Sample Question Paper - 12
Science (086)
Class- X, Session: 2021-22
TERM II

Time Allowed: 2 hours   **Maximum Marks: 40**

General Instructions:

1. All questions are compulsory.

2. The question paper has three sections and 15 questions. All questions are compulsory.

3. 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.

4. Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

Section A

1.   i. What would be the electron dot structure of carbon dioxide which has the formula of CO_2?   **[2]**

   ii. What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur?

2.   Write the reason for the following. (Number in parenthesis is atomic number of the substance).   **[2]**

   i. Lithium (3) and sodium (11) are considered as active metals.

   ii. Fluorine (9) is more reactive than chlorine (17).

3.   Give a brief account of vegetative propagation.   **[2]**

4.   i. Name the organ where sperms are produced and name the hormone produced by it.   **[2]**

   ii. Why do sperms have a tail, but ovum does not have it?

5.   Does genetic combination of mothers play a significant role in determining the sex of a newborn?   **[2]**

OR

An individual inherits different traits from his parents. On what basis classification of traits as dominant and recessive is done?

6.   A circuit contains a battery, a variable resistor and a solenoid. The figure below shows the magnetic field pattern produced by the current in the solenoid.   **[2]**
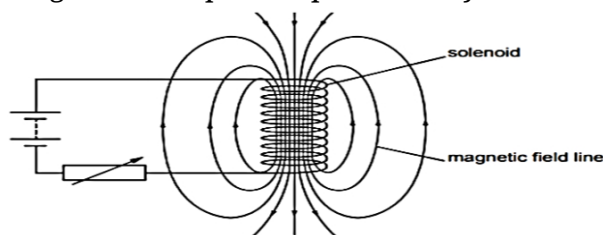
   i. State how the magnetic field pattern indicates regions where the magnetic field is stronger.

   ii. What happens to the magnetic field when the current in the circuit is reversed?

7. Rearrange the following according to their trophic levels in a food chain. **[2]**

    Fish, zooplankton, seal, phytoplankton

Section B

8. The following table shows the positions of four elements A, B, C and D in the periodic table. **[3]**

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

Using the above table answer the following questions.

   i. Which element will form only covalent compounds?

   ii. Which element is a metal with valency 2?

   iii. Out of C and D which one has bigger atomic radius and why?

9. i. Carbon forms four covalent bonds by sharing its four valence electrons with four univalent **[3]** atoms, e.g. hydrogen. After the formation of four bonds, carbon attains the electronic configuration same as which element?

   ii. What is the correct electron dot structure of a water molecule?

OR

   i. How many isomers are possible for the compound with the molecular formula C_4H_8? Draw the electron dot structure of branched chain isomer.

   ii. How will you prove that C_4H_8 and C_5H_{10} are homologues?

10. Name the plant Mendel used for his experiment. What type of progeny was obtained by **[3]** Mendel in F_1 and F_2 generations when he crossed the tall and short plants? Write the ratio he obtained in F_2 generation plants.

11. i. An electric heater is rated at 2kW. Electrical energy costs ₹4 per kWh. What is the cost of **[3]** using the heater for 3 hours?

    ii. You have two electric lamps having rating 40W, 220V and 60W, 220V. Which of the two has a higher resistance? Give reason for your answer. If these two lamps are connected to a source of 220V, which will glow brighter?

12. Find out the following in the electric circuit given in Figure **[3]**
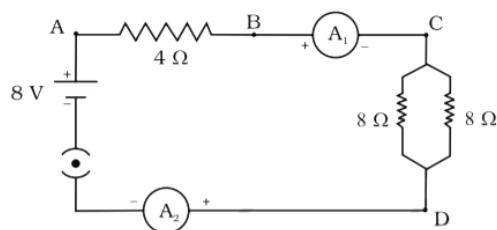
   i. The potential difference across 4 Ω resistance

   ii. The power dissipated in 4 Ω resistor

The following circuit diagram shows three resistors 2Ω, 4Ω, RΩconnected to a battery of e.m.f. 2V and internal resistance 3Ω. A main current of 0.25 A flows through the circuit.

 a. What is the P.D. across 4 Ω resistor.

 b. Calculate P.D. across the internal resistance of the cell.
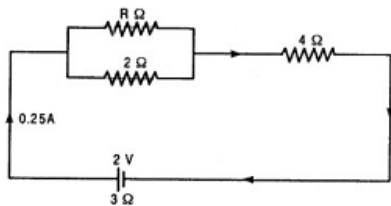
13.   i. Differentiate biodegradable and non-biodegradable pollutants.   **[3]**

      ii. Classify the following under the above two categories: DDT, Paper, Cotton cloth, Plastics.

