Sample Question Paper - 6
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. The table shows the electronic structures of four elements. **[2]**

Element	Electronic Structure
P	2, 6
Q	2, 8, 1
E	2, 8, 7
S	2, 8, 8

   i. Identify which element(s) will form covalent bonds with carbon
   ii. **Carbon reacts with an element in the above table to form several compounds.** Give suitable reason.

2. The three elements A, B and C with similar properties have atomic masses X, Y and Z respectively. The mass of Y is approximately equal to the average mass of X and Z. **[2]**
   i. What is such an arrangement of elements called as?
   ii. Give one example of such a set of elements.

3. i. Name the site of implantation and development of baby in human female. **[2]**
   ii. Mention any two benefits of using barrier method during sexual act.

4. i. Trace the path of sperms from where they are produced in human body to the exterior. **[2]**
   ii. Write the functions of secretions of prostate gland and seminal vesicle in humans.

5. What will be the blood groups of the children of following matings? **[2]**
   a) $I^A I^B$ X $I^B I^B$
   b) $I^A I^O$ X $I^A I^B$

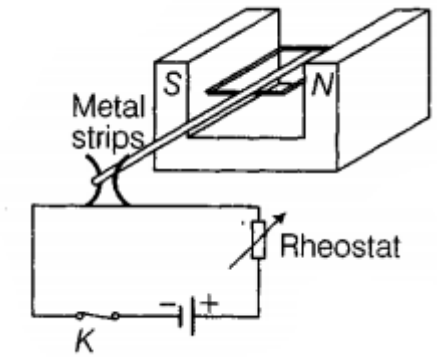
c) $I^A I^B$ X $I^A I^B$

d) IOIO X IA IB

OR

A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this information enough to tell you which of the traits-blood group A or O- is dominant? Why or why not?

6. The given figure shows a DC motor model used by a student to study electromagnetism. The two ends of the coil are fixed to a pair of curved elastic metal strips. The metal strips are connected to the power supply with a rheostat. **[2]**



i. State the direction of rotation of the coil when viewed from the front.

ii. The student is still testing on the feasibility of using the metal strips in the model. What is he trying to achieve?

7. What is the dam? Why do we seek to build large dams? While building large dams, which three main problems should particularly be addressed to maintain peace among local people? Mention them. **[2]**

Section B

8. Ria and Rama are students of Class X. Ria is very much organised and maintained. The teachers love her. She earns a great respect in the class whereas Rama is unorganised and always faces a lot of problems in handling the situations. Read the given passage and answer the following questions. **[3]**

i. In your opinion how does organisation help in daily life?

ii. How can you relate the above fact with the chapter classification of elements?

iii. What is the associated value the learner acquires from the given passage?

9. i. Define covalent bond. Explain with the help of examples. **[3]**

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

OR

A carbon compound 'A' having melting point 156K and boiling point 351K, with molecular formula C_2H_6O is soluble in water in all proportions.

i. Identify 'A' and draw its electron dot structure.

ii. Give the molecular formulae of any two homologues of 'A'.

10. In pea plant, round seed is dominant over the wrinkled. If a cross is carried out between these two plants, give answer to the following questions. **[3]**

i. Mention the genes for the traits of parents.

ii. State the trait of F_1 hybrids.

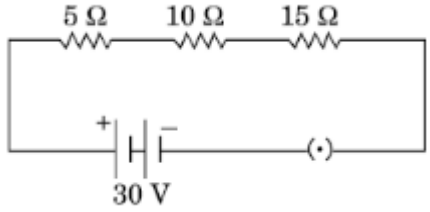
iii. Write the ratio of F_2 progeny obtained from this cross. What is the name of the cross?

11. a. Two electric lamps rated 100 W,220 V and 60 W,220 V are connected in parallel to electric mains supply. Calculate the current drawn from the mains if the supply voltage is 220 V? **[3]**

b. A lamp consumes 50 W and is lighted 2 h daily in month of April. How many units of electric energy is consumed ?

12. a. How will you infer with the help of an experiment that the same current flows through every part of a circuit containing three resistors in series connected to a battery? **[3]**

b. Consider the given circuit and find the current flowing in the circuit and potential difference across the 15 Ω resistors when the circuit is closed.

