Sample Question Paper - 42
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. All questions are compulsory.

(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. Write the molecular formula of first two members of homologous series having functional group —OH. Also, draw their bond line structure.

2. Define atomic radius. Give its units.

3. Some flowers of pumpkin and bottle gourd develop fruits whereas other flowers fail to develop fruits. What may be the possible reason?

4. Reproductive health means a total well-being in all aspects of reproduction, *i.e.*, physical, emotional, behavioural and social. Some of the strategies are adopted to achieve total reproductive health such as sex education. Do you think sex-education is necessary in schools?

5. Inheritance is the process by which characters are passed from the parent to progeny. It is the basis of heredity. What is meant by chemical basis of heredity?

OR

Gregor Mendel conducted hybridization experiments on garden peas for seven years and proposed the laws of inheritance in living organisms. How will you justify the selection of pea plant by Mendel for heredity experiments?

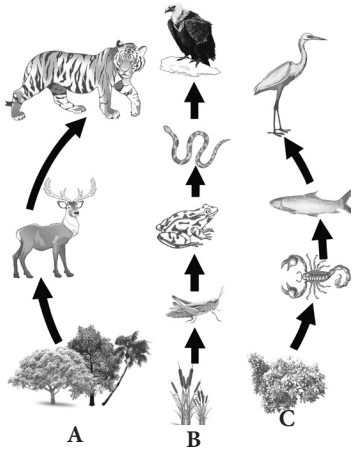
6. State the effect of a magnetic field on the path of a moving charged particle.

OR

(a) What is meant by a magnetic field? Mention two parameters that are necessary to describe it completely.

(b) If field lines of a magnetic field are crossed at a point, what does it indicate?

7. Out of the given food chains A, B and C which one has the minimum number of trophic levels? If in each food chain, the same amount of energy is available to the plants, in which case will the organism at top of the food chain get minimum energy for survival?



OR

Draw pie chart showing the relative contribution of different greenhouse gases to global warming.

SECTION - B

8. Explain the following :

(a) Diamond is a covalent solid, yet has a high melting point.

(b) Diamond is used for making tools for cutting and drilling.

9. (a) Lithium, sodium, potassium are all metals that react with water to liberate hydrogen gas. Is there any similarity in the atoms of these elements?

(b) Helium is an unreactive gas and neon is a gas of extremely low reactivity. What, if anything, do their atoms have in common?

(c) In the Modern Periodic Table, which are the metals among the first ten elements?

OR

Based on the group valency of elements write the molecular formula of the following compounds giving justification for each :

(i) Oxide of first group elements

(ii) Halide of the elements of group thirteen, and

(iii) Compound formed when an element, *A* of group 2 combines with an element, *B* of group seventeen.

10. Crossing of a pea plant with purple flower and pea plant with white flowers, produces 50 plants with only purple flowers. On selfing, the plants produced 470 plants with purple flowers and 160 with white flowers. Explain the genetic mechanism accounting for the above results.

11. (a) State Right Hand Thumb rule to find the direction of the magnetic field around a current carrying straight conductor.

(b) How will the magnetic field be affected on:

(i) increasing the current through the conductor

(ii) reversing the direction of flow of current in the conductor?

12. List in a tubular form three differences between a voltmeter and an ammeter.

OR

On what factors does the resistance of a conductor depend and how?

13. (a) Mr. X is eating curd/yoghart. Identify the trophic level he should be considered as occupying.
(b) Name the ultimate energy source of all ecosystem.

SECTION - C

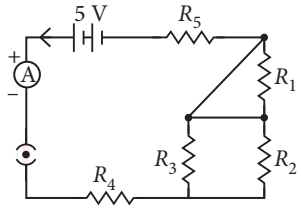
This section has 02 case-based questions (14 and 15). Each case is followed by 03 sub-questions (a, b and c). Parts a and b are compulsory. However, an internal choice has been provided in part c.

