Sample Question Paper - 30
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. Are $C_2H_4O_2$ and $C_2H_6O_2$ the members of same homologous series? Name the series. List any two characteristics of a homologous series.

2. How can the valency of an element be determined if its electronic configuration is known? What will be the valency of an element of atomic number 9?

3. Refer to the process depicted in the given diagram.
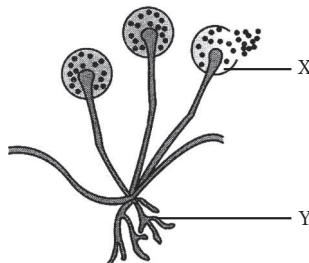
    (a) Identify the labelled parts X and Y.

    (b) Which labelled part is involved in reproduction?

4. Name the sex hormone secreted by the testis in human males. Write down its role.

5. "Different species use very different strategies for determining the sex of their new born." Justify this statement.

    OR

    What are dominant traits and recessive traits? How do Mendel's experiments show that traits may be dominant or recessive?

6. (a) The diagram shows a two-poles single-coil electric motor.
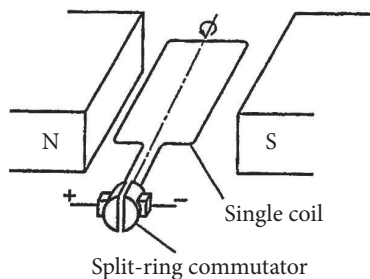
The split-ring commutator reverses the current in the coil as it rotates. How many times is the current reversed if the coil is rotated once?

(b) The magnetic field due to long straight wire at some distance P is B. What will happen to magnetic field if we increase the distance P.

OR

(a) A bar magnet is pushed steadily into a long solenoid connected to a sensitive meter.
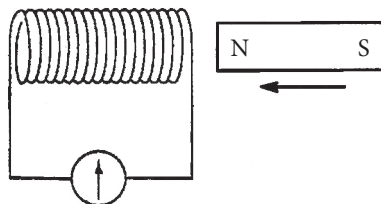
Is there any deflection in galvanometer? If yes give reason.

(b) A horizontal metal wire is carrying an electric current from the north to the south. Using a uniform magnetic field, it is to be prevented from falling under gravity. Find the direction of this magnetic field.

7. A condensed layer of ozone gas is present around earth in atmosphere. It absorbs harmful UV radiations from entering the earth's surface. There is decline in thickness of ozone layer over a restricted area. Write two causes of depletion of ozone layer. What are harmful effects of ozone depletion?

OR

Why are microorganisms like bacteria and fungi important in the ecosystem?

SECTION - B

8. A part of the early classification of elements has been given below :

H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S

(a) Which law of classification of elements is illustrated by the above arrangement of elements?

(b) Why is such a classification of element compared with a characteristic of musical scale?

(c) State one limitation of this classification of elements.

9. (a) Why are most carbon compounds poor conductors of electricity?

(b) Write the name and structure of a hydrocarbon in which five carbon atoms are arranged in a ring. Give the number of single bonds present in this compound.

OR

(a) Carbon monoxide is a simple molecule. Determine the number of pairs of electrons involved in the bonding between carbon and oxygen. How many pairs of electrons are not used for bonding purposes?

(b) Carbon monoxide burns in oxygen to form carbon dioxide. Briefly describe the structure and bonding in carbon dioxide.

10. Briefly describe multiple allelism?

11. A current through a horizontal power line flows in East to West direction. What is the direction of magnetic field at a point directly below it and at a point above it?

12. (a) Figure shows a battery of 12 V and internal resistance 0.6 Ω connected to three resistors A, B and C. Find the current drawn from battery.
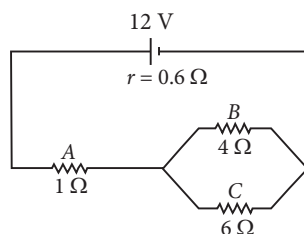
(b) Define one ampere.

OR

State Ohm's law. Write the necessary conditions for its validity. What will be the nature of graph between potential difference and current for a conductor? Name the physical quantity that can be obtained from this graph.

13. What practices we can follow to change our lifestyles so that less waste is generated?

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. Mendel selected *Pisum sativum* for his experiment to study inheritance of characters. Dihybrid cross involves crossing between parents differing in two pairs of contrasting characters.

(a) Name two contrasting characters related to pod of pea plant.

(b) Which Mendelian law were concluded from monohybrid cross?