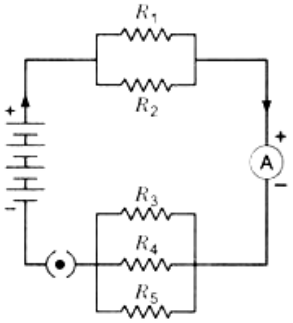


OR

If in the figure R_1= 10Ω, R_2 = 40Ω, R_3 = 30Ω, R_4 = 20Ω, R_5 = 60Ω, and a 12 V battery is connected to the arrangement.Calculate

i. the total resistance in the circuit ,and

ii. the total current flowing in the circuit.



13. One day Mohan found his neighbours burning plastic wastes in an open space near to his house. He explained three methods to save the environment from plastic wastes to them. Imagine yourself in methods that Mohan might have told to his neighbours. What value was exhibited by Mohan in this situation? **[3]**

Section C

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

Gregor Mendel conducted hybridization experiments on garden peas for seven years and proposed the laws of inheritance in living organisms. He investigated characters in the garden pea plant that were manifested as two opposing traits, e.g., tall or dwarf plants, yellow and green seeds, etc.

i. Among the seven pairs of contrasting traits in pea plants as studied by Mendel, What are the number of traits related to flower, pod, and seed respectively?

ii. What are the color-based contrasting traits in seven contrasting pairs, studied by Mendel in pea plants?

iii. What are some of the dominant traits studied by Mendel in pea plants?

OR

Write the scientific name of the plant on which Mendel carried out his experiments.

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

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.

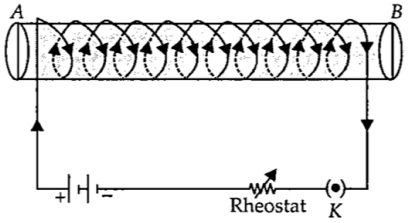
i. What would be the strength of the magnetic field inside a long current-carrying straight solenoid?

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?



Solution

SCIENCE - 086

Class 10 - Science

Section A

1. i. P and R
   ii. Carbon has a valency four or Tetravalency & Catenation
2. Since., The given three elements A, B and C with similar properties have atomic masses X, Y and Z respectively and mass of Y is approximately equal to the average mass of X and Z. Therefore, this arrangement of elements in which the atomic mass of middle element is almost the mean of atomic masses of first and third elements is known as Dobereiner's triads.
   e.g. Ca (Atomic mass=40), Sr (Atomic mass=88) and Ba (Atomic mass=137)
   Atomic mass of Sr = $\frac{40+137}{2}$ = 88.5
   Other example is Li(7), Na (23) and K (39).
3. i. The site of implantation and development of baby in human female is Uterus.
   ii. Two benefits of using barrier method during sexual act are:
      a. Protection from sexually transmitted diseases.
      b. Prevention of pregnancy.
4. i. The formation of sperms takes place in testis and which are delivered through the vas deferens or spermduct via urethera as males posses common urinogenital tract. Now sperms ejaculate out of the body through peins.
   ii. The secretions of prostate gland and seminal vesicles allow the sperms to be in a fluid medium, this fluid together with prostatic fluid and seminal fluid is known as semen, which makes their transport easier and also provides them with nutrition.
5. a) When a cross is made between I^AI^B x I^BI^B, then the two individuals will belong to blood group AB and two to blood group B.

   b) Similarly when a cross is made between I^AI^O x I^AI^B, then the two individuals will belong to blood group A one to AB and one to blood group B.

   c) When a cross is made between I^AI^B x I^AI^B, then the two individuals will belong to blood group AB, one to A and one to blood group B.

   d) When a cross is made between I^OI^Ox I^AI^B, then the two individuals will belong to blood group A and two to blood group B.

   OR

   No. This information is not sufficient to determine which of the traits - blood group A or O - is dominant. This is because we do not know about the blood group of all the progeny. Blood group A can be genotypically AA or AO. Hence, the information is incomplete to draw any such conclusion.

6. i. The direction of rotation of the coil is anti-clockwise when viewed from the front.
   ii. He is trying to achieve the rotation of the coil in one direction. As the current in the coil reverses for every half turn, the coil rotates in one direction.
7. The dam is a barrier that is built across a river or a stream for storage of water.
   We seek to build large dams because it can ensure the storage of an adequate amount of water for irrigation and also for generating electricity.
   The three main problems are an economical problem, environmental problem, and ecosystem problem.