14. Many strategies are adopted to maintain reproductive health such as fertile couples and people of marriageable age group should know about available birth control devices, care of pregnant mother, postnatal care of the mother and child, importance of breast feeding, equal importance for the male and female child etc.
(a) Give reasons for avoiding frequent pregnancies by women.
(b) Explain the barrier methods of contraception with giving one example.
(c) Explain the chemical methods of contraception with giving one example.

OR

Explain the surgical methods of contraception giving one example.

15. Several resistors may be combined to form a network. The combination should have two end points to connect it with a battery or other circuit elements. When the resistances are connected in series, the current in each resistance is same but the potential difference is different in each resistor. When the resistances are connected in parallel, the voltage drop across each resistance is same but the current is different in each resistor.
Now consider the following electric circuit and answer the following questions.



(a) Which two resistors are connected in parallel?
(b) Which two resistors are connected in series?
(c) If every resistors of the circuit is of 2 Ω, what current will flow in the circuit?

OR

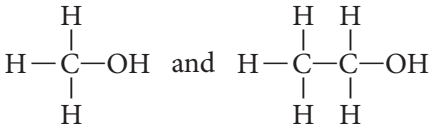
Deduce the expression for the equivalent resistance of the parallel combination of three resistors R_1, R_2 and R_3.

Solution

SCIENCE - 086

Class 10 - Science

1. The molecular formula of first two members of homologous series having –OH functional group are CH_3OH (methanol) and CH_3CH_2OH (ethanol).



2. Atomic radius can be defined as the distance between the centre of nucleus and the outermost shell of an isolated atom. Also, the atomic radius of a non-metallic element is defined as half of the distance between the nuclei of two smiliar atoms bound by a single covalent bond.
Units = Å (angstrom) or pm (picometre)
e.g., atomic radius of hydrogen atom = 37 pm.

3. Pumpkin and bottle gourd bear unisexual flowers. Some flowers are male and others are female. Male flowers do not develop fruits. They produce pollen grains. The female flowers possess carpels which develop fruits after fertilisation. Therefore, only female flowers develop fruits but not the male flowers.
4. A correct knowledge about reproductive organs, adolescence related changes, sexually transmitted diseases, etc., will save the young minds from myths and misconceptions about sex related aspects and help them to lead a reproductively healthy life. Thus, sex-education is necessary in schools.

5. Transmission of characters from one generation to another is termed as heredity. Carrier of hereditary information are genes that are segments of DNA. DNA (a chemical compound) is the chemical basis of heredity. Chemically, each gene has a specific sequence of nucleotides which determines its functional property. Chromosome → DNA → genes → proteins.
These proteins (either functional or structural) express phenotype of the individual.

OR

Mendel selected pea plant for breeding experiments because of the following features:

S. No.	Feature	Advantage
(i)	Annual plant	Short life cycle helped to study larger number of generations in shorter time.
(ii)	Contrasting characters	Made analysis more convenient and reliable.
(iii)	Easy hybridisation	Artificial cross pollination is quite easy due to large reproductive structures. It helped in crossing pure plants with contrasting characters.
(iv)	Self fertility	Made possible to maintain homozygous pure lines for a particular character.
(v)	High number of seeds	Thus, sufficient number of progenies of each generation obtained.

6. A charged particle moving in a magnetic field (not moving parallel to magnetic filed) may experience a force in the direction perpendicular to direction of magnetic field and direction of motion of particle. This force deflects the charged particle from its path.

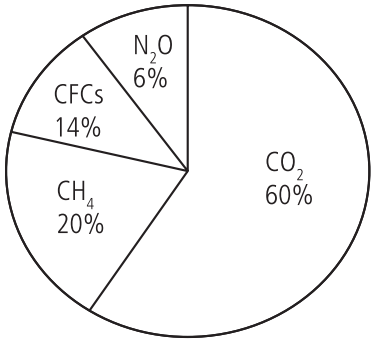
OR

(a) Magnetic field : It is defined as the space surrounding the magnet in which magnetic force can be experienced.
Necessary parameters are:
(i) Magnitude of magnetic field.
(ii) Direction of field lines.
(b) If field lines of a magnetic field are crossed at a point, it indicates that there are two directions of magnetic field at a point which is not possible.

