

Answers to RBI/Set-1

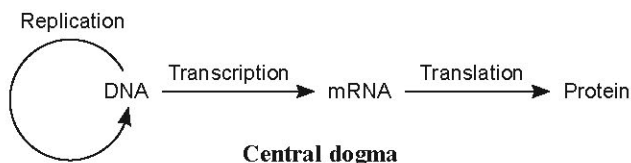
1. (b) Perimetrium – Site of implantation of blastocyst
2. (d) After spermiogenesis the sperm heads are embedded in the Sertoli cells and are later released from the seminiferous tubules.
3. (d) 7, 8
4. (c) Short non-coding repetitive sequence forming large portion of eukaryotic genome.
5. (d) $IIgG \times LIgG$
6. (d) $lac\ z \rightarrow lac\ y \rightarrow lac\ a$
7. (b)
8. (c) 6
9. (c) Symbiotic fungus – *Glomus*
10. (d) *Dryopithecus* → *Ramapithecus* → *Australopithecus* → *Homo habilis* → *Homo erectus*
11. (b) It is the first enzyme isolated from strain S2 of the bacterium.
12. (a)

Level of pollution	Value of BOD
High	High
13. (c) A is true but R is false.
14. (a) Both A and R are true and R is the correct explanation of A.
15. (a) Both A and R are true and R is the correct explanation of A.
16. (b) Both A and R are true and R is not the correct explanation of A.
17. A. – Oral pills contain progestogens or estrogen-progesterone combination.
– They inhibit ovulation and implantation.
– They alter the quality of cervical mucus and prevent or retard the entry of sperms.

OR

- B. (a) The couples can be assisted to have children through assisted reproductive technologies such as
- (i) *In vitro* fertilisation followed by embryo transfer.
 - (ii) Gamete intra-fallopian transfer.
 - (iii) Intra-cytoplasmic sperm injection.
 - (iv) Artificial insemination.

18. A. – Francis Crick proposed the Central Dogma.



OR

- B. – The ribosome exists as two subunits, a large subunit and a small subunit.
- The large subunit has two sites, where two amino acids coded by the two consecutive codons of mRNA bind to.
 - Since these two amino acids are closer enough, peptide bond formation occurs between them.
 - ATP helps in the activation of amino acids, during the charging of tRNA; since the amino acids are charged, peptide bond formation is favoured energetically.
19. (a) A – Lymph Nodes; they are secondary lymphoid organs.
B – Thymus; it is a primary lymphoid organ.
- (b) – Lymph nodes provide the sites for interaction of lymphocytes with the antigen, which then proliferate to become effector cells. They serve to trap the micro-organisms or other antigens, which happen to get into the lymph and tissue fluid.
- Thymus provides micro-environments for the development and maturation of T-lymphocytes. In thymus, T-lymphocytes differentiate into antigen-sensitive lymphocytes.
20. (a) The recombinant/transformant can be selected out from the non-recombinants/non-transformants by plating the culture on ampicillin-containing medium.
- The transformants will grow in it, while the non-transformants will not grow.
- (b) It acts as a selectable marker.
21. A. – Pyramid of biomass in terrestrial ecosystems is upright, because the amount of biomass is more in producers than herbivores (primary consumers) and that in herbivores is more in carnivores (secondary and tertiary consumers).
- In a sea ecosystem, the pyramid of biomass is inverted as the biomass of consumers (like fishes) far exceeds that of the producers (phytoplanktons).

OR

- B. – The colloidal nature of humus makes it a reservoir of nutrients; it is highly resistant to microbial action and undergoes decomposition at an extremely slow rate.
- Humus undergoes mineralisation, i.e., it is degraded by microbes and inorganic nutrients are released.
22. – The endosperm will have 30 chromosomes and the embryo will have 20 chromosomes.
- The meiocyte is a diploid cell (with 20 chromosomes) and it undergoes meiosis; hence, the haploid cells of the embryo sac of maize will have 10 chromosomes.
 - The endosperm develops from the primary endosperm cell, where the primary endosperm nucleus (PEN) is formed by triple fusion, i.e., fusion of three haploid nuclei (two polar nuclei fuse to form a diploid secondary nucleus) and a haploid male gamete.
 - So the endosperm cells are triploid with 30 chromosomes.
 - The embryo develops from the zygote, which is formed by the fusion of a female gamete with a male gamete; so it is diploid with 20 chromosomes.
23. **Duct System of Human Male Reproductive System**
- The seminiferous tubules open into vasa efferentia through the rete testis.
 - The vasa efferentia leave the testis and open into epididymis, which is located along the posterior surface of the testis.
 - The epididymis opens into the vas deferens that ascends into the abdominal cavity, loops over the urinary bladder and receives a duct from the seminal vesicle of its side to form the ejaculatory duct.
 - The ejaculatory duct opens into the prostatic urethra; urethra also receives ducts of prostate and bulbourethral glands and runs through the penis to its opening, called urethral meatus to the outside.
24. – Meselson and Stahl, in their experiments, grew *E.coli* in a medium containing $^{15}\text{NH}_4\text{Cl}$ as the only source of nitrogen for a number of generations.
- As a consequence, the heavy isotope of nitrogen, ^{15}N , was incorporated into the DNA as well as other nitrogenous compounds.
 - This heavy DNA molecule, i.e. $^{15}\text{N}/^{15}\text{N}$ DNA, can be distinguished from the normal $^{14}\text{N}/^{14}\text{N}$ DNA, by cesium chloride density gradient centrifugation based on their densities.

