

Sample Question Paper - 43
Science (086)
Class- X, Session: 2021-22
TERM II

Time allowed : 2 hours

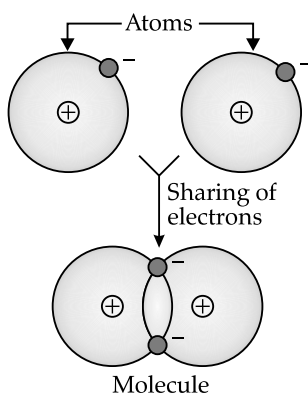
Maximum marks : 40

General Instructions :

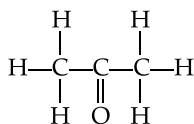
- (i) All questions are compulsory.
- (ii) The question paper has **three sections** and **15 questions**.
- (iii) Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case based questions of 4 marks each.
- (iv) Internal choices have been provided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

Section - A

1. A covalent bond is formed by equal sharing of electrons from both the participating atoms. The pair of electrons participating in this type of bonding is called shared pair or bonding pair. Sharing of bonding pairs will ensure that the atoms achieve stability in their outer shell which is similar to the atoms of noble gases. [2]



- (a) Why are covalent compounds generally poor conductors of electricity ?
- (b) Name the following compound:



2. The elements of the third period of the Periodic table are given below: [2]

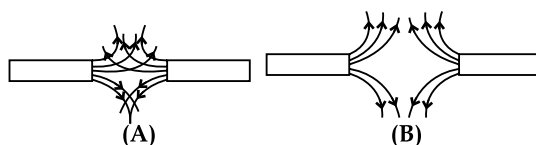
Group	I	II	III	IV	V	VI	VII
Period 3	Na	Mg	Al	Si	P	S	Cl

- (a) Which atom is bigger, Na or Mg? Why?
- (b) Identify the most (i) metallic and (ii) non-metallic element in Period 3.
3. In an experiment, a worm found in freshwater and slow-moving streams was cut into three pieces. It was observed that in due course of time, each cut piece of the worm develops to become a complete worm by growing all the missing parts.
- (a) Identify the worm. Name another organism, which possesses the same characteristic of growing fully from its cut body parts.
- (b) What is the name given to this type of reproduction? State whether the given organisms are unicellular and / or multicellular organisms. [2] **AI**
4. Contraception is defined as the intentional prevention of conception through the use of various devices, sexual practices, chemicals, drugs, or surgical procedures. Thus, any device or act whose purpose is to prevent a woman from becoming pregnant can be considered as a contraceptive. [2]
- (a) Name any two contraceptive methods practiced only by women.
- (b) How these contraceptive methods work?
5. In a cross between plants with homozygous pink flowers and plants with homozygous white flowers, all the offsprings of F_1 generation had pink flowers. When the F_1 generation was self-crossed, it was observed in the F_2 generation that out of 100, 75 flowers were pink. Make a cross and answer the following questions: [2]
- (a) What are the genotypes of the F_2 progeny?
- (b) What is the ratio of Pink: White flowers in the F_2 generation?

OR

‘Gene control traits’? Explain this statement with an example.

6. Garima Saini, performed an activity in school laboratory to observe the effects of magnetic field lines. Based on her observation, she has drawn the magnetic field lines of two magnets as shown in fig. A and fig. B. [2]



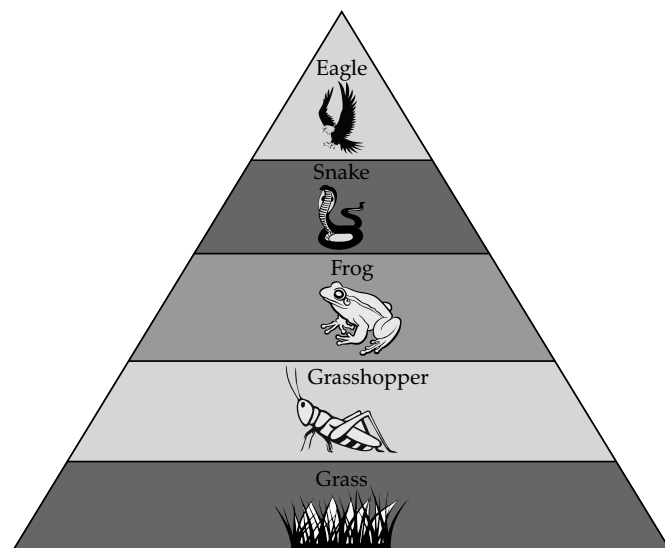
- (a) Select the figure that represents the correct pattern of field lines. Give reasons for your answer.
- (b) Also, name the poles of the magnets facing each other.

