Sample Question Paper - 7
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 is the name of next homologue of $C_5H_{11}COOH$? **[2]**

   ii. C_{60} and C_{70} are important members of which type of allotrope of carbon?

2. The position of three elements X, Y and Z in the periodic table is shown below. **[2]**

Group 1	**Group 2**
_	-
X	-
-	-
Y	Z

   i. Which type of ion i.e. cation or anion, will be formed by element X?

   ii. Which element Y or Z, has the atom of comparatively larger size? Give reason in each case.

3. 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.

4. Why is DNA copying an essential part of the process of reproduction? **[2]**

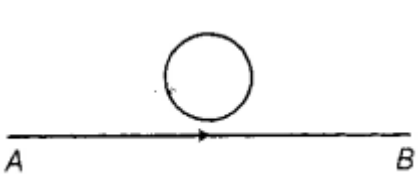
5. A child questioned his teacher that why do organisms resemble their parents more as compared to grandparents. In which way will the teacher explain to the child? **[2]**

   OR

   Give the pair of contrasting traits of the following characters in plant and mention which one is recessive and which is dominant?

   a. yellow seed
   b. round seed

6. A circular metallic loop is kept above the wire AB as shown below: **[2]**



What is the direction of induced current produced in the loop, if the current flowing in the straight wire

i. is steady, i.e. does not vary?

ii. is increasing in magnitude?

7. Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage? **[2]**

Section B

8. Two elements X and Y have atomic number 12 and 16 respectively. **[3]**

i. Write the electronic configuration of these elements. State the period of these elements.

ii. What type of bond will be formed if these two elements combine together?

9. i. An organic compound A on heating with concentrated H_2SO_4 forms a compound B which on addition of one mole of hydrogen in presence of Ni forms a compound C. One mole of compound C on combustion forms two moles of CO_2 and 3 moles of H_2O. Identify the compounds A, B and C and write the chemical equations of the reactions involved. **[3]**

ii. An organic compound A of molecular formula C_2H_6O on oxidation gives an acid B with the same number of carbon atoms in the molecule as A. Compound A is often used for sterilization of skin by doctors. Name the compounds A and B. Write the chemical equations involved in the formation of B from A.

OR

i. An element of group 14 has two common allotropes, A and B. A is hard and is bad conductor of electricity while B is soft to touch and a good conductor of electricity. Identify the element and its allotropes. Explain the reasons for their different properties.

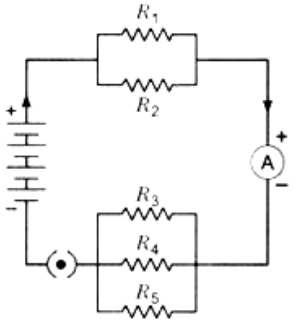
ii. An organic compound A on heating with concertrated H_2SO_4 forms a compound B which on addition of one mole of hydrogen in presence of Ni forms a compound C. One mole of compound C on combustion forms two moles of CO_2 and 3 moles of H_2O. Identify the compounds A, B and C and write the chemical equations of the reactions involved.

10. Mendel, in one of his experiments with pea plants, crossed a variety of pea plant having round seeds with one having wrinkled seeds. State Mendel's observations giving reasons of F_1 and F_2 progeny of this cross. Also, list any two contrasting characters, other than round seeds of pea plants that Mendel used in his experiments. **[3]**

11. If in the figure $R_1 = 10\Omega$, $R_2 = 40\Omega$, $R_3 = 30\Omega$, $R_4 = 20\Omega$, $R_5 = 60\Omega$, and a 12 V battery is connected to the arrangement.Calculate **[3]**

i. the total resistance in the circuit ,and

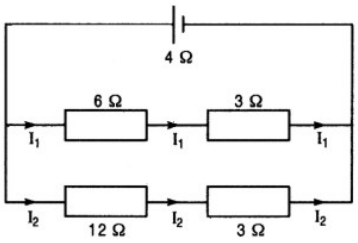
ii. the total current flowing in the circuit.



12. For the circuit shown in fig. what is the value of **[3]**

a. total resistance and current through 6W resistor

b. potential difference across 12 Wresistor?