Section C

14. **Read the Case study followed by 3 questions Part (i) and (ii) are compulsory. However, an** **[4]** **internal choice has been provided in part (iii):**

The cross that include the inheritance of two pairs of contrasting characters simultaneously is referred as dihybrid cross. Mendel chose pure breeding plants for yellow and green seeds and round and wrinkled shape of seeds. He cross pollinated the plant having yellow round seeds with plant having green wrinkled seeds. All the plants produced in Fx generation were having, yellow round seeds. The plants raised from these seeds were self pollinated, that resulted in production of plants having four phenotypically different types of seeds.

   i. What will be the percentage of yr gamete produced by YyRr parent?

  ii. How many types of gametes can be produced by YYrr?

 iii. In Mendelian dihybrid cross, when heterozygous tall plant with green seeds are self crossed then what will be the progenies?

    OR

    When round yellow seeded heterozygous pea plants are self fertilised, then what will be the frequency of occurrence of RrYY genotype among the offsprings?

15. **Read the Case study followed by 3 questions Part (i) and (ii) are compulsory. However, an** **[4]** **internal choice has been provided in part (iii):**

An insulated copper wire wound on a cylindrical cardboard tube such that its length is greater than its diameter is called a solenoid. When an electric current is passed through the solenoid, it produces a magnetic field around it. The magnetic field produced by a current-carrying solenoid is similar to the magnetic field produced by a bar magnet. The field lines inside the solenoid are in the form of parallel straight lines. The strong magnetic field produced inside a current-carrying solenoid can be used to magnetise a piece of magnetic material like soft iron, when placed inside the solenoid. The strength of magnetic field produced by a current carrying solenoid is directly proportional to the number of turns and strength of current in the solenoid.

i. What would be the strength of the magnetic field inside a long current-carrying straight solenoid?

ii. By using which rule we can find the north-south polarities of an electromagnet?

iii. A long solenoid carrying a current produces a magnetic field B along its axis. If the current is double and the number of turns per cm is halved, then what will be the new value of magnetic field?

OR

A soft iron bar is enclosed by a coil of insulated copper wire as shown in figure. When the plug of the key is closed, then where would the face B of the iron bar be marked?
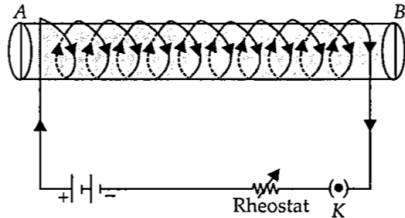
Section A

1. i. Electron dot structure of carbon dioxide (CO_2)**:**

   Carbon (C) is less electronegative than oxygen (O). Therefore, carbon is placed at the center of the Lewis structure. The structure for CO_2 has a total of 16 valence electrons. Two pairs of electrons are shared between the carbon atom and each oxygen atom in order to complete the octets. Thus, two double bonds are formed between carbon and oxygen atoms in the structure.
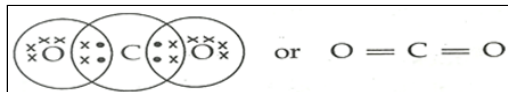

   ii. Electron dot structure of a molecule of sulphur (S_8)

   Atomic number of Sulphur is 16 and the electronic configuration is 2, 8, 6. The number of valence electrons is 6 and a sulphur atom requires 2 more electrons to complete an octet. A sulphur atom achieves the octet by sharing one electron each with two other sulphur atoms. Thus, 8 sulphur atoms form a cyclic octa-atomic molecule with formula S_8.
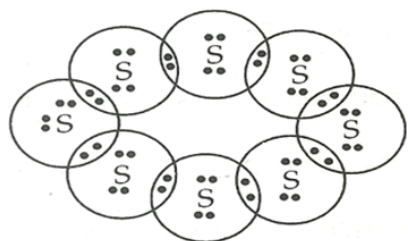

2. i. Chemical nature and reactivity depends upon the ability of the atoms to donate or accept electrons, so Li and K are active metals.

