CBSE Board
Class X Science
Sample Paper - 2
Term 2 – 2021-22

Time: 2 hours **Total Marks: 40**

General Instructions:

i. *All questions are compulsory.*
ii. *The question paper has three sections **and 15 questions**. All questions are compulsory.*
iii. *Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and*
Section–C has 2 case-based questions of 4 marks each.
iv. *Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.*

SECTION-A

1. Classify the following carbon compounds into two homologous series and name them.
C_3H_4, C_3H_6, C_4H_6, C_4H_8, C_5H_8, C_5H_{10} [2]

2. What are lanthanides and actinides? [2]

3. Why pre-natal sex determination has been prohibited by law? [2]

4. "A brother and sister are more related to each other as compared to the case when any one of them is related with his/her cousin". Through this statement what will we get to know about their ancestors? [2]

5. Which one of the following food chain is better and why? [2]
(a) Plant → Man
(b) Plant → Goat → Man

OR

Observe the given food chain.
Plant (1000 KJ) → Goat → Lion
(a) If autotrophs occupying the first tropic level are called producers what are herbivores called?
(b) How much energy does the lion get in the above food chain?

6. Calculate the number of electrons that flow per second to constitute a current of one ampere. Charge on an electron is 1.6×10^{-19}C. [2]

OR

Draw an electric circuit for studying Ohm's law. Label the circuit component used to measure electric current and potential difference.

7. How are variant genotypes produced? [2]

OR

A woman with blonde curly hair married a man with black soft hair. All of their children in the first generation had black soft hair but in next generation children had different combinations in the ratio of 9:3:3:1. State the law that governs this expression.

SECTION - B

8. Explain isomerism. State any four characteristics of isomers. Draw the structures of possible isomers of butane, C_4H_{10}. Also, explain why we cannot have isomers of the first three members of the alkane series. [3

9. An element P belongs to Group 17 and the third period of the periodic table. [3]

i) Write the electronic configuration of the element. What is its valency?
ii) Predict its nature, whether it is a metal or a non-metal.
iii) Give the formula of the compound formed when it combines with an element Q having a valency three.

OR

How could the modern periodic law remove various anomalies of Mendeleev's periodic table? Explain with examples.

10. The genotype of green stemmed tomato plants is denoted as GG and that of purple stemmed tomato plants as gg. When these two are crossed [3]

i) What colour of stem would you expect in their F_1 progeny?
ii) What is the percentage of purple stemmed plants in F_2 progeny if F_1 plants are self-pollinated?
iii) In what ratio would you find the genotype of GG and Gg in the F_2 progeny?

11. Two identical resistors of resistance R are connected in series with a battery of potential difference V for time t. The resistors are then connected in parallel with the same battery for the same time t. Compare the heat produced in the two cases. [3]

12.

i) State and explain the principle of the working of a dynamo.
ii) State the transformation of energy which takes place in a dynamo.
iii) What is a dynamo also called? [3]

OR

i) What are magnetic field lines?
ii) Draw two field lines around a bar magnet along its length on its two sides and mark the field directions on them by showing arrows.
iii) List any two properties of magnetic field lines.

13. [3]

i) What is biological magnification?
ii) Will the levels of this magnification be different at different levels of the ecosystem?
iii) Where will the magnification be maximum?

SECTION – C

This section has 02 case-based questions (14 and 15). Each case is followed by 03 sub-questions (a, b and c). Parts a and b are compulsory. However, an internal choice has been provided in part c.

14. Contraception is an artificial method or other techniques, mainly used to prevent pregnancy as a consequence of sexual intercourse. When a sperm reaches the ova in women, she may become pregnant. Contraception is a method that prevents this phenomenon by stopping the egg production or by keeping the egg distinct from the sperm or by stopping the fertilized egg attaching to the lining of the womb.

(a) What happens if an egg is not fertilized? [1]
(b) How does the embryo get nourishment inside the mother's body? [1]
(c) Why do we need to adopt contraceptive measures? [2]

OR

How does contraception work?