OR

a. How much current will an electric bulb draw from a 220 V source, if the resistance of the bulb filament is 1200 Ω?

b. How much current will an electric heater coil draw from a 220 V source, if the resistance of the heater coil is 100 Ω?

13. i. What is mean by biological magnification? **[3]**

ii. Will the levels of this magnification be different at different levels of the ecosystem?

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]**

In human, the allele for brown eyes (B) is dominant over that for blue eyes (b). A brown-eyed woman marries a blue-eyed man, and they have six children. Four of the children are brown-eyed and two of them are blue-eyed.

i. What is the genotype of blue-eyed offspring?

ii. What is the woman's genotype?

iii. What is the gene carried by the mother's ovum regarding the eye color?

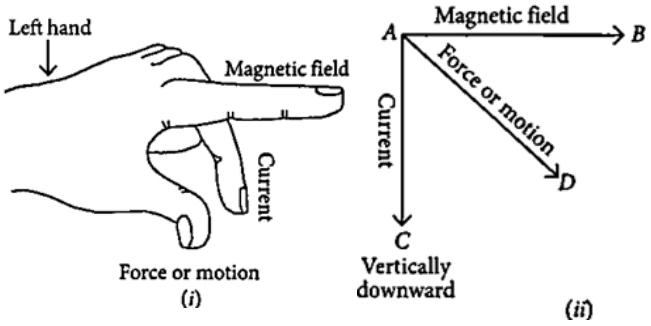
OR

What is the gene carried by the man's sperm regarding the eye color?

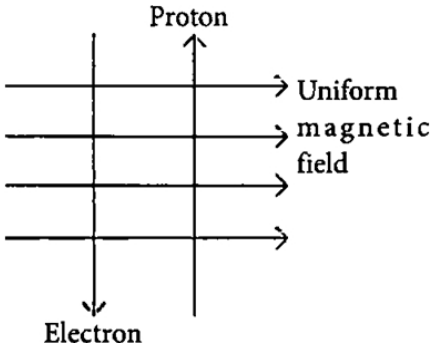
15. **Read the Case study followed by 3 questions Part (i) and (ii) are compulsory. However, an internal choice has been provided in part (iii):** **[4]**

Andre Marie Ampere suggested that a magnet must exert an equal and opposite force on a current carrying conductor, which was experimentally found to be true. But we know that current is due to charges in motion. Thus, it is clear that a charge moving in a magnetic field experience a force, except when it is moving in a direction parallel to it. If the direction of motion is perpendicular to the direction of magnetic field, the magnitude of force experienced depends on the charge, velocity (v), strength of magnetic field (B), and sine of the angle

between v and B. Direction of magnetic force is given by Fleming's left hand rule.

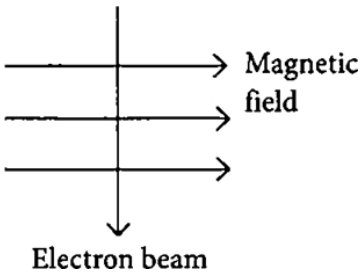


i. If an electron is travelling horizontally towards east. A magnetic field in vertically downward direction exerts a force on the electron along which direction?
ii. If a charged particle is moving along a magnetic field line. Then What would be the magnetic force on the particle?
iii. A uniform magnetic field exists in the plane of paper pointing from left to right as shown in figure. In the field, an electron and a proton move as shown. Where do the electron and the proton experience the force?



OR

An electron beam enters a magnetic field at right angles to it as shown in the figure. What would be the direction of force acting on the electron beam?



