Sample Question Paper - 44
Science (086)
Class- X, Session: 2021-22
TERM II

Time allowed : 2 hours ***Maximum marks : 40***

General Instructions :

(i) *All questions are compulsory.*

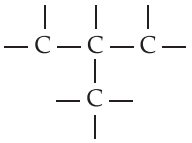
(ii) *The question paper has* ***three sections*** *and* ***15 questions****.*

(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 has the unique property to form bonds with other atoms of carbon. **[2]**



(a) Why does carbon exhibits the property of catenation to maximum extent ?

(b) With a valency of 4, how is carbon able to attain noble gas configuration in its compounds.

2. An element 'E' has following electronic configuration: **[2]**

K	L	M
2	8	6

(a) To which group and period of the periodic table does element 'E' belongs?

(b) State the number of valence electrons and valency present in element 'E'.

3. Fertilization can be defined as the fusion of the male gametes (pollen) with the female gametes (ovum) to form a diploid zygote. It is a physicochemical process which occurs after the pollination. The complete series of this process takes place in the zygote to develop into a seed. **[2]** AI

(a) What is the fate of the ovules and the ovary in a flower after fertilization?

(b) How is the process of pollination different from fertilization?

4. In an experiment, Aashi took a small piece of root tissue from the rose plant and placed it in a nutrient medium. She found that each root tissue produced a new rose plant. **[2]**

(a) Name the reproductive process involved in the process.

(b) Is the gene possessed by the new rose plant identical or different from the parent plant?

5. In an experiment by Mendel on a pea plant, the trait of flowers bearing purple colour (PP) is dominant over white colour (pp). **[2]** AI

(a) Explain the inheritance pattern of F_1 and F_2 with the help of a cross following the rules of inheritance of traits.

(b) State the visible characters of F_1 and F_2 progenies.

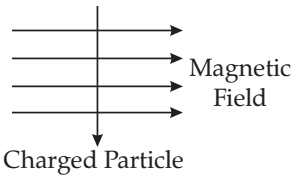
OR

While performing an experiment on pea plants, Mendel crossed tall pea plants and short pea plants and produced F_1 progeny through cross fertilisation.

(a) What type of progeny was obtained by Mendel in F_1 and F_2 generations when he crossed the tall and short plants?

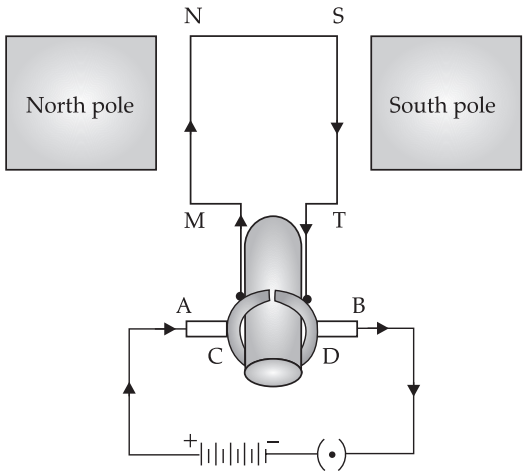
(b) Write the ratio he obtained in F_2 generation plants.

6. Charged particle enters at right angle into a uniform magnetic field as shown. What should be the nature of charge on the particle if it begins to move in a direction pointing vertically out of the page due to its interaction with the magnetic field? State the rule used to find it. **[2]** AI



OR

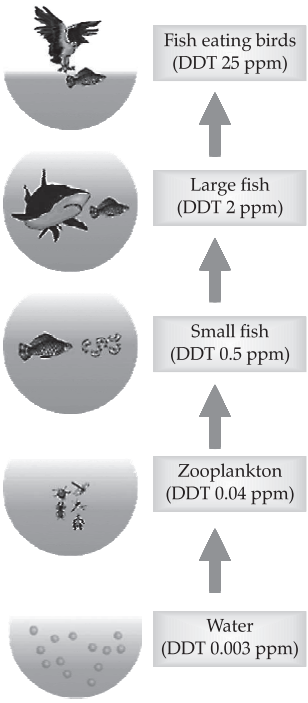
Study the given diagram.



(a) Identify the diagram and write the principle involved in its working.

(b) What is the function of brushes and split rings in it?

7.



