

Sample Question Paper 01

SCIENCE 10

Time : 3 Hrs.

Max. Marks : 80

General Instructions

- This question paper consists of 39 questions in 3 sections. Section A is Biology, Section B is Chemistry and Section C is Physics.
- All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

Section A

1. In a food chain, the snake preyed a rabbit which fed on fresh green bushes. What percentage of the energy accumulated by rabbit, would be acquired by the snake? [1]
- (a) 90% (b) 10% (c) 50% (d) 25%

Sol. (b) According to 10% energy law, in a food chain, only around 10 % of the available energy is passed on to the next trophic level. The rest of the energy is lost to the ecosystem in the form of heat.

2. How do spores develop into *Rhizopus*? [1]
- (a) Spores divide and grow into a new individual.
(b) Spores combine with other spores and grow
(c) Spores enlarge in size for the growth of new individual
(d) Spores land on other organisms and increase with their growth in size

Sol. (a) *Rhizopus* reproduces through spore formation. Under favourable conditions, the spores divide and grows into new individuals.

3. Select the group in which all functions are controlled by the cerebellum. [1]
- (a) Maintaining posture, balancing the body, coordinating voluntary movements
(b) Thinking, reasoning, memory storage
(c) Beating of heart, breathing, swallowing
(d) Reflex action, transmission of impulses, maintaining blood pressure

Sol. (a) Maintaining posture, balancing the body and coordinating voluntary movements belong to the same group as all these functions are controlled by cerebellum.

4. Which of the following is a correct combination of function and part of the heart? [1]
- (a) Pumping oxygenated blood to the body: Left ventricle
(b) Receiving oxygenated blood from lungs: Right atrium
(c) Receiving deoxygenated blood from body: Left atrium
(d) Pumping deoxygenated blood to the body: Right ventricle

Sol. (a) Pumping oxygenated blood to the body: left ventricle is the correct combination as left ventricle pumps oxygenated blood into the aorta, which carries it to all parts of the body under high pressure.

5. In human males, which chromosome does not have an identical pair? [1]
- (a) Chromosome no. 1 (b) Chromosome no. 7
(c) Y-chromosome (d) X-chromosome

Sol. (c) The Y-chromosome pairs with the X-chromosome. So, it does not have an identical matching pair.

Stage I : Foundation Level

6. Which are the correct statements related to the reflex pathway?

- (i) It involves the brain in initiating the response.
- (ii) The spinal cord acts as the coordinating centre.
- (iii) Sensory neurons carry impulses from receptors to the spinal cord.
- (iv) Motor neurons carry impulses from spinal cord to effectors.
- (v) Reflex actions are voluntary in nature.

(a) (i), (ii), (iii)

(b) (ii), (iii), (iv)

(c) (iii), (iv), (v)

(d) (i), (iv), (v)

Sol. (b) The statements (ii), (iii) and (iv) are correct because in a reflex pathway, the spinal cord serves as the coordinating centre. Sensory neurons transmit impulses from receptors to the spinal cord, and motor neurons carry impulses from the spinal cord to the effector organs to produce a quick and involuntary response.

7. Which statement is true for a dominant allele in Mendelian experiment.

- (a) It cannot undergo mutation
- (b) It gives a greater chance of survival than a recessive
- (c) It gives the same phenotype in heterozygotes and homozygotes
- (d) It is only responsible for male characteristics

Sol. (c) In Mendelian experiment dominant allele always expresses itself whether present in heterozygous or homozygous condition.

The following two questions consist of two statements – **Assertion (A)** and **Reason (R)**. Answer these questions by selecting the appropriate option given below.

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
- (c) (A) is true but (R) is false.
- (d) (A) is false but (R) is true.

8. **Assertion (A)** Lymph, also known as tissue fluid, is similar to plasma which is colourless.

Reason (R) Lymph is colourless because it lacks RBCs.

Sol. (a) Both A and R are true, and R is the correct explanation of A.

9. **Assertion (A)** After fertilisation, the ovule develops into a seed and the ovary into a fruit.