Section B

8. i. Organisation makes our life simple, easy and systematic. On the other hand, unorganization faces a lot of problems in handling the situations.
   ii. As an organisation helps us in our daily life in the same way classification of elements makes the study of elements easier and simple. It becomes easy to reproduce. Otherwise, it becomes difficult to remember all the elements and their properties.

iii. The learner will be motivated to adopt a well-disciplined and organized life.

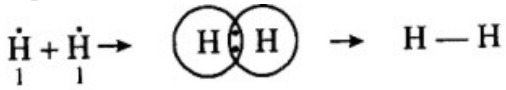
9. i. Covalent bond: The bond formed by equal contribution and mutual sharing of electrons between two atoms so that both the atoms acquire the stable nearest noble gas configuration i.e. get their octet complete is called covalent bond.
The mutually shared electrons become the common property of both the bonded atoms.
The number of electrons contributed by an atom of the element for mutual sharing during the formation of a covalent bond is called its covalency.
Each pair of shared electrons is represented by putting a single line (—) between two atoms.
In the example given below :

Element	At no.	Electronic configuration
H	1	1
C	6	2,4
O	8	2, 6
N	7	2, 5

Examples,

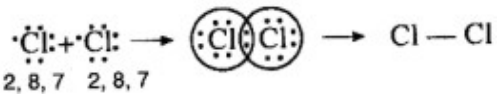
a. Formation of a hydrogen molecule(H_2): At no. of hydrogen = 1. It has one electron is the first orbit.

When two hydrogen atoms approach each other they share their single electron present in their first orbits. Each hydrogen atom can now be thought of as having noble gas configuration of helium. It may represented as:



Formation of H_2 molecule

b. Formation of chlorine molecule. Two chlorine atoms combine with each other to form a molecule of chlorine. In this case, both the atoms have seven electrons in their outermost shell and they contribute one electron each to form a covalent bond. Thus, both the chlorine atoms acquire noble gas configuration of argon. This may be depicted as:

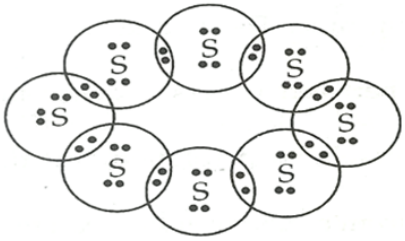


Formation of Cl_2 molecule

c. Formation of HCl molecule. A covalent bond is formed not only between similar atoms but it may be formed between dissimilar atoms also. For example, hydrogen and chlorine form a covalent bond between their atoms. Hydrogen atom has only one electron and chlorine atom has seven electrons in its valence shell. Therefore, by mutual sharing of electron pair between a hydrogen and a chlorine atom both the atoms acquire nearest noble gas configuration. Hydrogen atom acquires electronic configuration of helium whereas chlorine atom gets electronic configuration of argon.

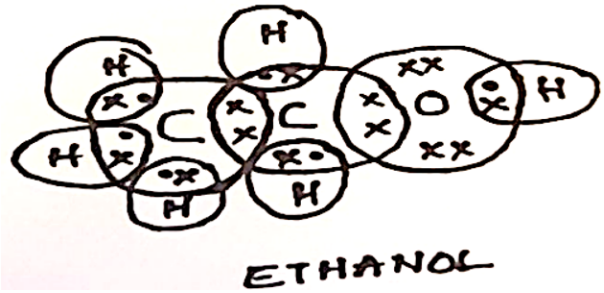
ii. Electron dot structure of a molecule of sulphur (S_8)

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.



OR

i. Ethanol; C_2H_5OH



ii. CH_3OH and C_3H_7OH are homologues of ethanol

OR

CH_4O and C_3H_8O

10. i. RR for homozygous pure round. And rr for homozygous pure wrinkle pea plant.
ii. Rr (hybrid) - heterozygous. All are round since round is dominant over wrinkled.
iii. 3:1 (phenotypic ratio), 1:2:1 (genotypic ratio) The name of this cross is monohybrid cross.

