

Maharashtra State Board

Class IX Science and Technology

Sample Paper – 1

Solution

SECTION A

1.

(A)

(a)

- electronic configuration
- valency
- inertia

(b)

- False. Mass is a scalar quantity.
- True.

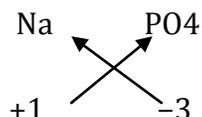
(B)

i. (c) Na_3PO_4

The symbols and valencies of sodium and phosphate are



Cross multiply the valencies



The formula of sodium phosphate is Na_3PO_4 .

ii. (b) 4 J

$$\begin{aligned}\text{Kinetic energy} &= \frac{1}{2} mv^2 = \frac{1}{2} \times 2 \times (2)^2 = \frac{1}{2} \times 2 \times 4 \\ &= \frac{8}{2} \\ &= 4 \text{ J}\end{aligned}$$

iii. (b) The product of the wave frequency and the wavelength.

A sound wave travels a distance equal to its wavelength in a time equal to the time period (T), so

$$\text{speed} = \frac{\text{wavelength}}{\text{time period}}$$

$$V = \frac{\lambda}{T}$$

$$V = \lambda \gamma$$

iv. (c) Does not change

A uniform solid body will have uniform mass distribution. Hence, if the volume is reduced to half by cutting, mass is also reduced to half of its initial value. Now, density is mass per volume. So, the new density will be the same as the initial value.

v. (d) Same atomic numbers but different atomic mass numbers

Isotopes are atoms of the same element with the same atomic number but different atomic mass numbers. Examples: ${}^1_1\text{H}$, ${}^2_1\text{H}$, ${}^3_1\text{H}$

[Please note that the explanation provided is to help you in learning. You may not be required to write an explanation in your answer to this question.]

2.

i.

(a) Atomic number (Z): The number of electrons or protons in an atom is called the atomic number. It is denoted by Z.

(b) Atomic mass number (A): The sum of the number of protons and neutrons in the nucleus of an atom is called the atomic mass number. It is denoted by A.

ii.

Data : $a = 4 \text{ m/s}^2$, $F = 20 \text{ N}$

To find: $m = ?$

Solution: $F = ma$

$$20 \text{ N} = m \times 4 \text{ m/s}^2$$

$$m = \frac{20 \text{ N}}{4 \text{ m/s}^2}$$

$$= 5 \text{ kg}$$

The mass of the object is 5 kg.

iii.

(a) When energy is transferred from one trophic level to another trophic level, some energy is lost while some is used for metabolic activities.

(b) Any food chain which operates in an ecosystem begins with the Sun.

(c) The solar energy obtained from the Sun is stored in the form of food molecules by plants.

(d) The energy in an ecosystem goes back to the Sun, and thus, the flow of energy in an ecosystem is said to be unidirectional.

iv.

- (a) In order to hear distinct echoes, the minimum distance of the reflecting surface from the source of sound must be 17.2 metres.
- (b) In a classroom, the distance between two walls is less than 17.2 metres, and therefore, we cannot hear the echo produced in our classroom.

v.

Atomic mass of sodium = 23

∴ Weight of 1 mole of sodium = 23 grams

$$\begin{aligned}\text{The number of moles of sodium} &= \frac{\text{Weight of sodium}}{\text{Molecular mass of sodium}} \\ &= \frac{69}{23} = 3\end{aligned}$$

Therefore, 3 moles of sodium are present in 69 grams of sodium.

vi. Difference between pressure and buoyant force:

Pressure	Buoyant force
1. The thrust on a unit surface area is called pressure.	1. The upward force exerted by a fluid on a body completely or partially immersed in it is called upthrust or buoyant force.
2. Its SI unit is N/m ² or pascal (Pa).	2. Its SI unit is newton (N).

3.

- i. The energy possessed by a body by virtue of its motion is called kinetic energy. Kinetic energy is obtained by the expression: kinetic energy = $\frac{1}{2} mv^2$. The mass (m) of a body cannot be negative. Also, the square of velocity (v^2) cannot be negative. Hence, kinetic energy can never be negative.
- ii.
- (a) The value of the constant of gravitation does not change with the nature, mass or size of material particles. It does not vary with the distance between the two objects. It is also independent of the nature of the medium between the two objects. Hence, the constant of gravitation is called a universal constant.
- (b) As Newton's law of gravitation is applicable throughout the Universe and to all particles, it is called the universal law of gravitation.

iii.