Reason (R) Fertilisation triggers cell division and growth in the zygote and surrounding tissues.

Sol. (a) Both A and R are true and R is the correct explanation of A.

10. "Placenta acts as a link between the mother and the foetus." Comment upon the statement with justification.

Sol. Placenta acts as a link between the mother and the foetus as it connects the blood supply of the mother with that of the foetus without mixing the two. It allows the transfer of oxygen and nutrients from the mother to the foetus for its growth and development. It also removes carbon dioxide and waste products from the foetus to the mother's blood for excretion. Thus, the placenta ensures nourishment, respiration and removal of wastes for the developing foetus throughout pregnancy.

11. Attempt either A or B.

A. Different organisms have different mechanism of sex-determination. These mechanisms vary across species and ensure the development of male and female individuals accordingly. Identify and mention in one line the method of sex-determination in the following.

(i) Humans

(ii) Reptiles

Or

B. Explain the mechanism by which tallness is inherited in pea plants, when a pure tall plant is crossed with a pure short plant.

- Sol.** A. (i) In humans, sex is determined by chromosomes - XX for female and XY for male. [1]
 (ii) In some reptiles, temperature during incubation of eggs determines whether the offspring will be male or female. [1]

Or

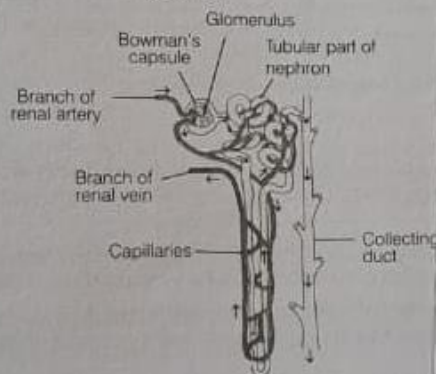
- B. When a pure tall pea plant (TT) is crossed with a pure short pea plant (tt), all plants in the F_2 -generation are tall (Tt). This happens because the allele for tallness (T) is dominant over the allele for shortness (t). The shortness trait is masked in the heterozygous condition, so all offspring show the tall character.

12. During an experiment on digestion, scientists observed that partially digested food from the stomach was mixed with bile and pancreatic juice and then broken down into simple sugars, amino acids, and fatty acids. They also found that these nutrients were finally digested and absorbed into the blood through finger-like projections present in the inner lining of the organ. [2]

- Sol.** The small intestine is the main organ for complete digestion and absorption of food. Bile from the liver emulsifies fats, and pancreatic and intestinal enzymes breakdown carbohydrates, proteins and fats into simple absorbable forms. And the inner walls of the small intestine have finger-like projections called villi, which increase the surface area, so the digested nutrients are absorbed through the villi into the blood and carried to different parts of the body.

13. Draw the structure of nephron and explain the process of urine formation. [3]

- Sol.** A nephron is the basic unit of the kidney that filters blood and forms urine. It consists of a glomerulus enclosed in Bowman's capsule, followed by a coiled tubule. Urine formation takes place in three steps **filtration**, **reabsorption** and **secretion**. First, blood is filtered in the glomerulus, and waste along with water passes into the capsule. Then, useful substances like glucose and water are reabsorbed in the tubule. Finally, excess waste is secreted into the tubule and the urine formed is collected in the collecting duct. [1½]



[1½]

14. In an experiment on nerve impulse transmission, it was observed that the electrical signal moved from the axon end of one neuron to the dendrite of another neuron through a synapse, but never in the reverse direction. [3]

- (i) Explain why the signal passes from the axon end of one neuron to the dendrite of the next neuron, but not in the reverse direction.

- (ii) What would happen to the transmission of the signal if neurotransmitters were not released at the synapse?

- Sol.** (i) The signal passes from the axon end of one neuron to the dendrite of the next neuron because only the axon terminal has chemical substances (neurotransmitters) that carry the signal to the dendrite of the next neuron. The signal cannot travel backward because the dendrite end does not have neurotransmitters, so no chemicals are released to send the signal in reverse. [2]

- (ii) If neurotransmitters were not released, the signal would not pass to the next neuron and the message would stop there. [1]

★ Value Point

To get maximum marks, students should mention about neurotransmitters, as these are chemicals that transmit signals between neurons.