15. Observe the table and answer the questions from 15(a) to 15(c).

Substance	Resistivity
A	$1.6 \times 10^{-8}\ \Omega$ m
B	$44 \times 10^{-8}\ \Omega$ m
C	$2.63 \times 10^{-8}\ \Omega$ m
D	$2300\ \Omega$ m
E	$10^{17}\ \Omega$ m

(a) Which of the above substances can be used as an insulator? [1]

(b) Which of the above substances can be used for the purpose of domestic wiring? [1]

(c) Which of the above substances is used for making solar cells and transistors? Give Reason. [2]

OR

(a) Which of the above substances is an alloy? Why

Solution

SECTION-A

1. Molecules in a homologous series:

Formula	Name of the molecule
C_3H_6	Propene
C_4H_8	Butene
C_5H_{10}	Pentene

2. The two rows of elements at the bottom of the modern periodic table are called the lanthanides (or lanthanoids) and actinides (or actinoids).
Lanthanides: Ce (Z = 58) to Lu (Z = 71)
Actinides: Th (Z = 90) to Lr (Z = 103)

3. <u>Pre-natal sex determination has been prohibited by law because of the following reasons:</u>
(a) Indiscriminate female foeticide and desire for a male child.
(b) Declining female-male sex ratio.

4. A brother and sister are more closely related to each other which mean that they have common ancestors more recently as compared to the case when any one of them (brother or sister) is related to the cousin. A brother and sister have their "parents" in common while a brother or sister and cousin have "grandparents" in common.

5. Food chain (a) is better than food chain (b).
In a shorter food chain maximum transfer of energy takes place according to ten percent law of nature.

OR

(a) Primary consumers
(b) When 10% law is applied, the goat gets 100 kJ and lion gets 10 kJ

6. Given:

I = 1 A

t = 1 sec

Q = 1 C

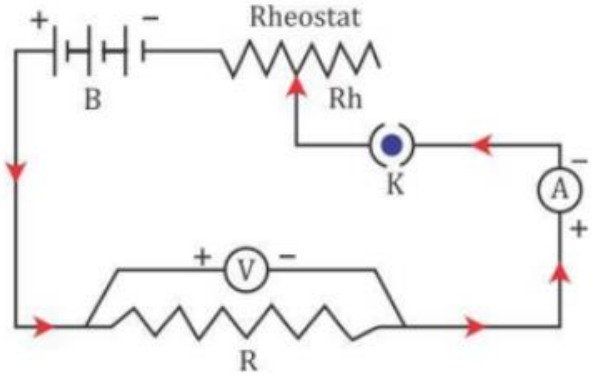
1.6×10^{-19} C is the charge on 1 electron.

1 C is the charge on electrons = (6.25×10^{18}) electrons.

6.25×10^{18} electrons flow per second to constitute the current of one ampere.

OR

Verification of Ohm's law (Circuit diagram):



A – Ammeter (used to measure electric current)

V – Voltmeter (used to measure potential difference)

7. <u>Variant genotypes are produced by the following mechanisms:</u>

- Mutation in genes and chromosomes
- Recombination of genes
- Hybridization of genes

OR

The law of independent assortment governs the given situation. The law states that the factors of different pairs of contrasting characters do not influence each other. They are independent of one another in the assortment.

SECTION - B

8. Isomers: Organic compounds having the same molecular formula but different structural arrangement of atoms in their molecules are called isomers.

<u>Characteristics of isomers:</u>

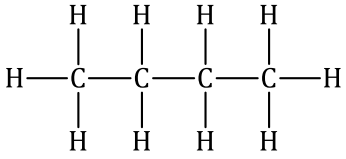
i) They have the same molecular formula but different structural formulae.

ii) They show similar properties only when they contain the same functional group.

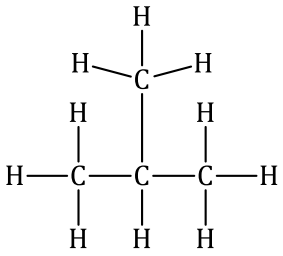
iii) Two isomers can have different boiling points. For example, in isomers of pentane, the branched chain pentane will have lower boiling point than linear pentane because the boiling point depends on the surface area which is more in case of n-pentane (linear).

iv) Isomers can have different functional groups. For example, aldehyde and ketone are two isomers, but they contain different functional groups.