- (a) B is an atom of noble gas as it has 8 electrons in its outermost shell.
- (b) A and C are a pair of isotopes as they have the same number of protons.

iv. In a body moving along a straight line with uniform acceleration a , the kinematical equations of motion are

(1) $v = u + at$ (velocity–time relation)

(2) $s = ut + \frac{1}{2} at^2$ (position–time relation)

(3) $v^2 = u^2 + 2as$ (position–velocity relation)

where

u = initial velocity of the body

v = final velocity of the body after time t

s = distance covered by the body in time t

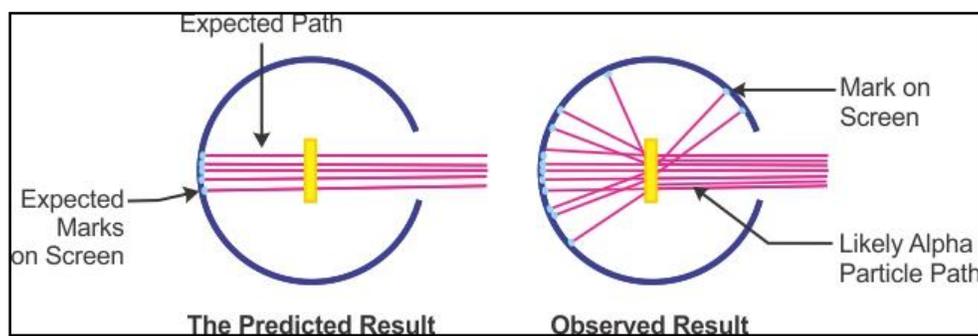
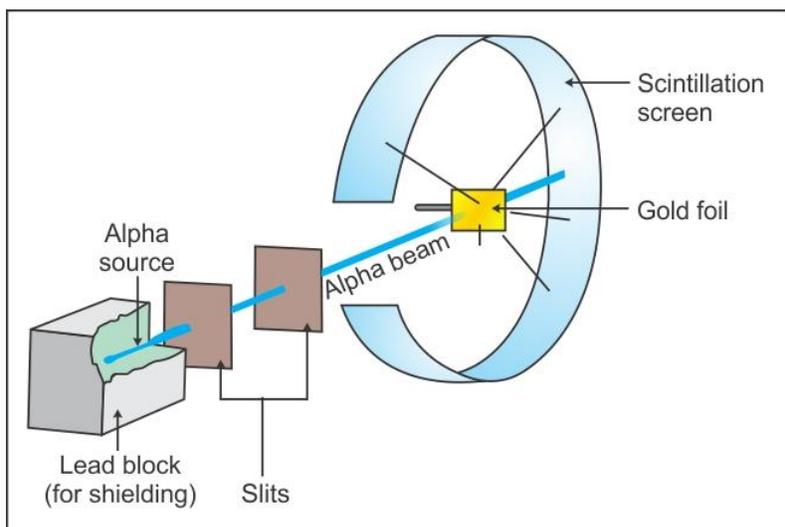
v. The given image depicts a food chain. In this food chain, the grass or crops act as producers which provide grains. The grains are consumed by a rat. The rat is a primary consumer. The rat is eaten by a snake. The snake acts as a secondary consumer. The snake in turn is eaten by a hawk. The hawk is the top or apex carnivore.

vi.

Element	Electrons in the outermost orbit	Valency
Carbon	4	4
Neon	8	0
Aluminium	3	3

4.

- i. Rutherford beamed alpha particles bearing a positive charge through a thin foil of gold about 0.00004 cm thick. He detected flashes of light or scintillations on a screen as the alpha particles collided on the screen.



The following observations were made by Rutherford:

- (a) Most of the alpha particles passed through the gold foil without any deviation.
- (b) Some alpha particles were deflected from their path through small angles.
- (c) Few alpha particles were scattered at large angles.
- (d) Only few alpha particles bounced back towards the source.

ii.