11. (a) We know that

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

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

Resistance of 1st lamp,

$R_1 = \frac{V^2}{P} = \frac{220 \times 220}{100}$

$= 484\Omega$

Resistance of 2nd lamp,

$R_2 = \frac{220 \times 220}{60}$

$= \frac{2420}{3}\Omega$

Since, two lamps are connected in parallel, so its equivalent resistance is given by

$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{484} + \frac{3}{2420} = \frac{8}{2420}$

R = $\frac{2420}{8}\Omega$

By Ohm's Law,current drawn from the mains:

I = $\frac{V}{R} = \frac{220 \times 8}{2420}$

= 0.73 A

∴ The current drawn from the mains is 0.73 A

(b) Energy consumed = $\frac{Watt \times hour}{1000} = \frac{50 \times (2 \times 30)}{1000} = \frac{3000}{1000} = 3\ unit\ or\ 3\ kWh$

12. a. (i) Join the three resistors R_1, R_2 and R_3 of different values in series connected to a battery of V volt.

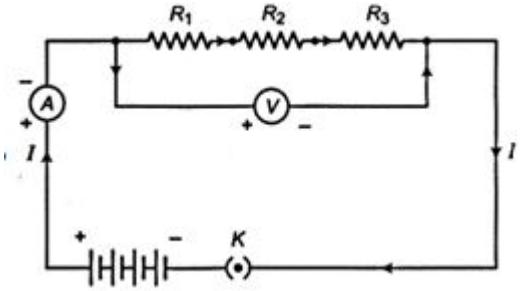
(ii) Connect them with battery, an ammeter (A) and plug key (K).

(iii) Plug the key and note the ammeter reading

(iv) Change the position of the ammeter to anywhere in between the resistors and note the ammeter reading each time.

(v) The ammeter reading will remain the same every time.

Therefore when resistors are connected in series same current flows through all resistors.



b. Given: $R_1 = 5\Omega$, $R_2 = 10\Omega$, $R_3 = 15\Omega$ and V = 30V

Total resistance of the circuit, $R = R_1 + R_2 + R_3$

R = 5 + 10 + 15

R = 30 Ω

Potential difference across the circuit, by ohm's law,

V = IR

or $I = \frac{V}{R} = \frac{30}{30} = 1A$

Potential difference across 15 ohm Resistor = 1 × 15 = 15 volt

OR

i. Let the equivalent resistance of parallel resistors R_1 and R_2 = R'. The equivalent resistance of parallel resistors R_3, R_4 and R_5 = R".

Then, we have

$\Rightarrow \frac{1}{R'} = \frac{1}{R_1} + \frac{1}{R_2}$

$\frac{1}{R'} = \frac{1}{10} + \frac{1}{40}$

$\Rightarrow \frac{1}{R'} = \frac{4+1}{40}$

$\Rightarrow R' = \frac{40}{5} = 8\Omega$

Similarly,

$\frac{1}{R''} = \frac{1}{R_3} + \frac{1}{R_4} + \frac{1}{R_5}$

$\Rightarrow \frac{1}{R''} = \frac{1}{30} + \frac{1}{20} + \frac{1}{60}$

$\Rightarrow R'' = \frac{60}{6} = 10\Omega$

R' = 8Ω

R" = 10Ω

As R' and R'' are connected in series.

Thus, the total resistance in the circuit,

R = R' + R" = 8Ω + 10Ω= 18Ω

ii. According to Ohm's law

$I = \frac{V}{R}$

$= \frac{12V}{18\Omega}$

= 0.67 A

13. Methods to save the environment from effects of plastic wastes are:

i. Use paper or cloth bags to carry things instead of plastic bags as paper bags are biodegradable causing less pollution in environment.

ii. Recycle the plastic waste by sending it to factories for processing as plastics are non biodegradable.

iii. Dispose off the plastic wastes in separate boxes that are placed for non-biodegradable wastes.
Mohan exhibited values of a responsible, concerned citizen, who is talking efforts to conserve environment.

Section C

14. i. 2, 2, 2

Characters studied by Mendel are as follows:

	Trait studied	Dominant	Recessive
1.	Plant height	Tall (T)	Dwarf (t)
2.	Flower position	Axial (A)	Terminal (a)
3.	Flower colour	Violet (V) or (W)	White (v) or (w
4.	Pod shape	Full or Inflated (I) or (C)	Constricted (i) or (c)
5.	Pod colour	Green (G) or (Y)	Yellow (g) or (y)
6.	Seed shape	Round (R) or (W)	Wrinkled (r) or (w)
7.	Seed colour	Yellow (Y) or (G)	Green (y) or (g)

ii. 3

iii. violet flower colour, green pod colour and round seed shape

OR

He took: Pea (Pisum sativum) plant.

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