Two isomers of butane:



n-Butane



iso-Butane

Isomers for the first three members of the alkane series are not possible because

i) The parent carbon must contain the most number of carbon atoms.

ii) The branching cannot be done from either the first or the last carbon atom.

9.

i) Electronic configuration of the element is 2, 8, 7 and its valency is 1.

ii) Non-metal

iii) The formula of the compound formed when element X combines with an element Y is PQ_3.

OR

The modern periodic table could remove various anomalies of Mendeleev's periodic table: In the modern periodic table, the elements are arranged in the increasing order of their atomic number, removing the anomaly regarding certain pairs of elements in Mendeleev's periodic table.

i) Atomic number of cobalt is 27and nickel is 28. Hence, cobalt will come before nickel even though its atomic mass is greater.

ii) All isotopes of the same elements have different atomic masses but the same atomic number; therefore, they are placed in the same position in the modern periodic table.

10.

i) F_1 progeny - Green

ii) Purple stemmed plants in F_2 progeny - 25%

iii) Ratio of GG and Gg in the F_2 progeny – 1:2:1

11. When resistors are connected in series:

$R_s = R + R = 2R$

$\therefore H_s = \frac{V^2}{R_s} = \frac{V^2}{2R}$ ..... (1)

When resistors are connected in parallel:

$\frac{1}{R_p} = \frac{1}{R} + \frac{1}{R} = \frac{2}{R}$

$\therefore R_p = \frac{R}{2}$

$\therefore H_p = \frac{V^2}{R_p} = \frac{2V^2}{R}$ ..... (2)

From (1) and (2),

$\frac{H_s}{H_p} = \frac{V^2}{2R} \times \frac{R}{2V^2} = \frac{1}{4}$

$\therefore H_p = 4H_s$

12.

i) A dynamo works on the principle of electromagnetic induction. The current produced by moving a straight wire in a magnetic field is called induced current. The phenomenon is called electromagnetic induction.

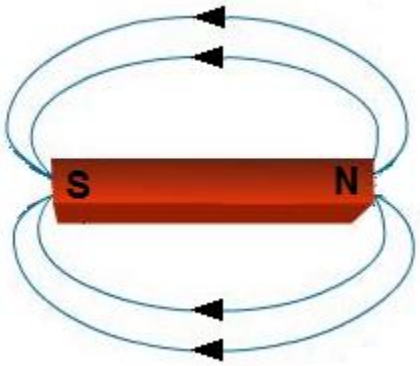
ii) A dynamo converts mechanical energy to electrical energy.

iii) A dynamo is also known as an electric generator.

OR

i) The space around a magnet in which the force of attraction and repulsion due to the magnet can be detected is called the magnetic field.

ii) Magnetic field lines around a magnet:



iii) Properties of magnetic field lines: (any 2)

(i) Field lines originate from the North Pole and end at the South Pole.

(ii) Magnetic field lines come closer to one another near the poles of a magnet, but they are widely separated at other places.

(iii) Field lines do not intersect each other.

13.

i) The accumulation of harmful chemicals in the body of living organisms at different trophic levels in a food chain is called biological magnification.

ii) Yes, the concentration of these harmful chemicals will be different at different levels of the ecosystem.

iii) It will be maximum at the last trophic level which is mostly the top carnivores (quarternary consumers).

SECTION – C

14.

(a) If an egg is not fertilized by a sperm then blood along with cellular debris comes out through the vagina and this process is called menstruation.

(b) The embryo gets nourishment inside the mother's body with the help of placenta .

(c) <u>We need to adopt contraceptive measures:</u>

(i) To prevent unwanted pregnancies.

(ii) To prevent sexually transmitted diseases.

(iii) Spacing between children

OR

Contraception is a method that prevents unwanted pregnancies by stopping the egg production or by keeping the egg distinct from the sperm or by stopping the fertilized egg attaching to the lining of the womb.

15.

(a) Substance E can be used as an insulator.

(b) Substances A and C can be used for the purpose of domestic wiring.

(c) Substance D can be used to make solar cells. The substance which is used in making the solar cells and transistors are semiconductors. The resistivity of the semiconductor devices lies between resistivity of conductor and insulator. So correct option is substance D.

OR

An alloy has resistivity higher than a pure metal but lesser than a semiconductor. Thus, substance B is an alloy.