Sample Question Paper - 46
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. Carbon is a Group 14 element in the Periodic Table. It is known to form compounds with many elements. Write an example of a compound formed with: **[2]**

(a) Chlorine, which is a group 17 element of a Periodic Table.

(b) Oxygen, which is a group 16 element of a Periodic Table.

2. Choose from the following: **[2]**

$_{20}Ca$, $_{3}Li$, $_{11}Na$, $_{10}Ne$

(a) An element having two shells completely filled with electrons.

(b) Two elements belonging to the same group of the periodic table.

3. **(a)** What is the pathway of sperm during ejaculation? **[2]**

(b) Name the organs producing sperms and ova respectively in humans.

4. Shweta conducted a study on a tobacco plant. She found that in tobacco plant, the male gametes have twenty four chromosomes. Based on this information, find out the number of chromosomes in: **[2]** AI

(a) Female gamete

(b) Zygote.

5. In a monohybrid cross between tall pea plants (TT) and short pea plants (tt), a scientist obtained only tall pea plants (Tt) in the F_1 generation. However, on selfing the F_1 generation pea plants, he obtained both tall and short plants in F_2 generation. On the basis of above observations with other angiosperms, can the scientist arrive at a law? If yes, explain the law. If not, give justification for your answer.

[2] AI

OR

'A trait may be inherited, but may not be expressed.' Justify this statement with the help of a suitable example.

6. Varun divided a magnet into three parts A, B, and C. **[2]**

(a) Name the parts where the strength of the magnetic field is:

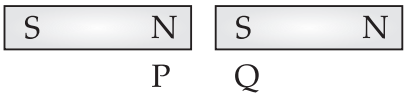
(i) maximum

(ii) minimum

(b) The density of magnetic field lines differ at these parts. Explain.

OR

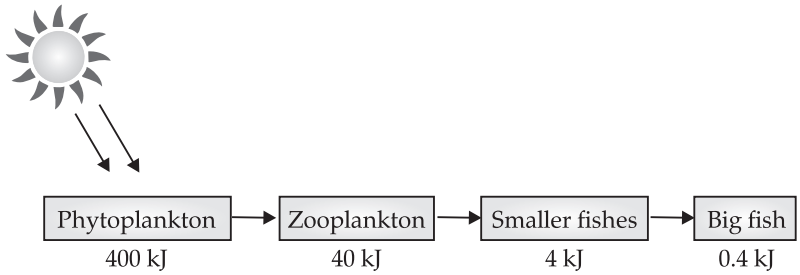
Priyanka arranged two magnets side by side as shown below. **[2]**



(a) Draw magnetic field line between poles P and Q.

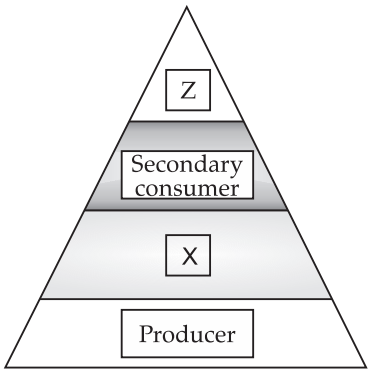
(b) What does the degree of closeness of magnetic field lines near the poles signify?

7. Shilpa studied the flow of energy at different trophic levels. Based on her studies she draw a flow chart. What does this flowchart depict? Why a food chain cannot have more than four trophic levels? **[2]**



OR

In the given figure, the various trophic levels are shown in a pyramid. What does "X" and "Z" represent?



Section - B

8. The position of three elements A, B and C in the Periodic Table is shown below: **[3]**

Period → Group ↓	1	2	3	4
Group 16				B
Group 17		A		C

Giving reasons, explain the following:

(a) Element A is non-metal.

(b) Atom of element B has a larger size than atom of element C.

(c) Element C has a valency of 1.

