

Sample Question Paper - 27
Science (086)
Class- X, Session: 2021-22
TERM II

Time allowed : 2 hours

Maximum marks : 40

General Instructions :

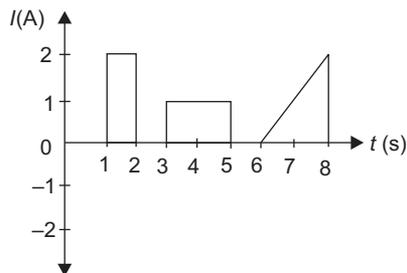
- (i) All questions are compulsory.
- (ii) The question paper has three sections and 15 questions. All questions are compulsory.
- (iii) Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case based questions of 4 marks each.
- (iv) Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

SECTION - A

1. Several electric bulbs designed to be used on a 220 V electric supply line, are rated 10 W. How many bulbs can be connected in parallel with each other across the two wires of 220 V line if the maximum allowable current is 5 A?
2. A house uses eight 60 W lamps for lighting. On average, each lamp is switched on for 6 hours each day. If the electricity tariff is 15 Rs. per unit, find the cost of the switching on the lamps
 - (a) for one day.
 - (b) for the month of January.
3. Why does the cord of an electric heater not glow while the heating element does?

OR

The plot represents the flow of current through a wire at three different time intervals. What is the ratio of charges flowing through the wire at the different time intervals?



4. What is the nature of magnetic field produced by a current flowing in a straight conductor? Name the rule to find the direction of magnetic field.
5. What is a solenoid? What is the advantage of a solenoid over an ordinary coil?
6. Imagine that you are sitting in a chamber with your back to one wall. An electron beam, moving horizontally from back wall towards the front wall, is deflected by a strong magnetic field to your right side. What is the direction of the magnetic field?

OR

A coil of insulated copper wire is connected to a galvanometer. What would happen if a bar magnet is

- (a) pushed into the coil?
- (b) withdrawn from inside the coil?

7. Define a food web. Write its significance for ecosystem.

OR

In a food chain consisting of plant, goat, wolf and lion, identify the primary, secondary and tertiary consumers.

SECTION - B

8. The position of eight elements in the Modern Periodic Table is given below where atomic numbers of elements are given in the parenthesis.

Period No.		
2	Li (3)	Be (4)
3	Na (11)	Mg (12)
4	K (19)	Ca (20)
5	Rb (37)	Sr (38)

- (a) Write the electronic configuration of Ca and Rb.
- (b) How many shells are there in Sr?
- (c) Arrange Be, Ca, Mg and Rb in the increasing order of the size of their respective atoms.

9. A hydrocarbon molecule has three carbon atoms. Write down its molecular formula if it is an :

- (a) alkane
- (b) alkene
- (c) alkyne.

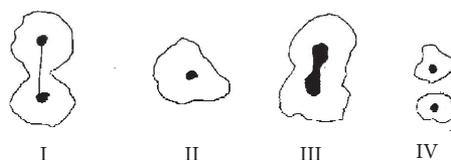
OR

The hydrocarbon X is an alkane. The relative molecular mass of X is 72.

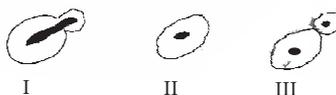
- (a) What is meant by 'alkane'?
- (b) What is the molecular formula of X?

10. (a) The two diagrams given below, aim to show the sequence of events for the binary fission in *Amoeba* and budding in yeast. Write the correct sequence of events in the two diagrams.

Binary fission in *Amoeba*



Budding in yeast



- (b) Name one natural and one artificial vegetative propagation method.

11. (a) Write down the functions of the ovaries in human females.
(b) Name accessory glands of male reproductive system.

12. (a) The human male is heterogametic while human female is homogametic. Why are they called so?
(b) What is the probability of production of dwarf offsprings in a cross between two heterozygous tall pea plants?

OR

- (a) When a red flowered plant was crossed with white flowered plant, all F_1 progeny showed only red flowers. Define the law of Mendel which supports this result.
(b) Define test cross.
13. Name the wastes which are generated in your house daily. What measures would you take for waste disposal?

