Maharashtra State Board
Class X Science and Technology Paper II
Board Paper – 2016

Time: 2 Hours **Max. Marks: 40**

Note:

(i) Draw well-labelled diagrams wherever necessary.
(ii) All questions are compulsory.
(iii) Students should write the answers of questions in sequence.

1.

(A) Answer the following sub-questions : **5**

(1) Fill in the blank and rewrite the completed statement: 1
..... is the largest gland in the body.

(2) Find the odd one out and write it: 1
vagina, uterus, vas deferens, ovary

(3) State whether the statement is true *or* false: 1
Aquatic animals breathe at a slower rate than the terrestrial animals.

(4) Considering the relationship in the first pair, complete the second pair: 1
rr : Homozygous : : Rr : .....

(5) Name the following: 1
Main ore of aluminium.

(B) Rewrite the following statements by selecting the *correct* options: **5**

(1) ..... liberated when acetic acid reacts with sodium metal.
(a) Hydrogen
(b) Chlorine
(c) Oxygen
(d) Nitrogen

(2) For binary fission, Amoeba required ..... parent cells.
(a) Three
(b) Two
(c) One
(d) Zero

(3) A solution of $CuSO_4$ in water is ..... in colour.
   (a) Pink
   (b) Blue
   (c) Colourless
   (d) Green

(4) Raisins are formed by drying grapes. The process that takes place during formation of raisins from grapes is ..... .
   (a) Absorption
   (b) Osmosis
   (c) Diffusion
   (d) Dehydration

(5) Ethanoic acid has a ..... odour.
   (a) Rotten eggs
   (b) Pungent
   (c) Vinegar-like
   (d) Mild

2. Attempt any *five* of the following: **10**

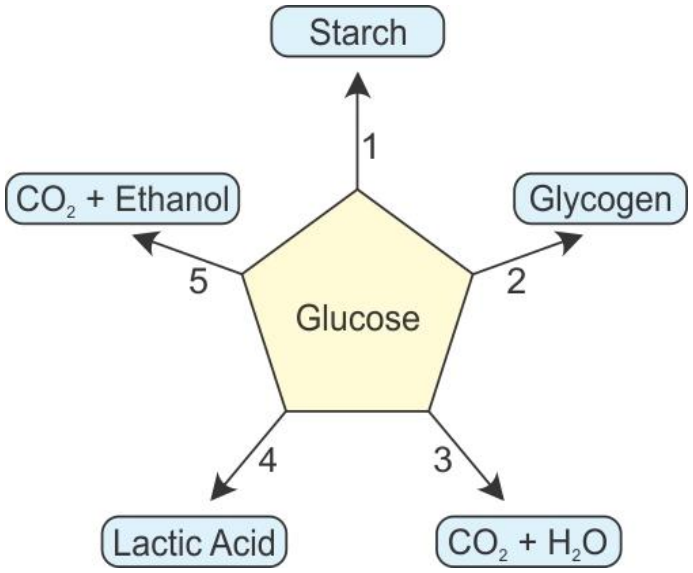
(1) Differentiate between voluntary and involuntary movements.
(2) What is the peculiarity of the 'DNA' structure?
(3) Draw a well-labelled diagram of longitudinal section of a flower.
(4) Give scientific reason : Roots of plants grow away from light
(5) Write any *two* measures to conserve water.
(6) What are fossils?

3. Attempt any *five* of the following: **15**

(1) What is an alloy? Give two examples with their chemical composition.
(2) How is sex determined in human beings?
(3) State the different types of neurons. Explain their functions.
(4) What is '3R' mantra? Write its significance.
(5) Metal A has electronic configuration (2, 8, 1) and metal B has (2, 8, 8, 2). Which is more reactive? Why? Identify these metals.
(6) Explain the disadvantages of a large family size.

4. Attempt any *one* of the following: **5**

(1) Given below are the end products of different reactions involving glucose.



Write the reaction number in front of the following:

(i) Anaerobic reaction =

(ii) Reaction in the human muscles =

(iii) Aerobic respiration =

(iv) Reaction in the plant cells =

(v) Reaction in the liver

(2) What is a homologous series? State any four characteristics of a homologous series.

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1.

(A)

(1) **Liver** is the largest gland in the body.

(2) Vas deferens. It is a part of the male reproductive system, while the vagina, uterus and ovary are parts of the female reproductive system.

(3) False. Aquatic animals breathe at a faster rate than terrestrial animals.

(4) rr : Homozygous : : Rr : **Heterozygous**

(5) Bauxite ($Al_2O_3.2H_2O$) is the main ore of aluminium.

(B)

(1) (a) Hydrogen
Hydrogen is liberated when acetic acid reacts with sodium metal.