OR

Identify the poles of the magnet in the given figures:

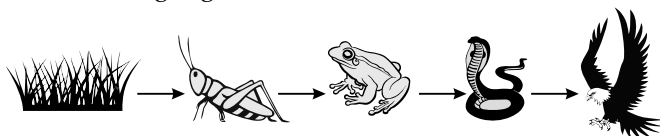
- (a) Figure (1)
- (b) Figure (2)

7. Let the amount of energy at fourth trophic level in the given food chain is 5 kJ, what will be the energy available at the producer level? Why do producers always occupy the first trophic level on every food chain? [2]



OR

The following organisms form a food chain.



Which of these will have the highest concentration of non-biodegradable chemicals? Name the phenomenon associated with it.

Section - B

8. Three elements are represented in the given periodic table:

[3] [AI]

Group → Period ↓	1	2	13	14	15	16	17
1							
2	B						A
3						C	

By giving reasons, explain the following questions:

- Element A is non-metal.
- Atom of element C has a larger size than atom of element A.
- Element B has a valency of 1.

9. (a) Elements that form ionic compounds attain noble gas electronic configuration by either gaining or losing electrons from their valence shells. Explain by giving reason why carbon cannot attain such a configuration in this manner to form its compounds. [2]
- (b) Name the type of bonds formed in ionic compounds and in the compounds formed by carbon. [1]

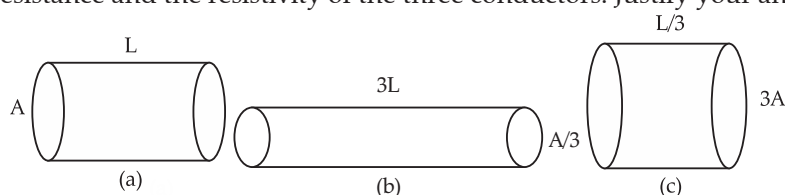
OR

- What are isomers? Draw the structures of two isomers of butane, C_4H_{10} .
- Why can't we have isomers of first three members of alkane series?

10. Shivani tried to cross a homozygous purple flower variety of pea plant (PP) with white flower variety of pea plant (pp). Mention the phenotype and genotype of the F_1 generation of offsprings. If the offsprings of the F_1 generation are self bred. What will be the phenotypic and genotypic ratios of the F_2 generation? State Mendel's law of dominance. [3]
11. (a) What is Electric power? Express it in terms of potential difference V and resistance R. [1]

- (b) An electric iron of 1 kW is operated at 220 V. Find, which of the following fuses that respectively rated at 1 A, 3 A and 5 A can be used in it? [2]

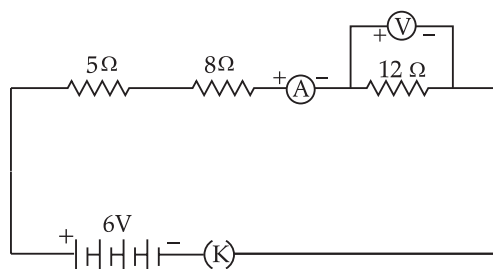
12. The figure below shows three cylindrical copper conductors along with their face areas and lengths. Compare the resistance and the resistivity of the three conductors. Justify your answer. [3] **AI**



OR

Consider the following circuit:

[3] **AI**



Calculate the readings of the ammeter and the voltmeter when key 'K' is closed. Give reason to justify your answer.

13. Management of waste is very important in today's society. The generation of waste is getting doubled day by day, as the population is increasing continuously. Moreover, the increase in waste is affecting the lives of many people.
- (a) Differentiate between biodegradable and non-biodegradable substances with the help of one example each. [2]
- (b) List two changes in habit that people must adopt to dispose non-biodegradable waste, for saving the environment. [1]

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).