7. Food chain 'A' has minimum trophic levels (three trophic levels).
Longer is the food chain, lesser is the amount of energy at top of the food chain. So, in the food chain 'B' which has five trophic levels, the energy available to eagle (organism at the top) will be minimum.

OR

Relative contributions of different GHGs in global warming are as follows:



8. (a) It is a giant molecule containing a large number of carbon-carbon single covalent bonds (network structure). To break these covalent bonds, a large amount of energy is needed and hence diamond has a high melting point.

(b) Diamond is a good conductor of heat and is used for making cutting and drilling tools because the heat generated during cutting and drilling is easily absorbed by the network structure without overheating the diamond tool.

9. (a) Lithium, sodium and potassium all react with water to form alkalies, *i.e.,* lithium hydroxide, sodium hydroxide and potassium hydroxide respectively with the liberation of hydrogen gas.

$$\underset{\text{Lithium}}{2Li} + \underset{\text{Water}}{2H_2O} \rightarrow \underset{\text{Lithium hydroxide}}{2LiOH} + \underset{\text{Hydrogen}}{H_2}$$

$$\underset{\text{Sodium}}{2Na} + \underset{\text{Water}}{2H_2O} \rightarrow \underset{\text{Sodium hydroxide}}{2NaOH} + \underset{\text{Hydrogen}}{H_2}$$

$$\underset{\text{Potassium}}{2K} + \underset{\text{Water}}{2H_2O} \rightarrow \underset{\text{Potassium hydroxide}}{2KOH} + \underset{\text{Hydrogen}}{H_2}$$

All these metals have one electron in their respective outermost shells. Thus, they have similar chemical properties.

(b) Helium and neon are noble gases and hence have extremely low chemical reactivity. The common thing in these gases is that they have their shells completely filled. Helium has only *K*-shell which is complete, *i.e.,* has 2 electrons. Neon, on the other hand, has two shells, *K* and *L*. Both these shells are complete, *i.e.*, *K* shell has 2 electrons and *L* shell has 8 electrons.

(c) Metals among the first ten elements are lithium (Li) and beryllium (Be). These are placed towards the left hand side in the table.

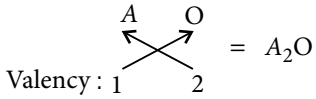
OR

(i) Oxides of group 1 elements :

Let the element be *A*.

As *A* belongs to group 1 of the periodic table, it will have valency = 1

So, molecular formula of its oxide will be



$= A_2O$

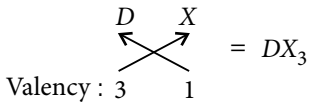
(ii) Halides of the element of group 13 :

Let the element be *D*.

As *D* belongs to group 13, it will have valency = 3

Halide *X* has the valency = 1

So, molecular formula will be

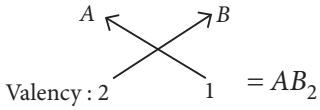


$= DX_3$

(iii) Valency of $A = 2$

Valency of $B = 1$

Molecular formula of the compound will be



$= AB_2$

10. In this breeding experiment, ratio of purple to white flowers is approximately 3 : 1 in F_2 generation. This ratio is according to Mendelian monohybrid cross. The cross further explains the following facts:

(i) F_1 is represented only by dominant trait, *i.e.*, purple flowered plants.

(ii) Both the traits, *i.e.*, purple and white flower colour appear in F_2 generation.

11. (a) It states that if you are holding a current carrying straight conductor in your right hand such that the thumb points towards the direction of current, then your finger will wrap around the conductor in the direction of the field lines of the magnetic field.