Researchers conducted a study on the occurrence of DDT along food chains in an ecosystem. The concentration of DDT in various trophic level was found to be as shown in the figure. Explain how the biomagnification of DDT has affected the bird population? **[2]**

OR

In the morning news, Rohit, a student of Class 10 heard that the mountain of garbage in Delhi, suddenly exploded and various vehicles got buried under it. Several people were also injured and there was traffic jam all around. AI

Next day, the teacher also discussed this issue and asked the students to find out a solution to the problem of garbage.

(a) Suggest any one measure to manage the garbage we produce.

(b) As an individual, what can we do to generate the least garbage? Explain with at least one point.

Section - B

8. The following table shows the position of five elements A, B, C, D and E in the modern periodic table.

Group ↓ Period →	1	2	3 to 12	13	14	15	16	17	18
2	A							B	C
3		D				E			

[3]

Answer the following giving reasons:

(a) Which element is a metal with valency two?

(b) Which element is least reactive?

(c) Out of D and E, which element has a smaller atomic radius?

9. **(a)** List two reasons for carbon forming a large number of compounds. **[3]** AI

(b) Give reason why the carbon compounds-

(i) Generally, have low melting and boiling points.

(ii) Do not conduct electricity in molten state.

OR

While studying the molecular formula of an aldehyde and Ketone, Vivaan observed that an aldehyde as well as a ketone can be represented by the same molecular formula, say C_3H_6O.

(a) Write their structures and name them.

(b) What is the scientific relation between the two.

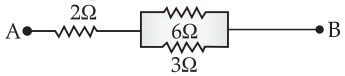
10. In a Biology class, teacher explained to the students that in humans, there is a 50% probability of the birth of a boy and 50 % probability that a girl will be born. Justify the statement on the basis of the mechanism of sex-determination in human beings. **[3]**

11. Calculate the total cost of running the following electrical devices in the month of September, if the rate of 1 unit of electricity is ₹6.00. **[3]** AI

(a) Electric heater of 1000 W for 5 hours daily.

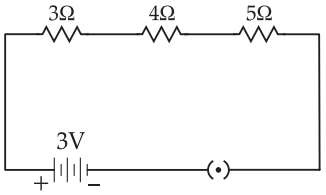
(b) Electric refrigerator of 400 W for 10 hours daily.

12. Find the effective resistance between the points A and B in the network shown in the figure. **[3]**



OR

Study the following electric circuit and calculate the potential difference across a 5Ω resistor.



13. Your mother always thought that fruit juices are very healthy for everyone. One day she reads in the newspaper, that some brands of fruit juices in the market have been found to contain certain levels of pesticides in them. She got worried as pesticides are injurious to our health. **[3]**

(a) How would you explain to your mother about fruit juices getting contaminated with pesticides?

(b) It is said that, when these harmful pesticides enter our body as well as in the bodies of other organisms, they get accumulated and beyond a limit may cause harm and damage our organs. Name the phenomenon and write about it.

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. If we cross-bred tall (dominant) pea plant with pure-bred dwarf (recessive) pea plant, we will get plants of F_1 generation. Now, if we self-cross the pea plant of F_1 generation, we obtain pea plants of F_2 generation. Based on the given information, answer the following questions: **[1]**

(a) What do the plants of F_1 generation look like? **[1]**

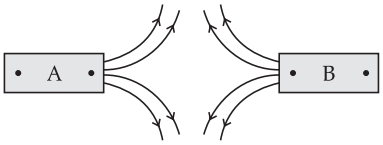
(b) State the ratio of tall plant to dwarf plants in F_2 generation.

(c) State the type of plants not found in F_1 generation but appeared in F_2 generation. Write the reason for the same. **[2]**

OR

Who is regarded as the 'Father of Genetics'? Name the plant on which he performed his experiment. **[2]**

15. Aashi observed the magnetic field lines of two bar magnets A and B as shown below.



(a) Name the poles of the magnets facing each other. **[½]**

(b) How does the strength of the magnetic field at the centre of a current carrying circular coil depend on the: AI

(i) Radius of the coil,

(ii) Number of turns in the coil, and

(iii) Strength of the current flowing in the coil ? **[1½]**

(c) Two magnetic field lines never intersect each other. Why ? **[2]**

OR

Why are magnetic field lines more crowded towards the pole of a magnet ? **[2]**

❑❑❑

Solution

SCIENCE - 086

Class 10 - Science

Section - A

1. **(a)** Due to strong C—C bond or covalent nature of bond. **1**

(b) By sharing its four valence electrons with other elements, carbon attains stable noble gas configuration. **1**

2. **(a)** 'E' belongs to group 16 and 3rd period.

