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. **Cucurbits are monoecious plants as**

   (A) **they produce only male flowers on the same plant.**

   (B) **they produce both male and female flowers on the same plant.**

   (C) **they produce bisexual flowers.**

   (D) **they produce only female flowers on the same plant.**

Ans. (B) / They produce both male and female flowers on the same plant.

[1 Mark]

SECTION B

6. **How are malignant tumors different from benign tumors ? Why are some patients treated with α-interferons ?**

Ans. Benign tumors remain confined to their original location/ do not spread to other part of the body / cause little damage / no metastasis ,

malignant tumors proliferate and spread to other body parts / is more harmful / cause serious damage / causes metastasis $= \frac{1}{2} \times 2 = 1$

Biological response modifiers / activate immune system to destroy tumor $= 1$

[2 Marks]

OR

Name the hormone with which a cow is administered using MOET technology. State the function of this hormone.

Ans. Follicular Stimulating Hormone like / FSH like , to induce follicular maturation/ super ovulation/ production of 6-8 eggs = 1 + 1

[2 Marks]

7. Mention the function of the spleen in the human body. Name the two different types of cells present in it.

Ans. Spleen acts as a filter of the blood , by trapping blood borne (micro) organisms = ½ × 2

Phagocytes/ lymphocytes / erythrocytes (any two) = ½ × 2

[½ × 4 = 2 Marks]

8. State giving one example each, what are the following pattern of inheritance called, where

(a) A single gene controls more than one phenotypic expression.

(b) Two , or more than two genes are involved in controlling a phenotypic character.

Ans. a) Pleiotropic inheritance, shape of pea seed and starch grain size of the pea (large starch grain size and shape is controlled by same gene) / Sickle cell anemia / Phenylketonuria / any other correct example = ½ + ½

b) polygenic inheritance, human skin colour controlled by two or more genes /any other correct example = ½ + ½

[½ × 4 = 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]

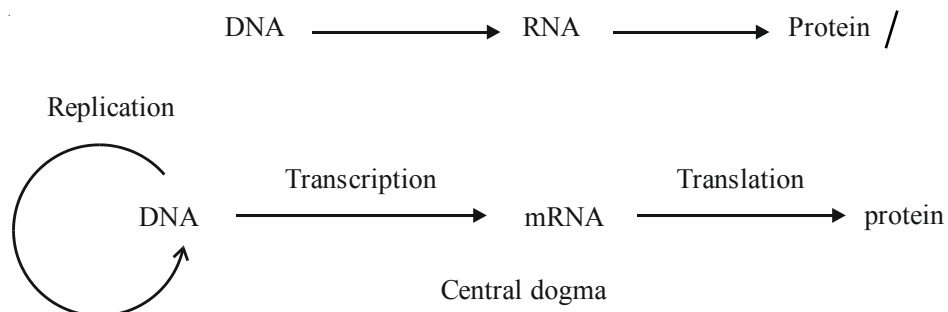**10. Write the ploidy and number of chromosomes in human (a) meiocytes, and (b) gametes.**

Ans. (a) (meiocytes) 2n , 46 = ½ + ½

(b) (Gametes) n , 23 = ½ + ½

[2 Marks]

11. Name the scientist who proposed the Central Dogma. Give its schematic representation.

Ans. Francis Crick = ½

DNA $\longrightarrow$ RNA $\longrightarrow$ Protein /

Central dogma

(DNA, mRNA and protein— to be marked on their correct position) = 3 × ½

[½ × 4 = 2 Marks]

29

12. **(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) = ½ + ½
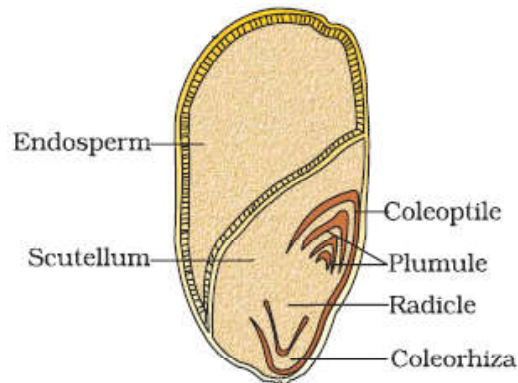
   b.   Australian marsupials each differ from the other evolved from an ancestral stock, all within the Australian island continent. = ½ + ½

[2 Marks]

SECTION C

13. **Draw a vertical section of maize grain and label its endosperm, plumule, coleoptile, scutellum, radicle and coleorhiza.**

Ans.