9. Draw the structures of the following compounds and identify the functional group present in them: **[3]** AI

(a) Butanoic acid

(b) Bromopropane

(c) Butyne

OR

Write the molecular formula of the following compounds and draw their electron-dot structures: **[3]**

(a) Ethane

(b) Ethene

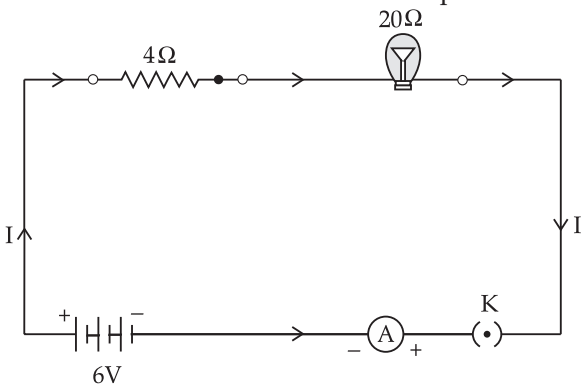
(c) Ethyne

10. In humans, there is a 50% probability of the birth of a boy and 50% probability that a girt will be born. Justify the statement on the basis of the mechanism of sex-determinants in human beings. **[3]** AI

11. **(a)** List the factors on which the resistance of a conductor depends.

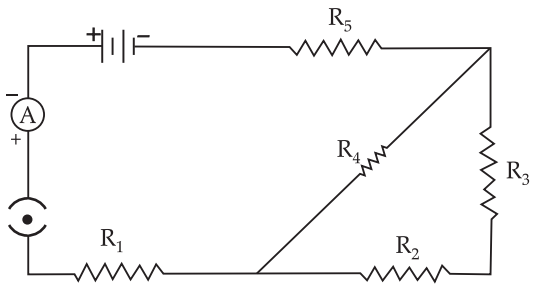
(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity ? **[3]**

12. An electric lamp whose resistance is 20 Ω and a conductor of 4 Ω resistances are connected to a 6 V battery as shown in the diagram below. Calculate the total resistance of the circuit, the current through the circuit and the potential difference across the electric lamp and the conductor. **[3]**



OR

Consider the following circuit diagram. If $R_1 = R_2 = R_3 = R_4 = R_5 = 3\ \Omega$, find the equivalent resistance (R_{eq}) of the circuit. **[3]**



13. You have been selected to talk on 'ozone layer and its protection' in the school assembly on 'Environment Day'. **[3]** AI

(a) Why should ozone layer be protected to save the environment ?

(b) List any two ways that you would focus upon in your talk to bring awareness amongst your fellow friends that would also help in protection of ozone layer as well as the environment.

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. Sahil conducted an experiment on pea plants. In which, pure breeding pea plants with green pods were crossed with pure breeding pea plants with yellow pods. He found that all the F_1 generation plants have green pods. Then he interbred the plants from the F_1 generation.

(a) What colour of pods will be observed in F_2 generation plants? Explain with a cross. **[1]**

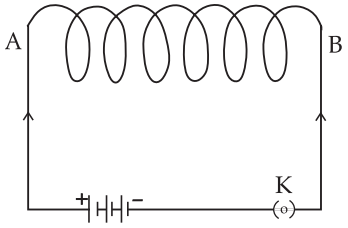
(b) The genotype for the colour of the pod of a pea plant is Gg. What conclusion may be drawn from this? **[1]**

(c) Why Sahil selected garden peas as his experimental material? Give two reasons. **[2]**

OR

List two contrasting visible characters of garden pea Mendel used for his experiment. **[2]**

15. In a school laboratory, Shikha was performing an activity. She started with an insulted copper wire that she wrapped as coil of many turns such that it takes the shape of a cylinder. Then, she drew the following diagram based on her observations. Answer the following questions. AI



(a) Write the special name given to the coil AB which has many circular turns of insulated copper wire. **[1]**

(b) State the nature of magnetic field inside AB when a current is passed through it. **[1]**

(c) Redraw the diagram and sketch the pattern of magnetic field lines through and around AB. **[2]**

OR

List two factors on which the strength of the magnetic field produced by AB depends. **[2]**

❑❑❑

Solution

SCIENCE - 086

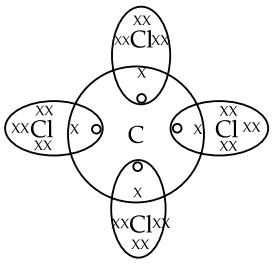
Class 10 - Science

Section - A

1.