(a) Conditions under which a body floats or sinks in a liquid:

1. The weight of a body acts downwards, while the buoyant force on a body acts upwards. When the magnitude of the buoyant force on a body is greater than the magnitude of the weight of the body, the body floats in the liquid.
2. When the magnitude of the weight of a body is greater than the magnitude of the buoyant force on the body, the body sinks in the liquid.
3. When the magnitude of the buoyant force on a body equals the magnitude of the weight of the body, the body floats inside the liquid.

(b) Archimedes' principle: When a body is immersed completely or partially in a fluid, it experiences an upward force which is equal to the weight of the fluid displaced by it.

SECTION B

5.

(A)

(a)

i. Silver

It is a metal, while the rest are alloys.

ii. Earthworm

It is a multicellular organism, while the rest are unicellular organisms.

(b)

Column A	Column B
i. Pisces	(c) Tuna
ii. Reptilia	(a) Turtle
iii. Mammalia	(b) Bat

(B)

i. (b) Is taken in but the temperature does not increase

During the melting of ice, the heat energy gets used up in changing the state from solid to liquid by overcoming the forces of attraction between the particles. As this heat energy is absorbed by the ice without showing any rise in temperature, it is considered that it gets hidden into the contents of the beaker.

ii. (d) Cell wall

Onion peel consists of plant cells which show the presence of a cell wall. However, in animal cells, the cell wall is absent. So, when we mount inner cheek cells instead of an onion peel, we are not able to observe the cell wall.

iii. (d) Long, cylindrical, unbranched and multinucleated

Striated or skeletal muscles show alternate light and dark bands or striations. They are voluntary muscles which control movements according to our will.

iv. (d) Cuticular exoskeleton

Presence of cuticular exoskeleton is a characteristic feature of Phylum Arthropoda.

v. (b) White

Barium sulphate, BaSO_4 , is the precipitate formed in the experiment for verification of law of conservation of mass, and its colour is white.

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6.

i.

- (a) Melting
- (b) Sublimation

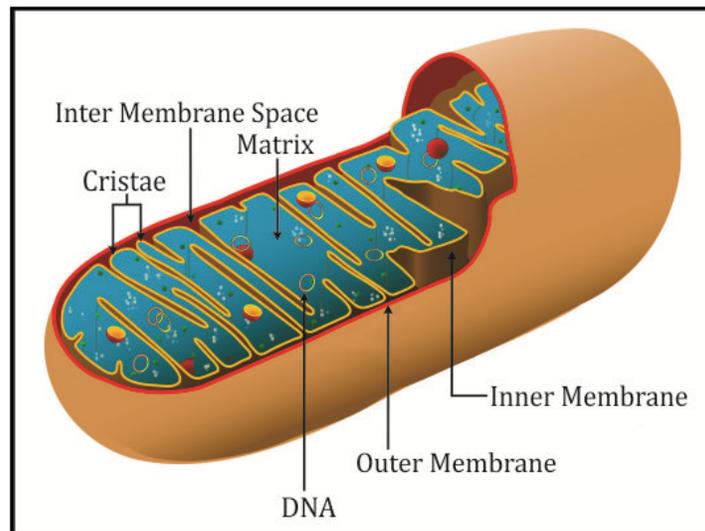
ii.

- (a) A mixture is obtained by just mixing two or more substances in any proportion.
- (b) Air contains nitrogen, oxygen and other gases.
- (c) These gases retain their original properties.
- (d) They do not chemically combine with each other on their own. Hence, air is termed a mixture.

iii.

- (a) In a fat person, there is greater proportion of fat globules in the adipose connective tissue than in a thin person.
- (b) The fat acts as an insulator.
- (c) Thin people have lesser storage of fats. Therefore, thin people feel colder than fat people.

iv. Internal structure of mitochondrion:



v.

- (a) Jaya, T141
- (b) Sonalika, Arjun

vi.

- (a) Biodegradable wastes: Plant leaves, animal dung
- (b) Non-biodegradable wastes: Plastic, glass

7.

- i. A substance produced by the chemical reaction of two or more elements combined in a fixed proportion is called a compound. Examples: Water, common salt

Characteristics of a compound:

- (a) The elements occur in a fixed proportion in a compound.
(b) The physical and chemical properties of a compound are different from those of its constituent elements.