(½ × 6 = 3)

[3 Marks]

14. **A woman with normal colour vision, whose father was colour blind , married a man with normal colour vision. Work out a cross to show the probability of children born to them with respect to colour vision.**

Ans. A woman with normal colour vision - whose father was colour blind has to be a carrier for colour blind gene and her genotype would be —— XX^C

Husband is normal - his genotype would be — XY

Parents $XX^c = ½$ x $XY = ½$

Gametes X X^c | X Y

	X	X^c
X	XX	XX^c
Y	XY	X^cY

Children
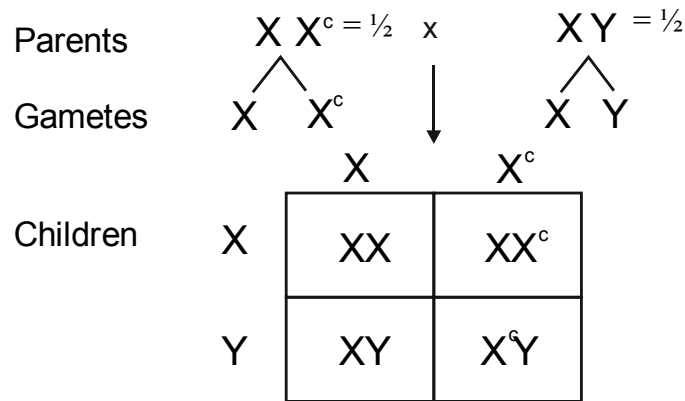
25% daughters with normal vision; 25% sons with normal vision ; 25% daughters are carrier ; 25% sons colour blind $= ½ \times 4$

[3 Marks]

15. **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) $= ½ + ½$

[3 Marks]

16. (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. $= ½ \times 4$

   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 $= ½$
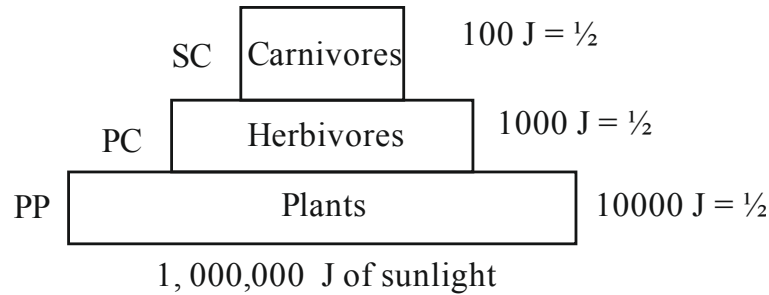
$$= \frac{1}{2} \times 4$$

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

[2 + 1 = 3 Marks]

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17. What is tissue culture ? Explain how, from a virus infected banana plant, virus free healthy banana plants can be grown by this technique.
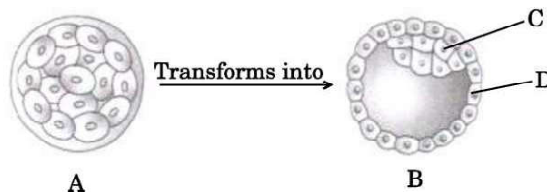
Ans. Growing a whole plant from an explant /(any part or the tissue of a plant), in a test tube under sterile conditions in special nutrient medium $= \frac{1}{2} + \frac{1}{2}$

Meristem of infected banana plant is removed, as meristems are virus free ,

Meristems grown in vitro/through tissue culture, many virus free new banana plant are grown $= \frac{1}{2} \times 4$

[3 Marks]

18. 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.
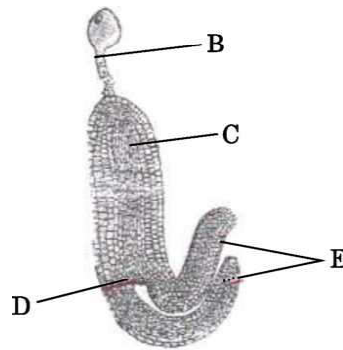
Ans. a) A - Morula ; B - Blastocyst ; C - Inner cell mass / Stem cells , D - Trophoblast $= \frac{1}{2} \times 4$

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.

(b) State the function of E.