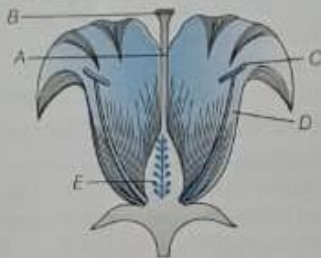
15. Riya planted a rose cutting in her home garden and also grew pea plants from seeds in her school laboratory. During the flowering season, she observed pollen grains on the stigma of the pea flowers. Help her to understand some concepts of reproduction in plants by answering the questions given below.

Attempt either subpart A or B.

A. Differentiate between the method of reproduction in the above given plants.

Or

- B. Explain the process of pollen germination in flowering plants.
C. Which method of reproduction in the above examples produces offspring genetically identical to the parent?
D. Given below is a diagram of a flower. Identify and name the part that produces the male gametes and the part that receives them during pollination.



Sol. A. The rose plant reproduces by vegetative propagation, which is an asexual method of reproduction where new plants grow from parts like stems, roots or leaves. In this case, a cutting from the rose stem can grow into a new plant.

The pea plant reproduces by sexual reproduction, which involves the fusion of male and female gametes formed after pollination and fertilisation.

Or

- B. Pollen germination is the process where a pollen grain lands on the stigma of a flower and germinates to form a pollen tube, which grows through the style into the ovary. The male gamete moves through this tube and fuses with the egg cell in the ovule.
C. The method that produces offspring genetically identical to the parent is vegetative propagation as seen in Rose plants.
D. The given figure represents a flower with different parts labelled as A, B, C, D and E. Out of these the part labelled C is the anther which produces the male gamete and the part labelled B is the stigma which receives the male gamete.

16. Attempt either A or B.

A. Mrs. Sharma was teaching about the ozone layer in the atmosphere.

- What are ozone depleting substances? Give one example.
- State any two harmful effects of ozone layer depletion.

Or

B. While studying the ozone cycle, Mrs. Sharma explained that ozone is constantly being formed and broken down in the atmosphere.

- How is ozone formed in the atmosphere?
- State any two ways by which we can reduce ozone layer depletion.

Sol. A. (i) Ozone depleting substances are chemicals which lead to the depletion of the ozone layer present in the upper atmosphere. These are mostly man-made. The most common example is chlorofluorocarbons (CFCs), used in refrigerators, air conditioners, aerosol sprays and in the production of foam. These chemicals, when released reach the stratosphere where they breakdown ozone molecules, reducing the thickness of the ozone layer.
(ii) **Two harmful effects of ozone layer depletion are**

- The ozone layer acts as a protective shield by absorbing harmful ultraviolet (UV) rays from the Sun. Depletion of this layer allows more UV rays to reach the Earth's surface.
- Increased exposure to UV rays can cause skin cancer, cataract in the eyes and damage to the immune system in humans.

Or

- B. (i) **Ozone is formed in the atmosphere** When high-energy ultraviolet (UV) radiation from the Sun splits oxygen molecules (O_2) into single oxygen atoms. These atoms then combine with other oxygen molecules to form ozone (O_3). Under natural conditions, ozone molecules are constantly being formed and broken down, maintaining a balance in its concentration. The ozone layer is important as it absorbs harmful UV rays, preventing them from reaching the Earth's surface.
- (ii) **Two ways to reduce ozone layer depletion are**
- By minimising the use of ozone depletion substances. e.g., use of CFC's in cooling appliances and aerosol/sprays should be avoided.
 - Use of eco-friendly alternatives, like servicing and proper disposal of old refrigerators and air conditioners to prevent leakage of CFC's.

 Mistake Alert

Students should not get confused about ozone, as it is good if present in the stratosphere but harmful if present near Earth's surface.