Solution

SCIENCE - 086

Class 10 - Science

Section A

1. i. The next homologue of $C_5H_{11}COOH$ (Pentanoic acid) is $C_6H_{13}COOH$ (Hexanoic acid). Two adjacent homologues in a series differ by 1 carbon atom and 2 hydrogen atoms i.e. by a CH_2 group.
   ii. Carbon can exist in three solid forms (Diamond, Graphite, Fullerenes) called allotropes. C_{60} and C_{70} are members of Fullerenes (Allotropes of carbon). Buckminsterfullerene contains a cluster of 60 carbon atoms joined together to form spherical molecules.
2. i. The valency of X is one so, It has tendency to lose one electron. Therefore, X will form cation.
   ii. Atomic radius decreases across a period due to increase in the electrostatic force between electrons and proton in the nucleus. Thus, Y has the larger atomic radii.
3. 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.
4. The process of reproduction results in the production of offsprings which are exactly similar to the parents. DNA copying is accompanied by cell division that gives rise to two cells. The exact blue print of body design is inherited in the offsprings due to DNA replication in parent cell. Therefore, DNA copying is an essential part of the process of reproduction.
5. The two parents involved in sexual reproduction produce gametes which fuse together forming a zygote. It gradually develops into a young child showing certain similarities with the parents.
   Since, a child inherits its characters from both the parents the resemblance with them is very close. The grandparents and the child resemble less closely because a gap of gene pool is created by the parents of the child. Since the child is immediate generation next to his parent thus to carry more similar genes as that of parents. Variations are more with grandparents.

   OR

   a. Green seed- Dominant Yellow seed- Recessive
   b. Wrinkled seed – Recessive Round seed- Dominant
6. i. The constant current flowing in the straight wire produces a constant magnetic field. Hence, no induced current is produced in the loop.
   ii. Since current in the straight wire is changing, hence, induced current will be produced in clockwise direction.
7. Ozone layer acts as a protective shield against the harmful Ultraviolet rays of the sun. Depletion of ozone layer leads to exposure to Ultraviolet rays & due to this the incidences of cancer, cataract are on rise. Also the uv rays damage the immune system of human beings.
   In 1987, United Nations Environment Programme (UNEP) succeeded in forging an agreement between nations to freeze chlorofluorocarbons (CFCs) production to 1986 levels. CFCs are the main cause of ozone layer depletion.

Section B

8. a. The electronic configuration is as shown below:

	k	**L**	**M**	**N**
X =	2	8	2	
Y =	2	8	6	

   b. Both elements X and Y have three shells, so they belong to the **3rd period** of the periodic table.
   c. **Electrovalent or ionic bond,** as X is a metal (2 valence electron) and Y is a non-metal(6 valence electron).

9. i. Compound A is ethanol. When it is heated with concentrated sulphuric acid, we get ethene. So, compound B is ethene. This can be shown by following equation.

$CH_3CH_2OH \xrightarrow{Conc.H_2SO_4} CH_2 = CH_2 + H_2O$

When ethene is heated in the presence of nickel, we get ethene. This can be shown by following equation.

$CH_2 = CH_2 \xrightarrow{Ni} C_2H_6$ (Compound C)

When I mole of ethene is burnt, we get 2 moles of carbon dioxide and 3 moles of water; as shown by following equation.

$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

ii. A is ethanol : C_2H_5OH

B is ethanoic acid : CH_3COOH

Chemical equation $\underset{(A)}{CH_3CH_2OH} \xrightarrow[KMnO4/OH]{(O)} \underset{(B)}{CH_3COOH}$

OR

i. The element is '**carbon**' and the two allotropes of the element are 'diamond' and 'graphite'.

Diamond (A) has three-dimensional rigid structure and does not have any free electrons. Hence, it is hard and a bad conductor of electricity.

Graphite (B) forms hexagonal sheet-like structure and one valency (one electron) with graphite is free. Hence, graphite is soft and a good conductor of electricity.

ii. Compound A is ethanol. When it is heated with concentrated sulphuric acid, we get ethene. So, compound B is ethene. This can be shown by following equation.

$CH_3CH_2OH \xrightarrow{Conc.H_2SO_4} CH_2 = CH_2 + H_2O$

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When I mole of ethene is burnt, we get 2 moles of carbon dioxide and 3 moles of water; as shown by following equation.

$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

10. i. In first generation progeny (F_1 progeny) all plants with round seeds.

ii. In second generation progeny (F_2 progeny) all plants with round and wrinkled seeds.

iii. (i) Tall and drawrf plants.
(ii) Yellow and green seeds.
(iii) White and purple flowers.