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. After the discovery of large number of elements, it became necessary to classify them and arrange them in a regular manner in order of their periodic properties. In 1817, Johann Wolfgang Dobereiner tried to arrange the elements with similar properties into groups. He identified some groups of three elements having similar physical and chemical properties, known as Dobereiner's triads.
In 1865, John Newlands arranged all known elements in the order of increasing atomic masses and found that the properties of every eighth element are similar to the properties of the first element.
- (a) According to the Newlands' law of octaves, which element possesses similar properties as magnesium (Mg)?
(b) Give one example of Dobereiner's triad.
(c) *A* and *B* are two elements having similar properties which obey Newlands' law of octaves. How many elements are there in between *A* and *B*?

OR

If Cl, Br and I is a Dobereiner's triad and the atomic masses of Cl and I are 35.5 and 127 respectively, what is the atomic mass of Br?

15. Pollination does not guarantee the transfer of the right type of pollen, *i.e.*, compatible pollen on the stigma. Often, pollen of the wrong type either from other species or from the same plant, also land on the stigma. Compatible pollens are identified by stigma. Draw a diagram of pistil showing pollen tube growth into the ovule and label the following:
- (a) Pollen grain, male germ cell, stigma, female germ cell, pollen tube and ovary.
(b) Name the parts of the flower that develop into (i) seed and (ii) fruit after fertilization.
(c) How many nuclei are involved in double fertilisation in angiosperms?

OR

The cells of endosperm of angiosperm have 24 chromosomes. What will be the number of chromosomes in the gametes and zygote?

Solution

SCIENCE - 086

Class 10 - Science

1. In a parallel combination, each bulb has the voltage equal to that of the main line, and the sum of the currents drawn by each bulb would be equal to the allowable current.

From the given data,

Current flowing through each bulb

$$= \frac{\text{Wattage}}{\text{Voltage}} = \frac{10\text{ W}}{220\text{ V}} = \frac{1}{22}\text{ A}$$

Total maximum allowed current = 5 A

So, number of bulbs which can be connected

$$= \frac{5\text{ A}}{\frac{1}{22}\text{ A}} = 22 \times 5 = 110$$

2. (a) Electrical energy used in one day

$$= 8(6\text{ h}) \left(\frac{60}{1000}\text{ kW} \right) = 2.88\text{ kWh}$$

Electricity cost per day

$$= (2.88\text{ kWh}) (15\text{ Rs. k}^{-1}\text{W}^{-1}\text{h}^{-1}) = 43.2\text{ Rs.}$$

(b) Electricity cost for the month of January

$$= (31\text{ days}) (43.2\text{ Rs. day}^{-1}) = \text{Rs. } 1339.2$$

3. The cord of an electric heater is made of thick copper wire and has much lower resistance than its element. For the same current (I) flowing through the cord and the element, heat produced (I^2Rt) in the element is much more than produced in the cord. Consequently, the element becomes very hot and glows whereas the cord does not become hot and as such does not glow.

OR

We know, current flowing through the wire,

$$I = \frac{Q}{t}$$

or $Q = I \times t$

Thus, area under the graph between current and time will give charge flowing through the wire.

For first time interval, ($t_1 = 2 - 1 = 1\text{ s}$)

$$Q_1 = I_1 \times t_1 = 2 \times 1 = 2\text{ C}$$

For second time interval, ($t_2 = 5 - 3 = 2\text{ s}$)

$$Q_2 = I_2 \times t_2 = 1 \times 2 = 2\text{ C}$$

For third time interval, ($t_3 = 8 - 6 = 2\text{ s}$)

$$Q_3 = \frac{1}{2} \times I_3 \times t_3 = \frac{1}{2} \times 2 \times 2 = 2\text{ C}$$