   ii. F is more reactive than Cl because F has more e - affinity than Cl

3. An vegetative propagation by leaves : Under suitable conditions new plants can develop from the leaves. In Bryophyllum, leaf helps in vegetative propagation. In the leaf there are notches, where meristem is present. When leaf comes in contact with soil, this meristem produces a new plant. Adventitious buds are formed in Begonia and Lilium on leaves which too help in vegetative propagation.
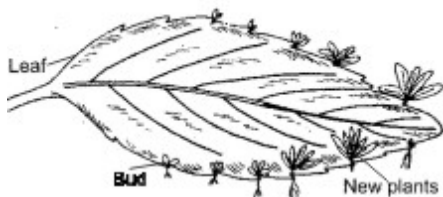
4. Sperms are produced in the testes, which is 2 in number and kept in scrotal sac in males. The testes secrete a hormone called testosterone, a male sex hormone, responsible for development of secondary male chatacteristics. Sperms have a long tail that helps them to move towards the female germ cells. Ovum is larger in size and contains the reserve food material, it does not need to travel large distances, thus tail is not desired.

5. No, mother have no role in determining the sex of a new born. As female have only a pair of X chromosome all children wiil inherit only one X chromosome from the mother. As males have X and Y chromosome its the

father, who determines the sex of a new born.
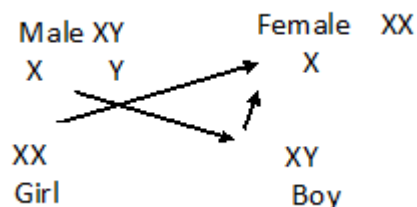
OR

A trait which is able to express itself both in homozygous condition as well as heterozygous conditions is called a dominant trait.

A trait which expresses itself only in homozygous condition is called recessive trait.

6. i. Relative closeness of field lines indicates the strength of magnetic field. Since field lines are crowded around the ends of the solenoid, hence these are the regions of strongest magnetism.
    ii. The direction of the field will also be reversed.

7. A food chain always start with producers followed by primary, secondary and tertiary consumer thus, the food chain will be Phytoplankton, zooplankton, fish, seal.

Section B

8. i. D as it has 4 valence electrons. Thus, to gain stablility it will form covalent bonds.
    ii. C as it lies in group 2. All elements in group 2 has 2 valence electrons.
    iii. C has bigger atomic radius than D because atomic radius decreases on moving from left to right across a period.

9. i. Electronic configuration of carbon is 2, 4 and after sharing four electrons from four univalent atoms, its electronic configuration becomes 2, 8 which is the same as that of Neon.

    ii. $H : \overset{\cdot\cdot}{\underset{\cdot\cdot}{O}} : H$ as this dot structure shows a complete octet after oxygen shared two electrons with two univalent atoms of hydrogen.

OR

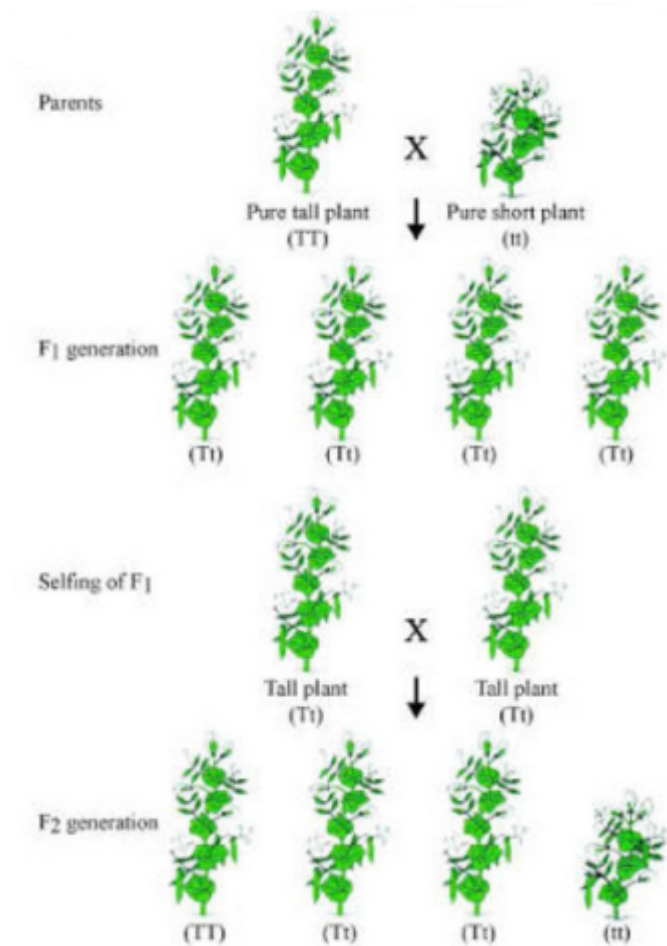   i. Four
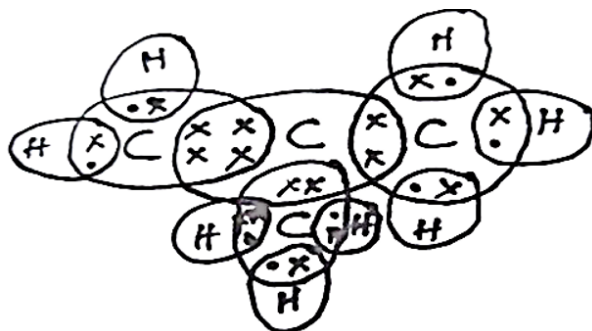
    ii. C_4H_8 and C_5H_{10} are homologues as they differ in