Ans. a) Mature Dicot Embryo,

B-Suspensor ; C- Radicle ; D-Plumule ; E-Cotyledon ; $= \frac{1}{2} \times 5$

b) Storage of food reserves (as in legumes) $= \frac{1}{2}$

[3 Marks]

19. **Starting from the pioneer species, trace the sequence that follows in an ecological succession on a bare rock, until climax community is reached in an ecosystem. Name this type of succession.**

Ans. Lichens are the pioneer species on rocks , they secrete acid and dissolve rocks help in soil formation , pave way to bryophytes that hold small amount of soil , succeeded by higher plants / and scrub , after several stages a stable climax forest community is formed

Primary Succession / Xerarch (succession) $= \frac{1}{2} \times 6$

[3 Marks]

20. **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.) $= \frac{1}{2} \times 6$
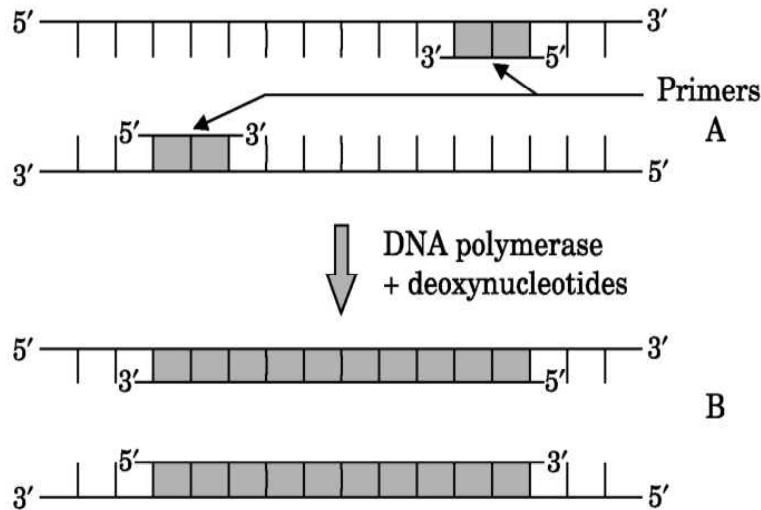
[3 Marks]

21. **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]

SECTION D

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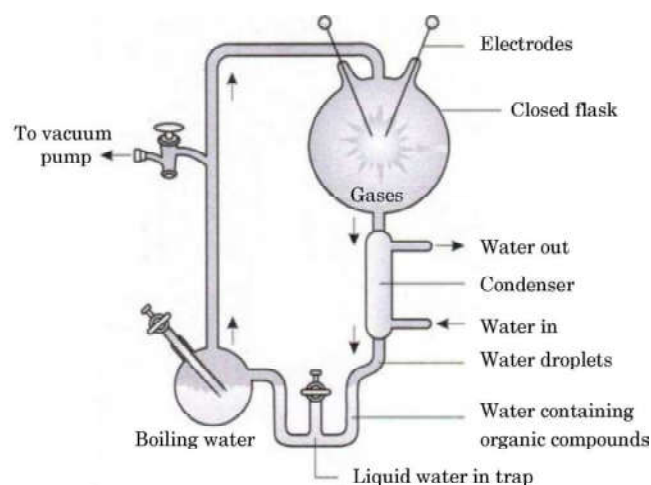

(b) **State the specific characteristic feature of the enzyme in carrying step B.**

Ans. a) A = Annealing ; B = Extension = 1 + 1

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

[2 + 1 = 3 Marks]

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

(a) **How did S.L. Miller create the conditions which existed before the origin of any life on Earth ?**

(b) **Name the organic compound formed and collected at the end of his experiment.**

(c) **Mention the kind of evolution his experiment supports.**
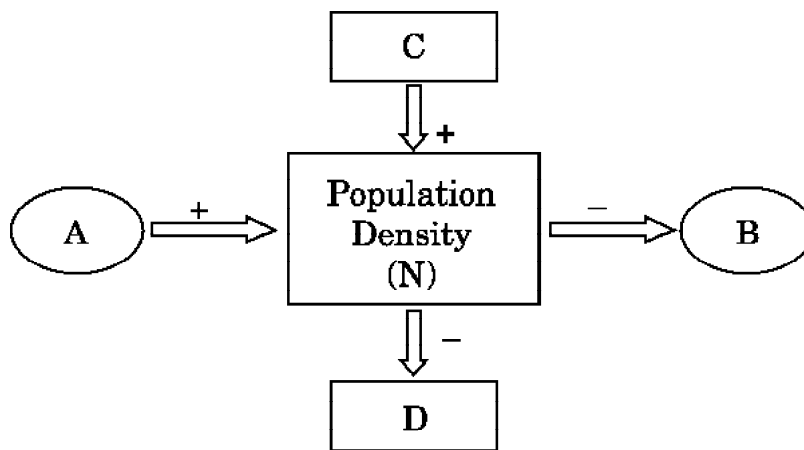
Ans. (a) (Conditions existed before the origin of life -High temperature, volcanic storms, reducing atmosphere containing CH_4, NH_3, etc.)

Conditions were created by electric discharge (high temperature) in a closed flask containing CH_4, NH_3, H_2, water vapours $= \frac{1}{2} \times 4$

b) amino acids $= \frac{1}{2}$

c) chemical evolution $= \frac{1}{2}$

[3 Marks]

24.