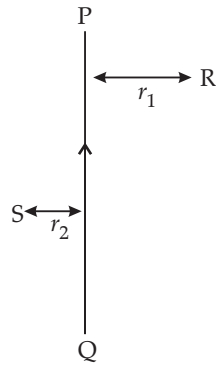
14. A blue colour flower plant denoted by BB is cross bred with that of white colour flower plant denoted by bb. [1] **AI**

- (a) State the colour of flower you would expect in their F_1 generation plants.
- (b) What must be the percentage of white flower plants in F_2 generation if flowers of F_1 plants are self-pollinated? State the expected ratio of the genotypes BB and Bb in the F_2 progeny. [1]
- (c) State the type of plants which are not found in F_1 generation but reappeared in F_2 generation. Write the reason for the same. [2]

OR

How dominant and recessive traits are different from each other? [2]

15. Sanjana placed a current carrying long straight conductor PQ perpendicular to the plane of the paper as shown in the figure below. R and S are the two points at distance r_1 and r_2 from it. Based on the given diagram, answer the questions given below:



- (a) Find the directions of the magnetic fields produced by it at points R and S? [1]
(b) Given $r_1 > r_2$, where will the strength of the magnetic field be larger? Give reasons. [1]
(c) If the polarity of the battery connected to the wire is reversed, how would the direction of the magnetic field be changed? Give reason. [2]

OR

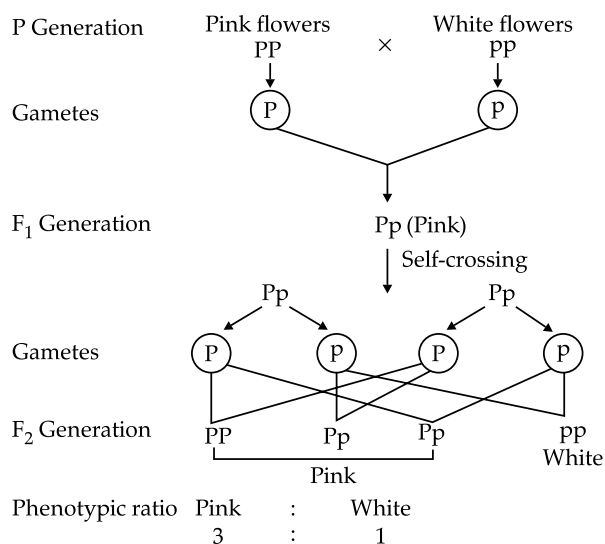
Explain the rule that is used to find the direction of the magnetic field for a straight current carrying conductor. [2]

□□□

Solution
SCIENCE - 086
Class 10 - Science

Section - A

1. (a) It is because they do not form ions. 1
 (b) Propanone (Acetone) 1
2. (a) Sodium is bigger than magnesium as it has lesser nuclear charge. So, there is less force of attraction between nucleus and valence electrons and less effective nuclear charge. It is, therefore, bigger in size. 1
 (b) (i) Sodium is the most metallic element in period 3, as it can lose electrons easily due to its larger atomic size.
 (ii) Chlorine is the most non-metallic element in period 3, because, it can gain electrons easily due to its smallest atomic size. 1
3. (a) The worm is *Planaria*. ½
 An example of other organism is "*Hydra*". ½
 (b) The process is known as regeneration. ½
 The given organisms are multicellular organism. ½
4. (a) Oral pills and Loop/Copper-T are used by women only. 1
 (b) (i) Oral pills change hormonal balance, so eggs are not released.
 (ii) Loop/Copper-T are placed in the uterus. It prevents pregnancy by checking the entry of sperms through the vagina. 1
5. (a) Genotypes of F₂ progeny are PP, Pp and pp. 1



- (b) Ratio of pink and white flowers is: 3:1 1
OR

Genes are sections or segments of DNA that are carried on the chromosomes and determine specific human characteristics, such as height or eye colour. A gene codes for the formation of a particular protein which in turn controls the characteristics or traits. 1

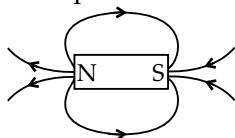
For example: In pea plant, gene T is responsible for tallness of the plant. It gives instruction to the plant to synthesize a particular plant hormone. The amount of the plant hormone made will depend on the efficiency of the enzymes that make it. Consider now an enzyme that is important for this process. If this enzyme works efficiently, huge amount of hormone will be made, and the plant will be tall. If the gene for that enzyme has an alteration that makes the enzyme less efficient, the amount of hormone will be less, and the plant will be short. Thus genes control the traits. 1

6. (a) Figure B represents the correct pattern of field lines. In figure A, field lines cross each other which is not possible because if they cross each other, at the point of intersection, there would be two directions of field lines. 1

- (b) In figure B, field lines are emerging in nature, so poles of magnet facing each other are north poles while opposite faces will have south polarity. 1

OR

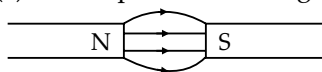
- (a) Field lines emerge from north pole (N) and merge at the south pole (S) in figure (1), So the poles of the magnet are:



1

Figure 1

- (b) Field lines emerge from north pole (N) and merge at the south pole (S) in figure (2), So the poles of the magnet are:



1

Figure 2

7. In the given food chain, if the amount of energy at fourth trophic level is 5 kJ, then 5000 kJ will be the energy available at the producer level. It is because, according to 10% law, only 10% of energy is transferred to the next trophic level and remaining 90% energy is used in life processes by present trophic level. 1

Producers always occupy the first trophic level on every food chain because producers (plants) have the ability to trap solar energy with the help of chlorophyll. 1

OR

Hawk will have the highest concentration of non-biodegradable chemicals. 1

The phenomenon associated with it is called biomagnification. 1

Section - B

8. (a) It is because it has 7 valence electrons. It can gain one electron to form negative ion. So, it is a non-metal. 1
- (b) 'C' has more number of shells than 'A'. So, it is larger in size. 1
- (c) 'B' has one valence electron. It can lose one electron to become stable. So, its valency is equal to 1. 1

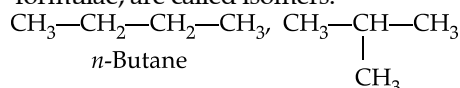
9. (a) Carbon has 4 electrons in its outermost shell. It cannot lose 4 electrons to form C^{4+} as very high energy is required to remove 4 electrons from its valence shell. 1

It cannot gain 4 electrons to form C^{4-} as it is difficult for 6 protons to hold on to 10 electrons. 1

- (b) In ionic compounds, ionic bonds are formed; while in carbon compounds, covalent bonds are formed. $\frac{1}{2} + \frac{1}{2}$

OR

- (a) Those compounds, which have same molecular formula but different structural formulae, are called isomers. 1



$\frac{1}{2} + \frac{1}{2}$

- (b) Isomerism is not possible in the first 3 alkanes primarily because branching is not possible from the first or the last carbon atom of the structure. 1

10. In F_1 generation:

- Phenotypes: All bear purple flower
- Genotype: All are heterozygous dominant for purple flower i.e., Pp 1

In F_2 generation:

- Phenotypic ratio: 3:1
- Genotypic ratio: 1:2:1 1

Law of Dominance: Out of a pair of contrasting characters, only one is able to express while the other remains suppressed. 1

Commonly Made Error

- Students often get confused between phenotype and genotype and between F_1 and F_2 generation.
- Many students fail to explain the law correctly. They get confused with the three laws. Many of them write all the three laws as they did not understand the questions.

Answering Tip

- Students should have a clear understanding of technical terms used in genetics like Genotype, Phenotype, Genotypic ratio and Phenotypic ratio. Practice a number of examples for Monohybrid and Dihybrid cross.

11. (a) **Electric power:** It is the rate of doing work by an energy source or the rate at which the electrical energy is dissipated or consumed per unit time in the electric circuit.

$$\begin{aligned}
 \text{So, Power, } P &= \frac{\text{Work done (W)}}{\text{Time (t)}} \\
 &= \frac{\text{Electrical energy dissipated}}{\text{Time (t)}} \\
 &= \frac{VIt}{t} \\
 &= VI = \frac{V^2}{R} \quad \left[\because I = \frac{V}{R} \right] \quad 1
 \end{aligned}$$

(b) Given: $P = 1 \text{ kW} = 1000 \text{ W}$, $V = 220 \text{ V}$

$$\begin{aligned}
 \text{Current drawn, } I &= \frac{P}{V} = \frac{1000}{220} = \frac{50}{11} \\
 &= 4.54 \text{ A}
 \end{aligned}$$

To run electric iron of 1 kW , rated fuse of 5 A should be used. 2

Commonly Made Error

- Calculation error is commonly seen.

Answering Tip

- While solving numerical, it is advisable that the formula need to be written in the beginning. Essential steps need to be shown and final answer needs to be expressed along with a proper unit.

12.

$$R_a = \rho \frac{L}{A}$$

$$R_b = \rho \left(\frac{3L}{A/3} \right) = 9 \frac{\rho L}{A} = 9 R_a$$

$$R_c = 9 \frac{L/3}{3A} = \frac{\rho L}{9A} = \frac{1}{9} R_a$$

Hence $R_b > R_a > R_c$

$\rho_a = \rho_b = \rho_c$ because all the three conductors are of same material. 3

[CBSE Marking Scheme, 2018]

Detailed Answer:

For the figure a,

Length of the cylinder = L

Cross sectional area of the cylinder = A

Now we will simply put these values in the formula to find out resistance.

$$\text{So, we get, } R_a = \rho \frac{L}{A}$$

For the figure (b),

Length of the cylinder = $3L$

Cross sectional area of the cylinder = $\frac{A}{3}$

Now we will simply put these values in the formula to find out resistance.