        i. - CH_2-

        ii. differ in 14u molecular mass
       iii. Same functional group
        iv. Same general formula

10. i. Plant used by Mendal is Garden Pea Plant (Pisum sativum).
     ii. F_1 - All tall; F_2 - Tall and short

iii. The ratio in F_2 progeny is 3:1.

11. i. Energy consumed = P × t = 2 × 3 = 6kWh

    Total cost = 6 × cost per unit

    Cost per unit = ₹4 per kWh

    Therefore, total cost = 6 × 4 = ₹24

ii. We know that,

$$P = \frac{V^2}{R}$$

Thus, resistance is inversely proportional to power. So, the electric lamp with power rating 40 W will have a higher resistance as compared to 60 W lamp.

Lamps with higher power will glow brighter, the lamp with rating 60W, 220V will glow brighter.

12. Given :-

    Resistor, R_1 = 4 Ω

    Resistor, R_2 = 8 Ω

    Resistor, R_3 = 8 Ω

    Potential Difference, V = 8 volts.

i. The potential difference across 4Ω resistors, V = IR = 1 × 4 = 4V

ii. Power dissipated in 4Ω resistors, P = I^2R = $(1A)^2(4Ω)$ = 4W

<div align="center">OR</div>

Current in the circuit = 0.25 A

Current through 4Ω wire = 0.25 A

  a. P.D. across 4Ω = 0.25 × 4 = 1V

  b. P.D. across 3Ω = 0.25 × 3 = 0.75 V

13.

Biodegradable pollutants	Non-biodegradable pollutants
1) These pollutants can be broken down into non-poisonous substances in nature by the action of living organisms such as bacteria, fungi.	1) These pollutants cannot be broken down into non-poisonous substances by living organisms.

2) They get recycled thus do not need any dumping sites.	2) They cannot be recycled thus require dumping sites.
3) Biodegradable are the one which gets decomposed within very short period.	3) Non biodegradable take longer time.
4) Biodegradable can act as soil manures .	4) Non biodegradable can't act as soil manures
Example: Paper, Cotton cloth.	Example: DDT and plastics.

Section C

14. i. Gametes produced by YyRr parent would be 25% YR, 25% yR, 25% Yr and 25% yr.

   ii. 1

   iii. Ttyy, TTyy, ttyy

   OR

   Round yellow heterozygous pea plant may be represented by genotype RrYy. On selfing, such plants following results will be obtained.

   Parents: ♂ RrYy × ♀ RrYy
   (Round Yellow)   (Round Yellow)

   Gametes: RY Ry rY ry   RY Ry rY ry

   Offsprings:

♀ \ ♂	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

   Hence, total 16 genotypes will be obtained in the next generation out of which the frequency of occurrence of RrYY genotype is 2, as illustrated by the given Punnett square chart.

15. i. Magnetic field inside infinite solenoid is uniform. Hence it is same at all points.

   ii. Clock face rule

   iii. For a long solenoid, magnetic field B $\propto$ In; where I is the flowing current and n is number of turns per unit length in the solenoid. Therefore, in the given case magnetic field will remain unchanged.

   OR

   N-pole