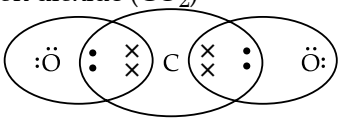
Element :	C	Cl	O
Valence electron:	4	7	6
Valency	4	1	2

(a) Thus, carbon can share its four electrons with four chlorine atoms



Carbon tetrachloride (CCl_4) **1**

(b) Carbon dioxide (CO_2) **1**



Carbon dioxide (CO_2) **1**

Thus, carbon can share its four electrons with two oxygen atoms.

2. **(a)** $_{10}Ne$ has electronic configuration 2, 8. It's both shells (shell k, L) are completely filled. **1**

(b) $_3Li$ and $_{11}Na$ belong to same group of the periodic table, *i.e.* 1^{st} group. **1**

3. **(a)** Sperms come out from testis into the vas deferens and pass through the urethra before ejaculation. The secretions of seminal vesicle and prostate glands provide nutrition to the sperms and also facilitate their transport. **1**

(b) Testis: Sperms, Ovary: Ova. **1**

4. **(a)** Number of chromosomes in female gamete is 24. **1**

(b) Number of chromosomes in zygote is 48. **1**

5. Yes, the scientist may arrive at the law of dominance according to which the trait that is expressed in the F_1 generation is the dominant trait, although both the dominant and recessive traits are present in the F_1 generation. In the F_2 generation, the recessive traits are also expressed along with the dominant traits. **2**

OR

When pure tall pea plants are crossed with pure dwarf pea plants, only tall pea plants are obtained in F_1 generation. ½

On selfing tall plants of F_1, both tall and dwarf plants are obtained in F_2 generation in the ratio 3:1. ½

Reappearance of the dwarf character, a recessive trait in F_2 generation shows that the dwarf trait/character was present in individuals of F_1 generation but it did not express (due to the presence of tallness, a dominant trait/character). **1**

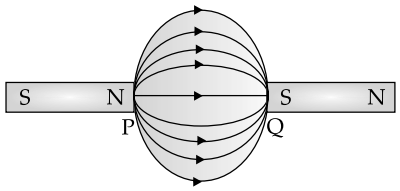
6. **(a)** **(i)** Maximum strength – At A and C

(ii) Minimum strength – At B ½ + ½

(b) At poles A and C, magnetic field lines are crowded that diverges from poles, so magnetic density is high at the poles. While at B, they are parallel to the centre and hence magnetic effect is minimum. **1**

OR

(a)



1

(b) The degree of closeness of magnetic field lines near the poles signify that the field is stronger there. **1**

7. It is a food chain that is depicting 10% law of energy. **1**

The loss of energy at each step is so great that very little usable energy remains after four trophic levels. **1**

OR

X: Primary consumer. **1**

Z: Tertiary consumer **1**

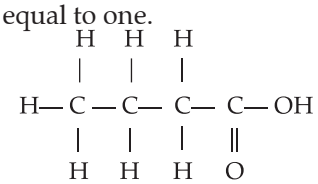
Section - B

8. **(a)** 'A' is non-metal because it can gain one electron easily as it has 7 valence electrons in its outermost shell. It requires one electron to attain stable noble gas configuration. Thus, it forms negative ion with stable electronic configuration. **1**

(b) It is because 'B' has lesser atomic number, less nuclear charge, less force of attraction between valence electrons and nucleus therefore, B has larger atomic size than C. **1**

(c) Element 'C' has 7 valence electrons. It can gain one electron to attain stable noble gas configuration. So, its valency is equal to one. **1**

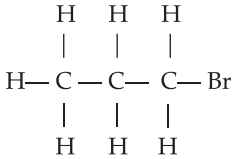
9. **(a)**



Butanoic acid

Functional group
Carboxylic group – COOH

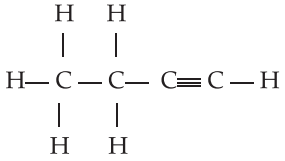
(b)



Bromopropane

Functional group
Halogen atom – Br

(c)



Butyne

Functional group
Triple bond – C ≡ C–

Commonly Made Error

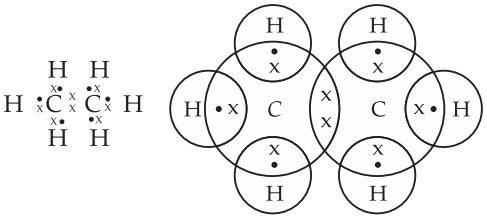
- Students mostly commit errors while drawing the structures of given compounds.