(b) It has 6 valence electrons. Its valency is equal to 2. ½ ×4

3. **(a)** After fertilization, ovules become seeds and ovaries form the fruit. ½ + ½

(b) Pollination is the transfer of pollen grains from anther to the stigma of a flower. ½
Fertilization is the fusion of male and female gametes. ½

4. **(a)** The reproductive process involved is called as Tissue culture. **1**

(b) The new rose plant has the genes which are identical to the parent plant. **1**

5. **(a)** Let purple trait be represented by: PP and White trait be: pp

Parental PP × pp
↓
F_1 generation Pp × Pp (Selfing)
Selfing of F_1 ↓
Gametes of F_2 P P

P	PP	Pp
p	Pp	pp

(b) In F_1 progeny: All flowers are purple coloured and in F_2 progenies: 3 are purple coloured and 1 is white coloured flower. **1+1**

Commonly Made Error

- Students often get confused between phenotype and genotype and between F_1 and F_2 generation.

Answering Tip

- Practice phenotype and genotype with the help of examples.

OR

(a) F_1 – All tall; F_2- Tall and short ½+½

Parents : TT (Tall) × tt (Short)

F_1 generation → Tt (Tall)

Selfing of F_1 : Tt (Tall) × T t (Tall)

F_2

	T	t
T	TT Tall	Tt Tall
t	Tt Tall	tt Short

(b) **Phenotypic ratio**: 3 Tall: 1 short
Genotypic ratio: 1 Pure Tall (TT): 2 Hybrid (Tt): 1 Pure short (tt) ½+½

Commonly Made Error

- Most students write incorrect answers.

Answering Tip

- Practice a number of examples for Monohybrid and Dihybrid cross.

6. Using Fleming's left hand rule, the nature of charged particle is positive.
Fleming's left hand rule: Fleming's left hand rule states that if we stretch the thumb, middle finger and the index finger of the left hand is such a way that, they make an angle of 90° to each other then the middle finger represents the direction of current, index finger represents the direction of magnetic field, the direction of motion of the conductor is represented by the thumb. **1+1**

OR

(a) The given picture is of a simple electric motor.

Principle of working of electric motor: A coil carrying electric current placed in an external magnetic field experiences a force. **1**

(b) **Function of brushes:** It helps in easy transfer of charge between the coil and the external circuit. ½

Function of split rings: It reverses the direction of current after each half rotation of the coil so that the coil can keep rotating continuously. ½

7. Bio-magnification of DDT leads to an increase in its concentration at the higher trophic level and its higher concentration in birds leads to the disturbance in their calcium metabolism. This causes the premature breaking of eggs in birds due to thinning of eggshell. Thus, the bio-magnification of DDT leads to a decrease in bird population. **1+1**

OR

(a) Incineration/Waste compaction/Biogas generation/Composting/Segregation and safe disposal/ Vermicomposting. **(Any other) 1**

(b) **(i)** Reuse of empty bottles, books, etc.

(ii) Reduce the use of non-biodegradable substances like polythene, thermocol, etc. **(Any other) 1**

Section - B

8. **(a)** D, as it is on the left side of the table in group 2. **1**

(b) C, as it is in the group 18/ Noble gas. **1**

(c) E, as we move from left to right across a period, atomic radius decreases. 1

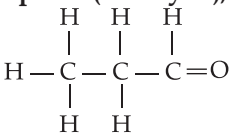
9. **(a)** The two characteristic properties of the carbon element which leads to the formation of a very large number of organic compounds are: Catenation and Tetravalency. **1**

(b) **(i)** Inter-molecular forces of attraction are weak; hence they have low melting and boiling points. **1**

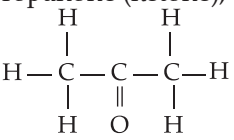
(ii) Covalent compounds do not form ions/ charged particles and therefore do not conduct electricity. **1**