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

(a) **Identify A in it.**

(b) **Identify D in it.**

(c) **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 = Natality / Immigration

b) D = Emigration / Mortality

c) $N (t+1) = Nt + [(B+I)-(D+E)]$ $= 1 \times 3$

[3 Marks]

SECTION E

25. (a) **How did Meselson and Stahl reach the conclusion that DNA replication is semi-conservative while working with E. coli in their experiment?**

(b) **Explain the contribution of Taylor and his colleagues in DNA replication in flowering plants.**

Ans. a) They grew *E. coli* in a medium containing $^{15}NH_4Cl$ as the only nitrogen source for many generations , ^{15}N was incorporated into newly synthesised DNA, heavy DNA molecule could be distinguished from the normal DNA by centrifugation in a cesium chloride (CsCl) density gradient, transferred the cells into a medium with normal $^{14}NH_4Cl$, took samples at various definite time intervals/20 minutes, samples were separated independently on CsCl gradients to measure the densities of DNA, looking at the positions according to their respective densities of ^{15}N DNA, ^{14}N DNA and hybrid (^{15}N DNA- ^{14}N DNA) in the centrifuge tubes they reached their conclusion. ($\frac{1}{2} \times 8 = 4$)

b) Worked on *Vicia faba* /faba beans , using radioactive thymidine to prove that DNA in the chromosomes also replicates semi conservatively $= \frac{1}{2} \times 2$

[4 +1 = 5 Marks]

OR

(a) **Write the steps that lead to aminoacylation of tRNA in the cell.**

(b) **Explain the events that occur in ribosomes during translation in prokaryotes.**

Ans. a) amino acids are activated in the presence of ATP ,and linked to their cognate t-RNA $= \frac{1}{2} \times 2$

b) the ribosome binds to the mRNA at the start codon (AUG) that is recognised only by the initiator tRNA, the ribosome proceeds to the elongation phase of protein synthesis, during this stage complexes composed of an amino acid linked to tRNA sequentially bind to the appropriate codon in mRNA by forming complementary base pairs with the tRNA anticodon , the ribosome moves from codon to codon along the mRNA, amino acids are added one by one, translated into Polypeptide sequences represented by mRNA, at the end-a release factor binds to the stop codon, terminating translation and releasing the complete polypeptide from the ribosome. $= \frac{1}{2} \times 8$

[1 + 4 = 5 Marks]

26. **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) <u>Narrowly utilitarian -</u> $= \frac{1}{2}$

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) <u>Broadly utilitarian -</u> $= \frac{1}{2}$

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

c) <u>Ethical -</u> $= \frac{1}{2}$

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 = ½ – protect the natural habitat the forest where the tiger lives/ protect the whole ecosystem to save tigers = ½

b)   Ex situ conservation = ½ – 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. = ½

[3 + 2 = 5 Marks]

<div align="center">

OR

</div>

What is integrated organic farming ? How did Ramesh Chandra Dagar, a farmer from Sonepat, 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. = ½ × 10

[5 Marks]

27.   (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)
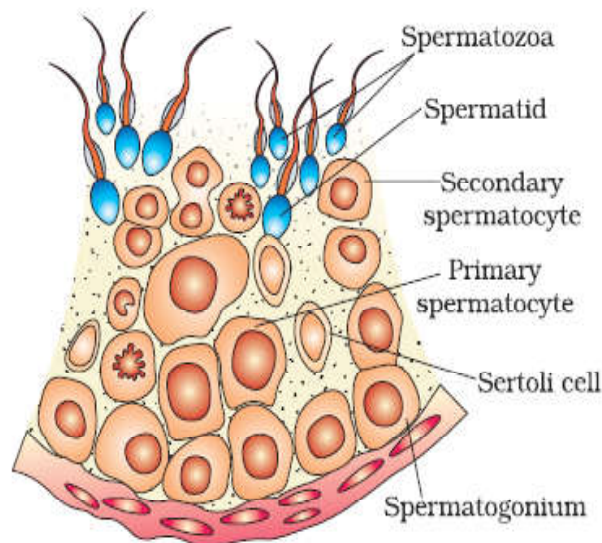
(any 6 parts) = ½ × 6

b)   Pituitary hormones: Luteinising hormone (LH) , follicle stimulating hormone (FSH) = ½ + ½

(LH) Acts at the leydig cells and stimulates synthesis and secretion of androgens = ½

(FSH) Acts on sertoli cells and stimulates secretion of some factors which help in the process of spermiogenesis. = ½

[3 +2 = 5 Marks]

(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) $= 1$

[2 + 3 = 5 Marks]