(c) What will be the percentage of purple stemmed plants in the F_2 generation, when the F_1 generation resulted due to cross breeding of green stemmed (GG) tomato plants with purple stemmed (gg) tomato plants, are self pollinated?

OR

Garden pea selected by Mendel for his experiment show several well defined, easily detectable contrasting traits. Mendel performed separate crosses involving one, two or three different contrasting characters.

Explain inheritance of character considering only one visible contrasting character.

15. The rate of flow of charge is called electric current. The SI unit of electric current is Ampere (A). The direction of flow of current is always opposite to the direction of flow of electrons in the current.

The amount of work done in bringing a unit positive test charge from one point to another point in an electric field is defined as potential difference.

$$V = \frac{W}{Q}$$

The SI unit of potential difference is volt.

(a) 2 C of charge is flowing through a conductor in 100 ms, find the current in the circuit.

(b) Find the number of electrons flowing per second in a conductor if 1 A current is passing through it.

(c) Name a device that you can use to maintain a potential difference between the ends of a conductor. Explain the process by which this device does so.

OR
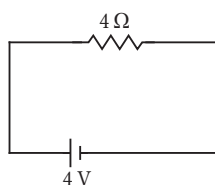
In the given circuit. How much energy is transferred by 4 V battery in 1s.

Solution

SCIENCE - 086

Class 10 - Science

1. Yes, ethanoic acid (CH_3COOH) and propanoic acid (CH_3CH_2COOH) belong to the same homologous series which is alkanoic acids (carboxylic acids) having general formula, $C_nH_{2n}O_2$. Two characteristics of homologous series are as follows:

(a) All the members of homologous series have similar chemical properties.

(b) Any two consecutive members differ in their molecular formula by a $-CH_2$ group.

2. Valency of an element is determined by the number of electrons present in its outermost shell. For elements having outermost electrons 1 to 4, valencies are equivalent to their respective valence electrons.

For elements having outermost electrons 5 to 8, valency is calculated as;

Valency = 8 – (Number of valence electrons)

For element having atomic number = 9

Electronic configuration = 2, 7

Valency = 8 – 7 = 1

3. The given figure shows spore formation in *Rhizopus*.

(a) X – Sporangium, Y – Rhizoidal hyphae

(b) Part labelled as X called sporangium takes part in reproduction by producing spores that after falling on a suitable substratum give rise to a new mycelium which further develops into new *Rhizopus*.

4. Testes produce the hormone testosterone. In addition to regulating the formation of sperms, testosterone also brings about changes in appearance seen in boys at the time of puberty.

5. In some animals, environmental factors such as egg size and incubation temperature determine the sex of the individuals. For example, in lizards the temperature at which fertilised eggs are kept, determines whether the developing animal in fertilised egg is male or female. However, in some animals, sex of individuals is determined genetically by specific chromosomes. For example in humans, if a child inherits X-chromosome from the father, then it will be a girl and one who inherits a Y-chromosome from the father, will be a boy.

OR

Dominant trait is a genetic trait which is expressed in a person even when only one copy of that gene is present. A dominant gene decides the appearance of an organism or expresses itself even in the presence of an alternate gene and is represented mostly by capital letter.

Recessive trait is a genetic trait that is expressed only when two copies of that gene are present and is represented mostly by small letter.

When Mendal crossed plants with two contrasting characters (*e.g.,* tall and dwarf) only one character is visible in F_1 generation and other character is suppressed. It shows dominance of one character over other (recessive character).

6. (a) Since the coil is only rotated once, the current is reversed twice.

(b) The magnetic field will decrease because the magnetic field produced by a current carrying straight wire depends inversely on the distance from it.

OR

(a) By Faraday's law of electromagnetic induction, the e.m.f. induced in a conductor is proportional to the rate of change of magnetic lines of force linking the circuit. Hence, by pushing in the magnet faster, the rate of change of magnetic lines will increase. This results in a larger induced e.m.f. and hence, larger deflection of the meter.

(b) According to Fleming's left hand rule, the direction of magnetic field should be towards the east.

7. Two causes of depletion of ozone layer are :

(i) Use of CFCs (chlorofluorocarbons) in refrigerators and aerosol sprayers.

(ii) Release of pollutant such as nitrous oxides by jets.

Harmful effects of ozone depletion are :

(i) UV radiations cause damage to immune system.

(ii) UV radiations cause damage to eyes resulting in photo burning, cataract, etc.