Answering Tip

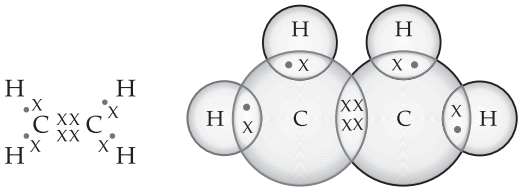
- Sufficient practice must be taken to draw the structures of organic compounds with correct functional groups.

OR

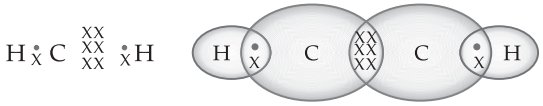
(a) Ethane : C_2H_6 **1**



(b) Ethene : C_2H_4 **1**



(c) Ethyne : C_2H_2



1

Commonly Made Error

- Students often make mistake while drawing electron dot structures.

Answering Tip

- Understand the basic concepts involved in drawing the dot structure. Make sure that you have made dots or cross for all shared bonds.

10. **(a)** In humans beings, the genes inherited from the parents decide whether it will be a boy or girl. Women have a perfect pair of sex chromosome (XX). But, men have a mixmatched pair (XY). All children will inherit an X chromosome from their mother regardless of whether they are boys or girts. Thus, the sex of the children will be determined by what they inherit from their father. A child who inherits an X-chromosome from her father will be a girl, and who in herits a Y-chromosome from him will be a boy.

11. **(a)** Factors on which resistance of a conductor depends:

(i) Length of conductor [or $R \propto l$]

(ii) Area of cross-section of the conductor

$$[\text{or } R \propto \frac{l}{A}] \quad \textbf{1}$$

(b) Metals are good conductor of electricity – as they have low resistivity/have free electrons. Glass is a bad conductor of electricity – as it has high resistivity/ have no free electrons. **1**

[CBSE Marking Scheme, 2017]

12. Since the lamp and conductor are in series, total resistance in the circuit,

$$R_S = R_1 + R_2$$
$$= 20\ \Omega + 4\ \Omega = 24\ \Omega$$

Current through the circuit, **1**

$$I = \frac{V}{R_S} = \frac{6V}{24\Omega} = 0.25A$$

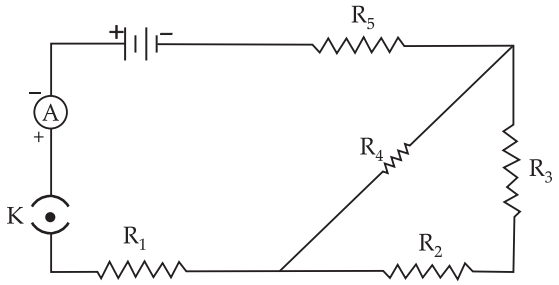
Potential difference across the lamp, **1**

$$V_1 = IR_1 = 0.25\ A \times 20\ \Omega$$
$$= 5\ V \quad ½$$

Potential difference across the conductor,

$$V_2 = IR_2 = 0.25\ A \times 4\ \Omega$$
$$= 1\ V \quad ½$$

OR



Given: $R_1 = R_2 = R_3 = R_4 = R_5 = 3\ \Omega$

In circuit, R_2 and R_3 are connected in series,

$$\therefore \quad R_{S_1} = R_2 + R_3$$
$$= 3 + 3 = 6\ \Omega \quad \textbf{1}$$

R_{S_1} and R_4 are in parallel connection

$$\frac{1}{R_P} = \frac{1}{R_{S_1}} + \frac{1}{R_4}$$

$$= \frac{1}{6} + \frac{1}{3} = \frac{1}{2}$$

$$\therefore \quad R_P = 2\ \Omega \quad \textbf{1}$$

Now, R_1, R_P and R_5 are in series connection. So equivalent resistance of the circuit is

$$R_{eq} = R_1 + R_P + R_5$$
$$= 3 + 2 + 3 = 8\ \Omega \quad \textbf{1}$$

Commonly Made Error

- Students often forget to write formula in the beginning of the numerical solution and lose marks.
- Students are confused in calculating equivalent resistance when resistances are connected in series or parallel within the circuit.