(2) (c) One
Amoeba undergoes asexual reproduction by binary fission. In this method, a single parent cell divides into two equal or nearly equal parts. Each part grows into a new individual.

(3) (b) Blue
A solution of $CuSO_4$ in water is blue in colour.

(4) (d) Dehydration
Raisins are formed by drying grapes by the process of dehydration.

(5) (b) Pungent
Ethanoic acid has a pungent odour.

2.

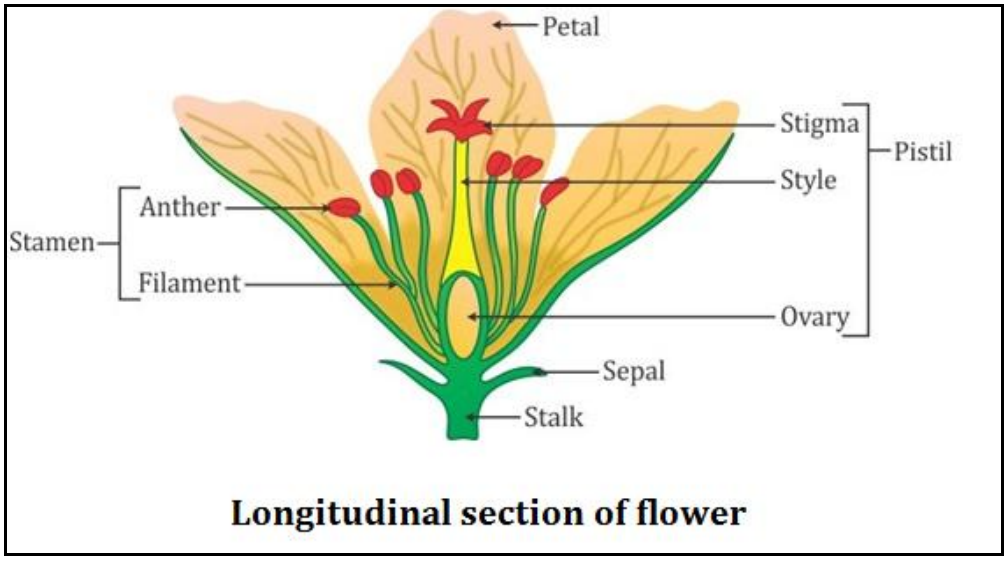
(1) Differences between voluntary and involuntary movements:

Voluntary movements	Involuntary movements
1. Voluntary movements are according to our will.	1. Involuntary movements are not according to our will.
2. They are caused by the cerebrum but controlled by the cerebellum.	2. They are caused by the medulla oblongata and some part of the midbrain.
3. They are under the control of the central and peripheral nervous systems.	3. They are under the control of the autonomic nervous system.
4. Voluntary movements occur when needed and are under our control.	4. Involuntary movements occur continuously and are not under our control.
5. Examples: Eating, walking, reading	5. Examples: Breathing, heartbeat, digestion

(2) Peculiarities of the DNA structure:

- DNA is a double helical structure having nucleotides.
- These nucleotides are made of deoxyribose sugar, phosphoric acid and nitrogenous bases such as adenine, thymine, cytosine and guanine.
- The nucleotide sequence of the DNA molecule is called a gene.
- Genes are present on DNA.
- A type of gene is responsible for the synthesis of a particular protein.
- Changes in the gene can alter the characteristics of the organisms.

(3) Longitudinal section of a flower:



Longitudinal section of flower

(4)

- The root system of plants always grows downwards in response to the stimulus of gravity and water.
- This ensures that the roots find soil and water.
- Hence, the roots of plants grow away from sunlight.

(5) Measures to conserve water:

- Close the taps when not in use.
- Fix leaking taps immediately to avoid the wastage of water.
- Practise rainwater harvesting and recycling of used water.
- Spread awareness among people about the importance of water.
- Restrain the use of appliances which require more water.

(6)

- Fossils are the preserved remains or traces of plants, animals and other organisms from the remote past.
- They are collected from different levels or depths of the soil structure.
- The study of fossils enables us to understand the structure, age, evolutionary process and significance of different organisms.
- Hence, fossils serve as good paleontological evidences.

3.