\therefore Ratio of charges flowing through the wire at different intervals is

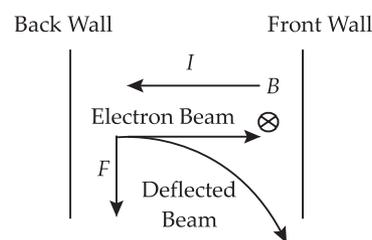
$$Q_1 : Q_2 : Q_3 = 2 : 2 : 2 = 1 : 1 : 1$$

4. When current flows through a straight conductor, the magnetic field is circular i.e., the magnetic lines of force are in the form of concentric circles with the conductor as centre. The plane of the magnetic lines of force is perpendicular to the length of the conductor. The direction of magnetic lines of force can be given by Right hand thumb rule.

5. A long tightly wound coil consisting of many circular turns of insulated metallic wire in the shape of cylindrical tube such that its diameter is less in comparison to its length is called a solenoid.

The advantage of solenoid over an ordinary coil is that inside a solenoid a uniform magnetic field is produced.

6. The direction of current I is opposite to the direction of electron beam as shown in figure. Since the beam is deflected to the right side, the force, F acting on the beam is as shown. Applying Fleming's left hand rule, it is found that magnetic field, B is acting vertically downwards (i.e., perpendicular to the plane of the paper and directed inwards) as shown by \otimes .



OR

(a) The magnetic field lines (flux) linked with the coil changes (i.e., increases). As a result of this, an induced current flows in the coil and the galvanometer shows a momentary deflection (say towards right) i.e., the needle of the galvanometer moves momentarily in one direction.

(b) The magnetic field lines (flux) linked with the coil changes (i.e., decreases). As a result of this, an induced current flows in the coil but in a direction opposite to that in case (a).

7. A system of interconnected food chains between various organisms so as to form a number of feeding connections amongst different organisms of a biotic community is called a food web.

A food web maintains ecological balance by maintaining the interdependence of different organisms.

OR

Goat is the primary consumer because it directly feeds upon producers. Wolf is the secondary consumer because it preys upon primary consumer, *i.e.*, goat. Lion is the tertiary consumer because it feeds upon secondary consumer *i.e.*, wolf.

Plant → Goat → Wolf → Lion
(Producer) (Primary consumer) (Secondary consumer) (Tertiary consumer)

8. (a) Atomic number of Ca = 20

∴ Electronic configuration = 2, 8, 8, 2

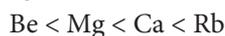
Atomic number of Rb = 37

Electronic configuration = 2, 8, 18, 8, 1

(b) As Sr (38) belongs to period number 5 so, it will have 5 shells.

(c) The atomic size decreases across a period and increases down the group.

Increasing order of atomic size is



9. The number of carbon atoms in the molecule of this hydrocarbon is 3, that is, $n = 3$.

(a) The general formula of an alkane is C_nH_{2n+2} . On putting $n = 3$, we get $C_3H_{2 \times 3 + 2}$ or C_3H_8 (propane).

(b) For alkene having general formula C_nH_{2n} , we get, $C_3H_{2 \times 3}$ or C_3H_6 (propene).

(c) For alkyne having general formula C_nH_{2n-2} we get $C_3H_{2 \times 3 - 2}$ or C_3H_4 (propyne).

OR

(a) Alkanes are hydrocarbons with general formula C_nH_{2n+2} *i.e.*, compounds made up of C and H only.

(b) As the molecular mass of X is 72 and general formula of alkanes is C_nH_{2n+2} , thus

$$12 \times n + 2 \times (n + 2) = 72$$

$$12n + 2n = 70$$

$$14n = 70 \Rightarrow n = 5$$

Thus, formula of X is C_5H_{12} .

10. (a) In *Amoeba*, correct sequence is

II – III – I – IV

In yeast, correct sequence is

II – I – III

(b) Bulbils as a vegetative propagule and cutting of root, stem or leaves are natural and artificial methods of vegetative propagation respectively.

11. (a) Functions of ovaries are :

(i) production of female gametes (egg or ova), and
(ii) secretion of female sex hormones-estrogen, progesterone, relaxin and inhibin.