Answering Tip

- Students must remember formula and concept of series and parallel connections.

13. **(a)** Because Ozone layer protects/shields the earth from harmful UV radiations of the sun. **1**

(b) **(i)** Conducting poster making competition highlighting effects of ozone layer depletion. **1**

(ii) Conducting street plays highlighting the ways of environment protection. **1**

[CBSE Marking Scheme, 2017]

Detailed Answer:

(a) Ozone layer helps in shielding the Earth from the harmful UV radiations coming from sun. If ozone layer gets depleted, UV radiations can directly reach the earth's surface and drastically affect the life on earth.

(b) **Ozone layer can be protected by:**

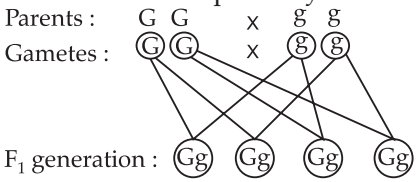
(a) Stopping the release of chlorofluorocarbon.

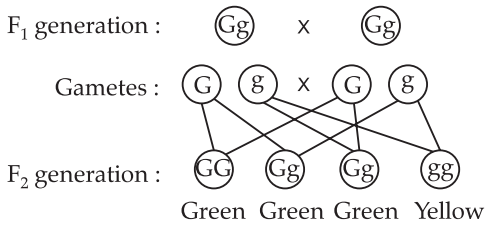
(b) Removing the pollutant nitrogen monoxide.

(c) Reduce the usage of air conditioners. **1+2**

Section - C

14. **(a)** In pea plants, the gene for green coloured pod (G) is dominant over the gene for yellow coloured pod (g). During a cross between pure breeding pea plants with green pods (GG) and pure breeding pea plants with yellow pods (gg), in F_2 generation, plants with green and yellow coloured pods will be obtained in the ratio of 3:1 respectively. **1**





(b) Genotype is the genetic composition of an organism, *i.e.,* the combination of alleles it possesses. Every character in an organism is controlled by a gene that has at least two alleles that lie on the two homologous chromosomes at the same locus. These alleles may represent the same (homozygous, *e.g.*, GG for green coloured pod) or alternate expressions (heterozygous, *e.g.*, Gg) of the same character. Thus, if genotype for the colour of the pod is Gg, this means there are at least two different alleles for the gene for the colour of pod one is G and the other is g. **1**

(c) Sahil selected pea plants because:

- Peas have many visible characters like tall/dwarf plants, round/ wrinkled seeds, green/yellow pod etc.
- Peas have bisexual flowers and therefore they undergo natural self-pollination. Thus, pea plants produce offspring with same traits generation after generation.
- In pea plants, cross-pollination can be easily achieved by emasculation in which the stamen of the flower is removed without affecting the pistil. **(any two) 2**

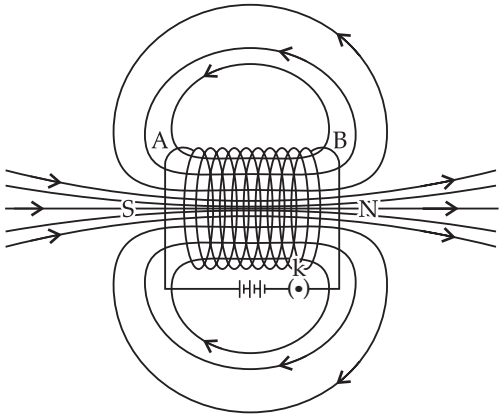
OR

(d) **Contrasting characters:**
Round/wrinkled seeds
Tall/short plants
White/purple flowers
Green/yellow seeds (Or any other).
(Any two) 2

15. **(a)** Solenoid. **1**

(b) Uniform magnetic field. **1**

(c)



OR

Strength of magnetic field depends upon the following.

(i) Magnitude of current flowing through it. ½

(ii) Number of turns of the coil.