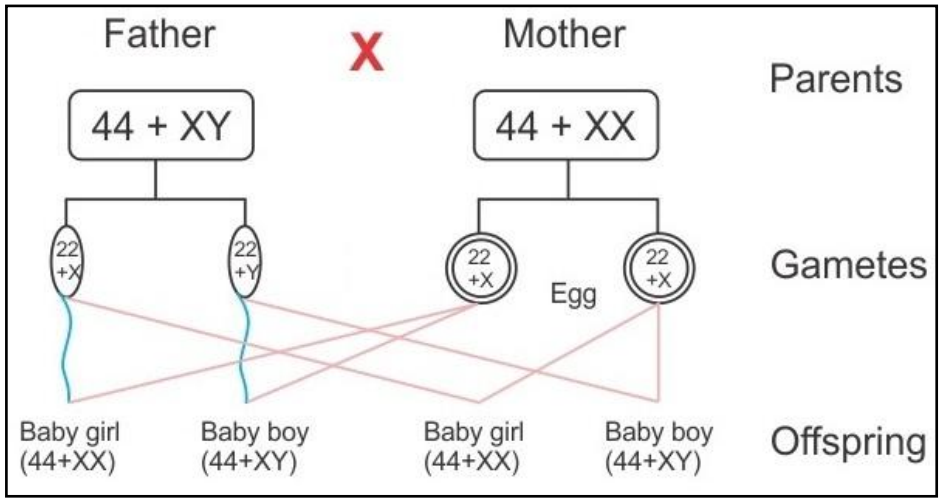
(1) An alloy is a homogeneous mixture of two or more metals or of one or more metals with certain non-metallic elements.

Examples:

Name of the alloy	**Composition**
Duralumin	Al + Cu + Mg + Mn
Brass	Cu + Zn

(2) Determination of sex in human beings:

- In human beings, the male possess 44 autosomes and a pair of heteromorphic sex chromosomes, XY, while the female possess 44 autosomes and a pair of homomorphic sex chromosomes, XX.
- At the time of gamete formation, meiosis occurs.
- The male parent produces X-bearing and Y-bearing gametes or sperms. The female parent produces only X-bearing gametes or eggs.
- During reproduction, the combination of one X-bearing gamete from the male with one X-bearing gamete from the female results in offspring with the genetic constitution XX. The child produced is a female or a daughter.
- The combination of a Y chromosome from the male with one X chromosome from the female results in an offspring with genetic constitution XY. The child produced is a male or a son.
- The offspring produced are always in equal proportion, and hence, the chance of having a daughter or a son is 50%.



(3) There are three different types of neurons—sensory neuron, motor neuron and association neuron.

- Sensory neurons: They conduct nerve impulses from the sense organs to the brain and the spinal cord.
- Motor neurons: They carry impulses from the brain and the spinal cord to the effector organs of the body such as muscles and glands.
- Association neurons: They integrate the functions of the sensory and motor neurons.

(4) Reduce, reuse and recycle is the 'three R mantra'. It is an effective approach to eliminate waste and conserve resources.

- Reduce: Using fewer resources helps in reducing their consumption, e.g. use of less paper and less plastic carry bags.
- Reuse: Using things again rather than throwing them after using them only once is called reuse, e.g. plastic jars can be reused for storing salt and food grains.
- Recycle: The process in which substances which are used before are put back into process to make new items is called recycling, e.g. used and discarded plastics, glass, paper and metal are sent to the respective industries where they can be converted to other useful products such as lampshades and handbags.

Significance of the 'three R mantra':

All three processes cut down the amount of energy used for producing new items. They also reduce the pollution during the process. Thus, natural resources are conserved.

(5) Metal A with electronic configuration (2, 8, 1) is more reactive than metal B with electronic configuration (2, 8, 8, 2). This is because the metal A can lose its one electron more easily as compared to metal B with two electrons.
Metal A = Sodium
Metal B = Calcium

(6) Large family size generally affects individual life and community life.

Disadvantages of large family size:

- Economic pressure
- Mother's poor health
- Poor housing
- Children neglected at home
- Malnutrition
- Lack of better educational facilities
- Insufficient medical care

4.

(1)

(1) Anaerobic reaction = 5
(2) Reaction in the human muscles = 4
(3) Aerobic respiration = 3
(4) Reaction in the plant cells = 1
(5) Reaction in the liver = 2

(2) Homologous series is a group of organic compounds with a similar structure and similar chemical properties in which the successive compounds differ by a **CH_2** group.

Characteristics of a homologous series:

- Each member of the series differs from the preceding one by the addition of a -CH_2 group and by 14 a.m.u.
- All members of a homologous series share the general formula.

  Example: The general formula for alkane is C_nH_{2n+2} and alkene is C_nH_{2n}.
- The physical properties of the members show a gradation in properties as the molecular mass increases.
- The chemical properties also show a gradient similarity.

  Example: Methane and ethane react with chlorine to form methyl chloride and ethyl chloride, respectively.

  $CH_4 + Cl_2 \rightarrow CH_3Cl$

  $C_2H_6 + Cl_2 \rightarrow C_2H_5Cl$
- All members of a homologous series can be prepared by the same general method of preparation.

  Example: Alcohols can be prepared from alkyl halides.

$$CH_3Br + KOH \xrightarrow{\text{Boil}} CH_3OH + KBr$$

$$C_2H_5Br + KOH \xrightarrow{\text{Boil}} C_2H_5OH + KBr$$