- Then the cells were transferred to a medium containing $^{14}\text{NH}_4\text{Cl}$ (normal nitrogen) and samples were taken at definite time intervals.
 - They isolated the DNA and the samples were independently centrifuged on CsCl density gradient to measure the densities of the DNA.
 - The DNA isolated after one generation (after 20 minutes) of transfer to ^{14}N medium, had a hybrid or intermediate density; it is because of semiconservative replication.
 - The DNA isolated after two generations (after 40 minutes) had equal amounts of hybrid ($^{15}\text{N}/^{14}\text{N}$) density DNA and light ($^{14}\text{N}/^{14}\text{N}$) DNA, showing semiconservative replication.
25. - The properties that can be correlated:
- (i) UAA does not code for any amino acid; it is a termination codon.
 - (ii) Genetic code is specific and unambiguous, i.e. one codon codes for a particular amino acid only.
 - (iii) Each codon is a triplet.
 - (iv) Genetic code is degenerate, as one amino acid is coded by more than one codon, e.g. UUU and UUC code for phenylalanine.
 - (v) Genetic code is read in a contiguous manner without any punctuation.
- The property that cannot be correlated:
- AUG has dual functions; it is initiation codon as well as codes for methionine.
26. (a) The organic farmer creates a system where the insects (called pests) are not eradicated, but kept at manageable levels by a complex system of checks and balance within a living and vibrant ecosystem
- e.g. (i) The ladybird beetle gets rid of aphids
- (ii) The dragonflies control the mosquito population.
- (b) - An organic farmer relies on bio-control agents and hence, only the so called pests are targeted and no useful organisms are killed; since there is no chemicals involved, there is no pollution of soil, groundwater, etc.
- The conventional pest control methods use chemicals, which kill both the harmful and useful organisms indiscriminately; they also pollute the soil, and groundwater and the agricultural produces.

27. – When a restriction enzyme cuts the strands of DNA, a little away from the centre of the palindrome site, between the same two bases on the two strands, single-stranded portions are left at the ends.
- These overhanging single-stranded stretches of DNA at the ends, are called ‘sticky ends’.
 - They are so called because they easily form hydrogen bonds with their complementary cut counterparts with the action of enzyme ligase.
28. – Brood parasitism refers to the phenomenon in which a (parasitic) bird species lays its eggs in the nest of another (host) bird species and lets the host incubate them.
- The eggs of the parasitic bird must have evolved resemblance to the eggs of the host in size and colour to reduce the chances of the host bird detecting the foreign eggs and ejecting them from the nest, e.g. the cuckoo lays its eggs in the nest of a crow.
29. (a) Methane, Ammonia, hydrogen and water vapour.
- (b) – The components of the hypothesis are as follows:
- (i) The first form of life could have come from pre-existing non-living organic molecules like RNA, proteins, etc.
 - (ii) Formation of life was preceded by chemical evolution that resulted in the formation of diverse organic molecules from inorganic molecules.
- This hypothesis was proposed by Oparin and Haldane.
- (c) Amino acids

OR

- (d) 800°C
30. (a) – The secondary response is due to the memory of the immune system.
- The memory B and T cells recognise the pathogen and overwhelm, the pathogen with a massive production of antibodies; hence it is highly intensified.
- (b) Humoral immune responses and cell-mediated immunity are the two types of acquired immune response.

Humoral Immune Response

- It consists of the antibodies that are circulating in the body fluids (humors).
- These antibodies are produced by B-lymphocytes.
- The antibodies neutralise the pathogens/antigens that enter the body.

Cell-mediated Immune Response

- It consists of the different types of T-lymphocytes.
- The T-lymphocytes stimulate the B-cells to produce antibodies.
- It is responsible for rejecting organ transplants.

(c) Response B is more vigorous than response A.

OR

(d) Peak B is due to anamnestic response.