- ii. Differences between plant cell and animal cell:

Plant cell	Animal cell
1. Presence of a definite cell wall made of cellulose	1. Absence of cell wall
2. Cell membrane present internal to the cell wall	2. Cell membrane forms the boundary of the cell
3. Absence of centrosome	3. Presence of centrosome
4. Absence of centriole	4. Presence of centriole
5. Presence of one or more prominent vacuoles	5. Presence of small and temporary vacuoles
6. Presence of plastids	6. Absence of plastids

iii.

- (a) Squamous epithelium
(b) Tendon
(c) Apical meristem

- iv. Preventive measures for hepatitis:

- (a) Hepatitis A and B can be prevented through vaccinations.
(b) Hepatitis D can be prevented when vaccination against hepatitis B is taken.
(c) Food and water which are to be consumed should be clean and hygienic.
(d) Follow good hygienic practices and wash hands thoroughly after using the toilet and before eating.

- v. When two or more crops are grown simultaneously on the same piece of land, it is known as mixed cropping or multiple cropping. The two crops selected are such that they support each other's growth.

Advantages of mixed cropping:

- (a) It improves the fertility of the soil.
(b) Two or more crops grown simultaneously in the same field through the method of intercropping help in reducing time and space.
(c) Intercropping is economically profitable.

- vi. The three important R's in solid waste management are reduce, reuse and recycle. It is an effective measure to eliminate waste and conserve resources.
- (a) Reduce: Using of fewer resources helps to reduce their consumption.
 - (b) Reuse: Using things again and again rather than throwing them after only one use helps to conserve resources.
 - (c) Recycle: The substances used before are put back into process to make new items.

Significance of the three R's:

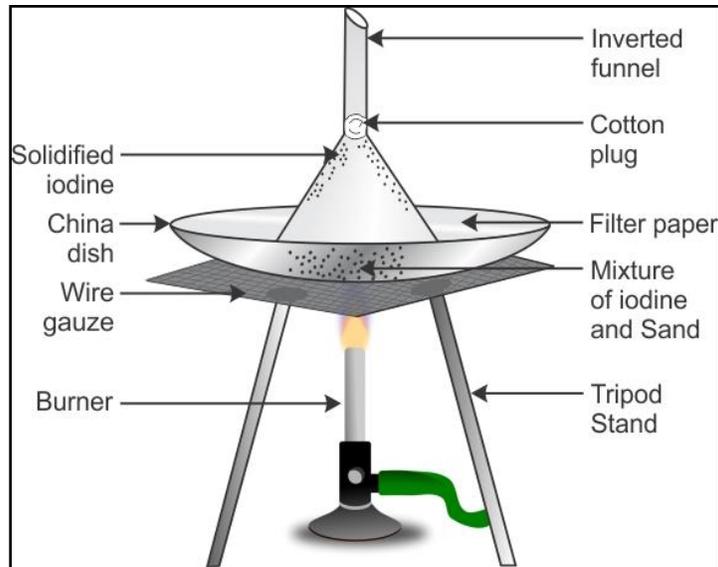
- (a) All the three processes—reducing, reusing and recycling—cut down the amount of energy used while producing new items.
- (b) It also curtails the amount of pollution created during the process.
- (c) It helps to conserve valuable natural resources.

8.

(A)

i.

- (a) Take a mixture of sand and iodine crystals in a China dish.
- (b) Cover the dish with a filter paper having several small pores.



- (c) Place an inverted glass funnel over it and close its stem with a cotton plug.
 - (d) Heat the China dish under a burner.
 - (e) Iodine, being volatile, changes into vapour which gets condensed on the cooler inner surface of the inverted funnel in the form of crystals, whereas sand is left behind.
- ii. The process in which a solid gets directly converted into the gaseous state without passing through the liquid state is called sublimation.
- iii. Iodine, Camphor

(B)

- i. The figure shows a plant cell.
- ii. Chloroplasts present in plant cells perform the function of photosynthesis.
- iii. P – Vacuole
Q - Mitochondria
- iv. P (Vacuole) – Storage of metabolic end-products such as glycogen, proteins and water takes place in the vacuoles.
Q (Mitochondria) – Energy in the form of ATP (adenosine triphosphate) is produced in the mitochondria.