11. 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

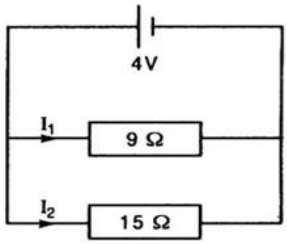
12. Resistor of 6Ω and 3Ωare in series therefore, combined resistance of these two is

R_1 = 6 + 3 = 9Ω

Again 12W and 3W are in series. The combined resistance of these two is

R_2 = 12 + 3 = 15Ω

Now 9Ω and 15Ω are in parallel to each other. Fig. (a) is the equivalent circuit.



Therefore, the combined resistance of full circuit is

$\frac{1}{R} = \frac{1}{9} + \frac{1}{5} = \frac{5+3}{45} = \frac{8}{45}$ $or\ R = \frac{45}{8} = 5.6\Omega$ $\ldots\ldots\ldots(i)$

V = 4 volt

∴ P.D. across 9 Ω as well as across 15 Ω is 4 V

Current along 9Ω resistor (and hence through 6Ω resistor)

$I_1 = \frac{V}{R_1} = \frac{4}{9}\ A = 0.44\ A$ $\ldots\ldots\ldots(ii)$

Current along 15Ω resistor (and hence through 12Ω resistor)

$I_2 = \frac{V}{R_2} = \frac{4}{15}\ A$

Potential difference across 12Ω wire = $12I_2$

$= 12 \times \frac{4}{15} = \frac{16}{5} = 3.2V$ $\ldots\ldots\ldots\ldots(iii)$

OR

a. We are given V = 220 V; R = 1200 Ω

From Eq. ($R = \frac{V}{I}$), we have the current I = $\frac{220V}{1200\Omega} = 0.18A$

b. We are given, V = 220 V, R = 100 Ω

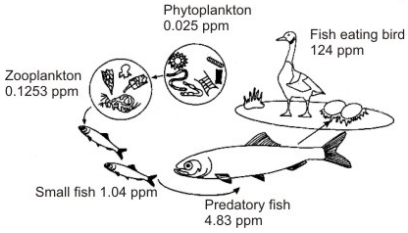
From Eq. ($R = \frac{V}{I}$), we have the current I = $\frac{200V}{100\Omega} = 2.2A$

Note the difference of current drawn by an electric bulb and electric heater from the same 220 V source.

13. The phenomenon in which the harmful pollutants (such as pesticides) enter the food chain and get concentrated more and more at each successive trophic level of organisms is called **biological** magnification. This can be illustrated by the following example:

Illustration:

In an island in USA after regular DDT spraying for a few years, the population of fish-eating birds started declining. It was detected that the concentration of DDT had increased 300 times in phytoplankton relative to concentration in water. Zooplankton contained about five times greater DDT than phytoplankton. In different fish, the DDT concentration increased 9 to 40 times relative to the concentration in zooplankton. Birds showed about 24 times greater DDT concentration relative to that in fish. Many other persistent pesticides and radionuclides also show biological magnification.



Process of biological magnification

Therefore, we observe that as we go higher and higher in the food chain, the concentration of pesticides in

the body of the organisms gradually increases. For example, in the above example, the biological magnification of harmful pesticides goes up to 8000 times from water to fish eating birds.

Section C

14. i. bb
    ii. Bb
    According to the given passage some children show recessive trait, i.e., homozygous. So, the woman must be heterozygous.
    iii. B or b
    Human ova are haploid, hence they only contain one copy of each gene. Since the woman has a Bb genotype her ova would contain either B or b allele.
    OR
    Human sperm is haploid, hence they only contain one copy of each gene. Since the man has a bb genotype, his sperm would contain allele b only.
15. i. Fleming's left hand rule is used to determine the direction of force on electron i.e., in south direction.
    ii. The angle between velocity and magnetic field is zero. Therefore, magnetic force on the particle is zero.
    iii. As the direction of current is taken opposite to the direction of motion of electrons, therefore, current from the motion of electron and proton is in the same direction, i.e., from bottom to top. Now, according to Fleming's left hand rule, the electron and the proton experience forces both pointing into the plane of paper.

    OR

    into the page