31. A. (a) A-Graafian follicle, B-Tertiary follicle, C-Secondary oocyte, D-Corpus luteum.

(b) **Function of D:**

(i) If fertilisation takes place, corpus luteum continues to exist and produces large quantity of progesterone that helps to maintain pregnancy.

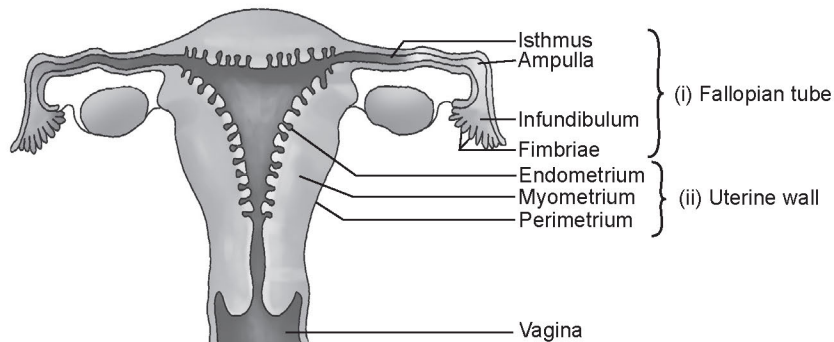
(ii) If fertilisation does not take place, corpus luteum slowly regresses.

(c) – Luteinising hormone is responsible for the release of ‘C’ from the ovary.

– The process is called ovulation.

OR

B. (a)



- (b) – A primary spermatocyte is diploid and has 46 chromosomes; it undergoes meiosis I and forms two secondary spermatocytes.
 - A secondary spermatocyte is haploid and has 23 chromosomes; it undergoes meiosis II and forms two spermatids.
32. A. (a) – DNA is a hydrophilic molecule that cannot pass through cell membrane; so the bacterial cells must be made competent to take up the DNA.
- The bacterial cells are made competent by treating them with a specific concentration of a divalent cation, such as calcium; this increases the efficiency with which DNA enters the bacterium.
- (b) (i) Biolistics/Gene gun
- (ii) Micro-injection
- (c) – The prokaryotes/bacteria have restriction enzymes to restrict the growth of bacteriophages, which infect them; it is a defence mechanism of bacterial cells.
- They do so by cutting the DNA of the phage with restriction enzyme.
 - Bacteriophages do not infect eukaryotes; eukaryotes have other defence mechanisms.

OR

- B. (a) Tissue culture is the technology used; its steps are as follows:
- Making explants, i.e., any part of the plant or cells or tissues that will be used to regenerate whole plants.
 - Preparing a nutrient medium containing carbon source (sucrose), inorganic nutrients, vitamins, amino acids and growth regulators.
 - Sterilisation of the medium.
 - Growing the explants in the medium.
 - Transferring the plantlets on to the field (micropropagation).
- (b) **Somatic hybridisation**
- The steps include:
- Isolation of protoplasts from the selected two different varieties of plants.
 - Fusion of the isolated protoplasts.
 - Growth of hybrid in a suitable nutrient medium.
 - Transfer of plantlets to the field (micropropagation).

33. A. (a) (i) – ‘X’ is Insects
– ‘Y’ is Molluscs
(ii) – X is species-rich
– More than 70 percent of animals.

(b) **Biodiversity Loss**

(i) **Habitat loss and fragmentation**

- It is the primary cause for extinction.
- The tropical rain forests initially covered 14% of the land surface of the earth, but now they cover only 6% of land area.
- Total loss of a habitat deprives many animals and plants of their homes and they face extinction.
- When a large habitat becomes fragmented animals requiring large territories and those with certain migratory habits start decreasing.

(ii) **Over-exploitation**

- When nature is overexploited by man for the natural resources, many species become extinct.

(iii) **Invasion by Alien Species**

- The alien species become invasive and compete with native species and cause extinction of indigenous species.

(iv) **Co-extinction**

- Co-extinction is a phenomenon in which when a species becomes extinct, the plant and animal species associated with it in an obligatory manner, also become extinct. (any three)

OR

- B. (a) Hotspots are the regions with very high levels of species richness and high degree of endemism and need maximum protection. e.g. Western Ghats and Himalayas.

(b) **Genetic diversity**

- It refers to the high diversity of a species at the genetic level over its ditributional range. e.g. India has more than 50,000 genetically different strains of rice.

Species diversity

- It refers to the diversity at species level, i.e., the number of different species in a given region, e.g. Western Ghats have a greater amphibian species diversity than Eastern Ghats.

Ecological diversity

- It refers to the diversity at the ecosystem level, i.e., presence of different types of ecosystems in a given landscape. e.g. India has a number of ecosystems like rain forests, coral reefs, deserts, wetlands, etc.