OR

Microorganisms like bacteria and fungi are important in the ecosystem because they decompose or break down the dead remains of animals and plants. This process releases the locked nutrients to be recycled in the ecosystem for reuse as raw materials by the producers.

8. (a) Newland's law of octaves

(b) This classification of elements is compared with a musical scale because in this classification, the repetition in the properties of elements is just like the repetition of eight notes in an octave of music.

(c) This system of classification could be applied only up to the element calcium and not beyond that.

9. (a) Due to catenation, carbon forms covalent bonds with the constituent elements in the carbon compounds, hence it does not have mobile electrons and carbon compounds do not dissociate themselves into ions and hence, they are poor conductor of electricity.
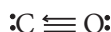
(b) Structure :
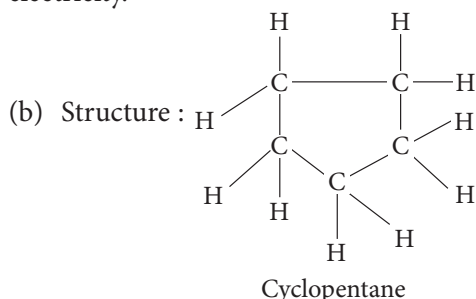
Cyclopentane

Name : Cyclopentane

Number of single bonds : 15

OR

(a) The number of pairs of electrons involved in bonding between C and O in CO is three. Two pairs of electrons are not used for bonding purpose.

$$:C \equiv O:$$

(b) Carbon dioxide (CO_2) is a simple molecule. Carbon atom shares four pairs of electrons with the oxygen atoms to achieve a noble gas configuration. The carbon atom is bonded by two double covalent bonds to the oxygen atoms.

$$:\ddot{O} = C = \ddot{O}:$$
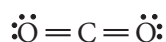
10. Multiple alleles are three or more alternatives forms of a gene (allele) than can occupy the same locus but only two of the alleles can be present in single organism. *E.g.*; ABO system of blood groups in controlled by three alleles, I^A, I^B and i, only two of which are present in an individual.

11. The current is in the East-West direction (given). Applying the right-hand thumb rule, we can find the direction of magnetic field associated with a current-carrying conductor. The direction of magnetic field at a point directly below the wire is from North to South.

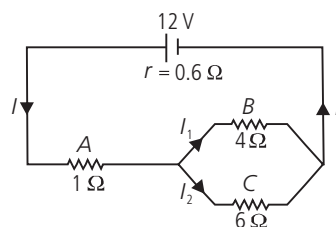The direction of magnetic field at a point directly above the wire is from South to North.
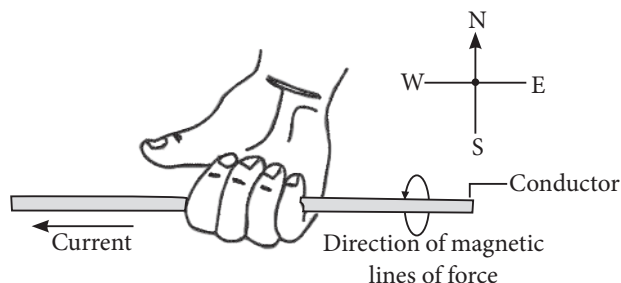
12. (a) The equivalent resistance of B and C is given by

$$\frac{1}{R} = \frac{1}{4\,\Omega} + \frac{1}{6\,\Omega} = \frac{6\,\Omega + 4\,\Omega}{(6\,\Omega)(4\,\Omega)} = \frac{10}{24\,\Omega} = \frac{5}{12\,\Omega}$$

or $R = \dfrac{12}{5}\,\Omega = 2.4\,\Omega$

Total resistance in circuit = $1.0\,\Omega + 2.4\,\Omega + 0.6\,\Omega$
= $4.0\,\Omega$

Current in circuit, $I = \dfrac{12\ \text{V}}{4\,\Omega} = 3$ A

(b) One ampere is constituted by the flow of one coulomb of charge per second.

$1\ \text{A} = 1\ \text{C s}^{-1}$

OR

Ohm's law : When the physical condition such as temperature remains same, the current flowing through the conductor is directly proportional to the potential difference applied across the ends of the conductor, *i.e.*,
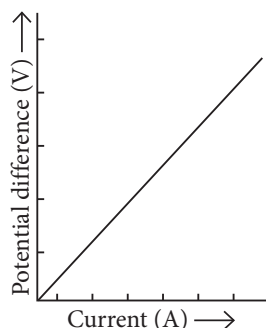
$I \propto V$ or $V \propto I$

$\Rightarrow V = RI$

$\Rightarrow \dfrac{V}{I} = \text{constant}$

where R is constant of proportionality and is called resistance of the wire.