$$\text{So, we get } R_b = \rho \frac{3L}{\left(\frac{A}{3}\right)}$$

We can rewrite this equation as

$$R_b = \rho \frac{9L}{A}$$

For figure (c),

$$\text{Length of the cylinder} = \frac{L}{3}$$

Cross sectional area of the cylinder = $3A$

Now, we will simply put these values in the formula to find out resistance.

$$\text{So, we get } R_c = \rho \frac{\left(\frac{L}{3}\right)}{3A}$$

We can rewrite this equation as

$$R_c = \frac{1}{9} \left(\rho \frac{L}{A} \right)$$

Comparing R_a , R_b and R_c , we can observe that

$$R_b = 9R_a \text{ and } R_c = \frac{1}{9} R_a$$

Therefore, we can arrange the resistances in the following order $R_b > R_a > R_c$

Since all conductors are made by copper (same material), so their resistivity will remain same i.e., $\rho_a = \rho_b = \rho_c$

OR

$$R = R_1 + R_2 + R_3$$

$$R = 5 \Omega + 8 \Omega + 12 \Omega$$

$$= 25 \Omega \quad 1$$

Given, $V = 6V$

By Ohm's law, $V = IR$

$$\therefore I = \frac{V}{R} = \frac{6V}{25\Omega} = 0.24A \quad 1$$

Hence, the ammeter reading will be = 0.24 A

$\therefore$ Voltage across 12Ω resistor = IR

$$= 0.24 \times 12$$

$$= 2.88$$

Hence, the voltmeter reading will be 2.88 V 1

Commonly Made Error

- Sometimes, students fail to write the correct relation among current, voltage and resistance.

Answering Tip

- Learn the formula of resistance carefully. Practice writing formula in the beginning. Make sure you write all essential steps. Final answer need to be expressed along with a proper unit.

13. (a) Differences between biodegradable and non-biodegradable substances:

S. No.	Biodegradable Substances	Non-biodegradable Substances
(i)	The substances which are broken down into simpler, harmless substance in nature in due course of time by the biological processes such as action of microorganisms are called biodegradable substances.	The substances which cannot be broken down into simpler, harmless substances in nature are called non-biodegradable substances.
(ii)	e.g., Domestic waste products, sewage.	e.g., DDT and polythene bags.

1+1

(b) Two methods of disposal of non-biodegradable waste are:

(i) **Recycling:** The wastes are treated and same value materials are extracted for reuse. $\frac{1}{2} + \frac{1}{2}$

(ii) **Incineration:** Medical and toxic waste are burnt at high temperature in Incinerators. Incinerators transform the waste into ashes. 3

Section - C

14. (a) The colour of all the flowers in F_1 generation will be blue. 1

(b) Percentage of white flower plants in F_2 generation will be 25. The ratio of genotype BB and Bb in F_2 progeny will be 1:2. $\frac{1}{2} + \frac{1}{2}$

(c) White flower. 1

Reason: Being a recessive trait, white flower can only be expressed in the recessive homozygous condition or in the absence of dominant trait. 1

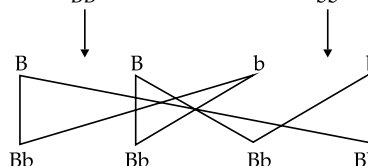
OR

Dominant trait: The character which gets expressed in the presence of its contrasting form is termed as dominant trait. 1

Recessive Trait: The trait which remains unexpressed in the presence of its contrasting form is called recessive trait. 1

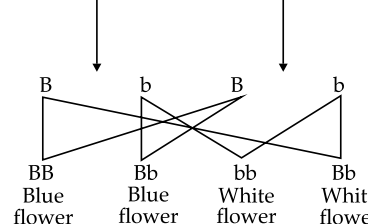
Cross:

Parents: Blue flower BB × White flower bb



F_1 generation: Blue flower Blue flower Blue flower Blue flower

Bb × Bb



F_2 generation:

15. (a) The magnetic field lines produced will be in anti-clockwise direction on the plane of the paper. 1

(b) Field at S > Field at R. Magnetic field strength for a straight current carrying conductor is inversely proportional to the distance from the wire. 1

(c) The current will be going from top to bottom in the wire and the magnetic field lines are now in the clockwise direction on the plane of the paper. 2

OR

Right hand thumb rule: The thumb is aligned to the direction of the current and the direction in which the fingers are wrapped around the wire will give the direction of the magnetic field. 2