(b) Accessory glands of male reproductive system are seminal vesicles, prostate gland and Cowper's gland (Bulbourethral glands).

12. (a) The human male produces two different types of gametes (sperm with X-chromosome and sperm with Y-chromosome) thus, termed heterogametic (*heteros*-different). Human female produces only one type of gametes (ova with X-chromosomes) thus, termed homogametic.

(b) In cross between two heterozygous tall pea plants (Tt), the probability of production of dwarf offsprings

(tt) is 25% and tall offsprings (TT, Tt) is 75%.

OR

(a) It is first law of Mendel or the principle of dominance which states that out of the two alternative factors or alleles, only one expresses itself in offspring which is known as dominant allele and other one which does not show its effect on the offspring in first generation is termed as recessive allele.

(b) Cross between an individual of unknown genotype and recessive parent is called test cross.

13. The types of waste generated in our house are:

(i) Kitchen waste like vegetable and fruit peel, rind, used tea leaves.

(ii) Empty milk pouches, polythene bags, empty cartons, etc.

(iii) Waste paper (newspaper, paper bags, packing paper). Used tooth picks and ear buds.

Following measures can be taken for household waste disposal.

(i) Reuse of maximum possible materials.

(ii) Separation of biodegradable and non-biodegradable wastes. Biodegradable wastes should be used for composting. Nonbiodegradable wastes should be disposed off at suitable places from where municipal authorities can pick them up and dispose properly and scientifically.

(iii) The solid wastes are dumped into low lying areas by the process known as landfilling.

(iv) Composting is used for digesting the organic matter of solid wastes aerobically or anaerobically.

(v) Incineration is used for burning the solid or organic wastes like garbage, rubbish, burning in open places produces offensive odours and air pollutants. Incineration is controlled aerobic combustion of wastes inside the chambers at temperature of 900-1300 °C. Incinerators are fitted with scrubbers and electrostatic precipitators to prevent release of smoke and toxic chemicals.

14. (a) Properties of magnesium are similar to those of beryllium because magnesium is eighth element starting from beryllium.

(b) Li, Na, K is a Dobereiner's triad. The atomic mass of middle element is approximately the arithmetic mean of the atomic masses of other two elements of the triad.

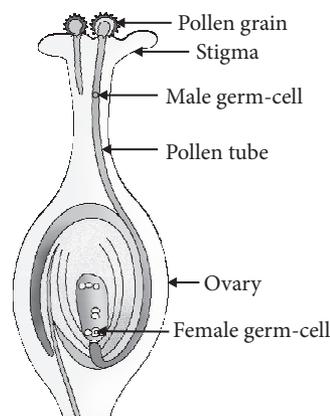
(c) According to Newlands law of octaves, when elements are arranged in order of increasing atomic masses, the properties of first and eighth element are found to be similar just like octaves found in musical scale. If A is the first element and B is the eighth element, the total number of elements between A and B is 6.

OR

In a triad, the atomic mass of the central atom is nearly the average of the atomic masses of the other two atoms. In the triad, Cl, Br, I, the mass of Br will be the average mass of Cl and I.

$$\text{Atomic mass of bromine} = \frac{35.5 + 127}{2} = 81.25$$

15. (a)



(b) After fertilisation, (i) ovule develops into seed.

(ii) ovary develops into fruit.

(c) Double fertilisation is an event unique to angiosperms. It involves fusion of one male gamete (haploid) with egg (haploid) to form zygote (diploid) that gives rise to embryo accompanied with fusion of other male gamete (haploid) with two polar nuclei (secondary nucleus) to form primary endosperm nucleus (PEN) that gives rise to a nutritive tissue called endosperm. Hence total of five haploid nuclei are involved in double fertilisation process.

OR

In angiosperms, endosperm is a triploid (3n) structure.

$$\therefore 3n = 24 \text{ (given), then } n = 8$$

As gametes are haploid structures, therefore number of chromosomes in gametes will be 8.

As zygote is diploid (2n) structure, therefore number of chromosomes in zygote will be 16.