Necessary condition for validity of Ohm's law : Physical condition such as temperature of the conductor should remain same.

Nature of V–I graph is a straight line passing through the origin of the graph and inclined to x-axis as shown.

The slope of V-I graph gives the value of resistance of the conductor at the given temperature.

13. The practices we can follow to change our lifestyles so that less waste is generated are:

(i) We can use only those materials which come packed in biodegradable packs such as paper, coir, jute, etc.

(ii) We can separate the waste into recyclable and non-recyclable parts.

(iii) We may reduce the use of certain products which are not so essential for our life.

(iv) We may recycle plastic, paper, glass and metal items.

(v) We can reuse certain things like paper, plastic container and glass bottles.

14. (a) Two contrasting characters related to pod of pea plant are :
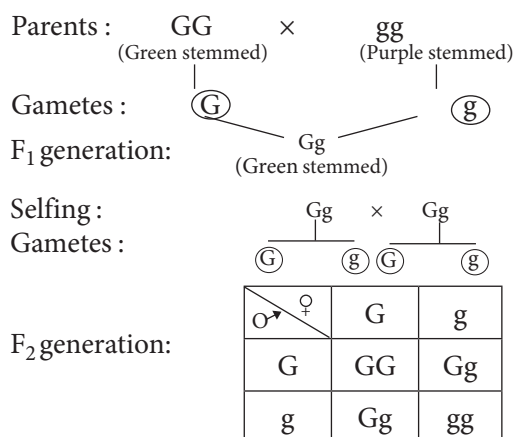
Pod shape — Inflated and constricted

Pod colour — Green and yellow

(b) (i) Law of dominance

(ii) Law of segregation

(c) When F_1 generation of a cross between green stemmed (GG) tomato plants and purple stemmed (gg) tomato plants were self-pollinated, then the F_2 progeny can be obtained as follows:

1 out of 4 plants will be purple stemmed (gg), so the percentage of purple stemmed plants will be 25%.

OR

Mendel conducted experiments with garden pea plants using a number of visible contrasting characters.
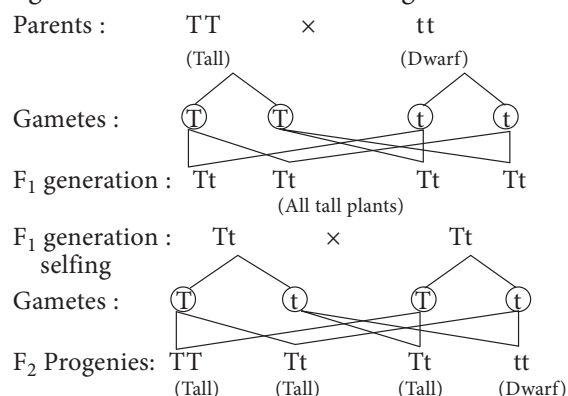
He studied (pure) plants of a tall (TT) and short (tt) varieties.

He crossed them and obtained F_1 progenies. He found that in F_1 progenies all the plants were tall (Tt). He selfed the (hybrid) plants of F_1 progeny (Tt) and found that in F_2 progenies there were tall as well as short plants. The three quarter plants (75%) were tall and one quarter (25%) was short.

15. (a) $q = 2$ C, $t = 100$ ms $= 0.1$ s

$$I = \frac{q}{t} = \frac{2}{0.1} = 20 \text{ A}$$

(b) $I = 1$ A, $t = 1$ s

$q = It = 1 \times 1 = 1$ C

$$n = \frac{q}{e} = \frac{1}{1.6 \times 10^{-19}} = 6.25 \times 10^{18}$$

(c) A cell or a battery can be used to maintain a potential difference between the ends of a conductor. The chemical reaction within a cell generates the potential difference across the terminals of the cell, even when no current is drawn from it. When it is connected to a conductor, it produces electric current and maintain the potential difference across the ends of the conductor.

OR

Current $(I) = \dfrac{\text{Voltage}}{\text{Resistance}} = \dfrac{4 \text{ V}}{2\Omega} = 2$ A

Now $I = \dfrac{q}{t}$

$q = I \times t = 2$ A $\times 1$ s

we know $V = \dfrac{W}{q}$

$W = q \, V$

$W = 2$ C $\times 4$ V

$W = 8$ J

8 J energy is transferred by 4 V battery.