(b) (i) If the current is increased, the magnetic field strength also increases.

(ii) If the direction of current is reversed, the direction of magnetic field also get reversed.

12. Difference between ammeter and voltmeter

	Ammeter	**Voltmeter**
(i)	It measures electric current in a circuit.	It measures the potential difference between two points in a circuit.
(ii)	It is connected in series in a circuit.	It is connected in parallel across the two points in a circuit.
(iii)	It is a low resistance device.	It is a high resistance device.

OR

The resistance (*R*) of a conductor depends upon :

(a) Its length (*l*), *i.e.*, $R \propto l$. Resistance of a conductor increases with increase in length of the conductor.

(b) Its cross-sectional area (A) *i.e.*, $R \propto 1/A$. Resistance of a conductor decreases with increase in cross-section area of a conductor.
(c) Nature of material : Conductors have small resistance as compared to other materials like semi-conductors and insulators.
(d) Temperature : Resistance of conductors increases with increase in temperature.

13. (a) Mr. X eating curd/yoghurt should be considered as occupying third trophic level. Producers or green plants (first trophic level) are consumed by herbivores (second trophic level) and from them curd/yoghurt (made from dairy breed) is consumed by third trophic level organisms like man.
(b) Solar radiation is the ultimate energy source of all ecosystem.

14. (a) Having pregnancies too frequently and giving child birth at quick succession reduce mother's health and vitality and cause mental strain. Health of children is also affected due to nutritional deficiencies.
(b) Barrier method: These are physical devices to prevent the entry of sperm into the female genital tract during copulation. They also protect against sexually transmitted diseases *e.g.*, condoms. Condoms are thin, strong rubber sheaths used by man to cover the erect penis. It is simple but effective and widely used contraceptive that has no side effects. It checks pregnancy by preventing deposition of semen in the vagina.
(c) Chemical method: Some common chemicals like foam tablets, jellies, pastes, creams and spermicides are used by females. These are placed in vagina. These chemicals adhere to the mucous membrane and immobilise and kill the sperms.

OR

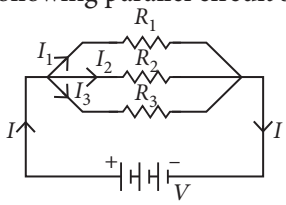
Surgical methods include – Vasectomy and Tubectomy. Vasectomy is a small surgical operation performed in males. It involves removal of a small portion of the sperm duct (or vas deferens) by surgical operation. The two cut ends are then ligated (tied) with threads and this prevents the sperms from coming out. Tubectomy is done in females where oviducts are cut and cut ends are tied with threads. Therefore, passage of ova is prevented.

15. For the given circuit,
(a) R_2 and R_3 resistors are in parallel.
(b) R_5 and R_4 resistors (with parallel combination of R_2 and R_3) are in series.
(c) R_2 and R_3 in parallel gives $R_p = 1\ \Omega$
R_p, R_5 and R_4 are in series. So, $R_{eq} = 5\ \Omega$
R_1 is not to be taken as it is shorted.

Current flowing, $I = \dfrac{V}{R_{eq}} = \dfrac{5}{5} = 1\ \text{A}$

OR

Consider the following parallel circuit shown below :



Let I_1, I_2 and I_3 be the current flow through the resistors R_1, R_2 and R_3 connected in parallel.
Using Ohm's law, current through each resistor is

$$I_1 = \frac{V}{R_1},\ I_2 = \frac{V}{R_2} \quad \text{and} \quad I_3 = \frac{V}{R_3}$$

Let their equivalent resistance be R_P then

$$V = IR_P \ \Rightarrow I = \frac{V}{R_P}$$

Total current through the circuit is
$I = I_1 + I_2 + I_3$

$$\text{or} \quad \frac{V}{R_P} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

$$\text{or} \quad \frac{V}{R_P} = V\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$$

$$\text{or} \quad \frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$