OR

(a) **(i) Propanal (aldehyde);** ½+½

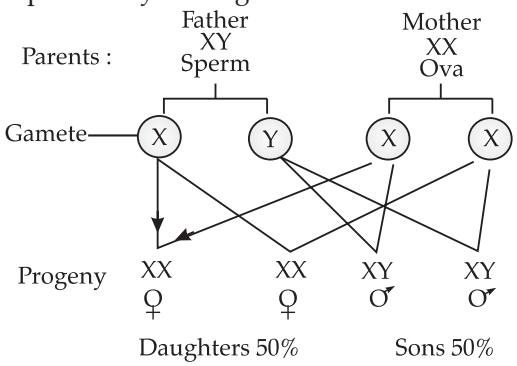


(ii) Propanone (ketone);



(b) Isomers (same molecular formula but different structural formula/different functional group). **1**

10. In humans, every cell contains 23 pairs of chromosomes or 46 chromosomes. Out of these 46 chromosomes, 44 chromosomes are autosomes and 2 are sex chromosomes. The female gametes have a perfect pair of sex chromosomes (XX) while male gametes have a mismatched pair (XY). There is a 50% probability of male to produce (22 + X) and a 50% of probability to produce (22 + Y) type of chromosomes. Therefore, there is a 50% probability of the birth of a boy and a 50% probability that a girl will be born. **3**



11. Electric heater $P_1 = 1000W = \frac{1000}{1000}$ kW,
$t_1 = 5h$

Electric refrigerator $P_2 = 400W = \frac{400}{1000}$ kW,
$t_2 = 10h$

No. of days, $n = 30$ days

$E_1 = P_1 \times t_1 \times n$ ½

$= 1\,kW \times 5h \times 30$

$= 150\,kWh$ ½

$E_2 = P_2 \times t_2 \times n$

$= \frac{400}{1000}\,kW \times 10h \times 30$

$= 120\,kWh$ ½

$\therefore$ Total energy $= (150 + 120)\,kWh = 270\,kWh$

$\therefore$ Total cost $= 270 \times 6 = ₹1620$

Commonly Made Error

- Calculation error is commonly seen in numerical questions.

Answering Tip

- While solving numerical, always write formula in the beginning. Keep in mind that the essential steps are properly shown and final answer is expressed along with a proper unit.

12. Resistance $R_1 = 2\Omega$, $R_2 = 6\Omega$, and $R_3 = 3\Omega$

Here, R_2 and R_3 are in parallel combination,

$$\frac{1}{R_4} = \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{6} + \frac{1}{3} \quad \textbf{1}$$

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

$$R_4 = 2\Omega \quad \textbf{1}$$

Resistance R_1 and R_4 are in series combination,

Equivalent resistance $R_{eq} = R_1 + R_4 = 2 + 2$

$= 4\Omega$ **1**

OR

Since, $V = IR$

From the figure $R = 3 + 4 + 5 = 12\Omega$

$$I = \frac{3}{12} = \frac{1}{4} \text{ A}$$

Potential difference across 5Ω resistor:

$$V' = IR'$$

$$V = \frac{1}{4} \times 5$$

$$= \frac{5}{4} \text{ V or } 1.25\text{V}$$

13. **(a)** **(i)** Farmers generally use pesticides on fruit crops to protect their crops from plant diseases.
However, pesticides may contaminate the fruit and therefore fruit juices also become contaminated. ½

(ii) Using contaminated ground water for irrigation also makes the fruits infected with contaminants. ½

(b) Biological magnification or bio-magnification is the accumulation of chemicals in the individuals of higher trophic level. Chemicals are non-biodegradable and their concentration increases at each trophic level. Humans, being at the top of food chain, also get higher concentration of these harmful chemicals resulting into various health problems. **2**

Section - C

14. **(a)** Tall (Tt, Tt, Tt, Tt) **1**

(b) 3: 1 (TT, Tt, Tt and tt) ½

(c) Dwarf ½

Reason: Being a recessive trait, dwarfness can only be expressed in the recessive homozygous condition or in the absence of dominant trait. **2**

OR

Gregor Johann Mendel, garden pea. **2**

15. **(a)** North poles. ½

(b) **(i)** Inversely proportional; larger the radius, weaker will magnetic field. ½

(ii) Directly proportional; more turns, more strong magnetic field. ½

(iii) Directly proportional; more strength of current, more strong magnetic field. ½

(c) The magnetic field lines never intersect each other because if two lines intersect each other, then at that point of intersection, the magnetic field has two directions, which is not possible. **2**

OR

The magnetic field is stronger at the poles so the magnetic field lines are crowded at the poles. **2**