
 In female: a small part of the fallopian tube is removed or tied up (tubectomy) = 1

**[5 Marks]**

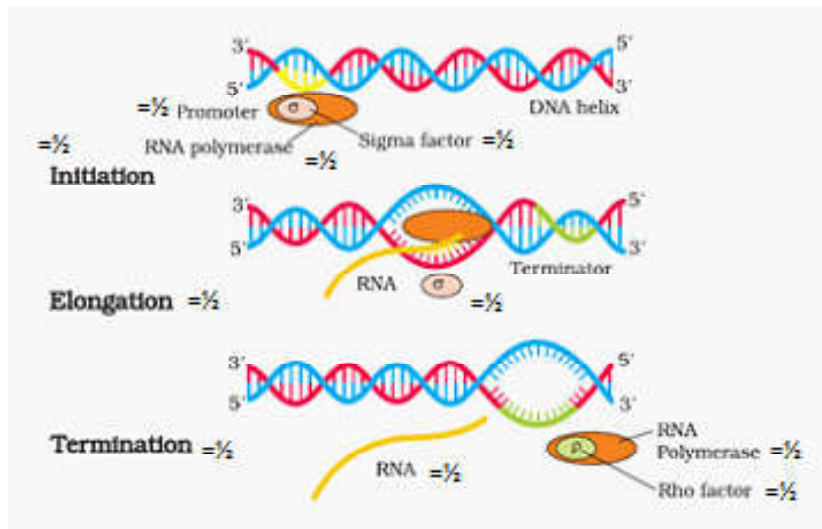
**27. Explain the process of transcription in prokaryotes.**

- Ans. DNA - dependent RNA polymerase that catalyses the process of transcription, three steps: initiation, elongation, and termination,  
 Initiation: RNA polymerase binds to promoter, associated with initiation - factor ( $\sigma$ ) at 5' end of DNA,

Elongation : nucleoside phosphates serve as substrate following the rule of complementarity , RNA polymerase help in opening the helix and continuous elongation ,

Termination : Terminator factor ( $\rho$ ) , nascent RNA falls off along with RNA polymerase =  $\frac{1}{2} \times 10$

//



[ 5 Marks]

OR

(a) Write the scientific name of the organism Griffith used in his experiments. State the conclusions he arrived at.

(b) Name the scientists and describe how they experimentally proved the biochemical nature of the genetic material which was earlier considered as protein.

Ans. (a) *Streptococcus pneumoniae* =  $\frac{1}{2}$

He concluded that the R strain bacteria has been transformed by the heat-killed S strain bacteria / R strain to become virulent from non-virulent / he proved the transforming principle of genetic material =  $\frac{1}{2}$

(b) (Oswald) Avery, (Colin) MacLeod , and (Maclyn) McCarty

They purified biochemicals (proteins, DNA, RNA, etc.) from the heat-killed S cells to see which ones could transform live R cells into S cells ,

They also discovered that protein-digesting enzymes (proteases) and RNA-digesting enzymes (RNases) did not affect transformation, so the transforming substance was not a protein or RNA ,

Digestion with DNase did inhibit transformation, suggesting that the DNA caused the transformation =  $\frac{1}{2} \times 8$

[1 + 4 = 5 Marks]