Q1) It is observed that water boils at lower temperature at higher altitudes. Why?

Solution:

Atmospheric pressure is much less at higher altitudes. So, less thermal energy is required to get the vapour pressure equal to the atmospheric pressure.Hence, water boils at lower temperature at higher altitudes.

Q2) Why are mitochondria and chloroplasts considered to be semi-autonomous organelles?

Solution:

Mitochondria and chloroplasts have their own DNA and ribosomes and can synthesise some of their own proteins. Hence, they are considered to be semi-autonomous.

Q3) How does vermicompost differ from compost?

Solution:

Compost is the decomposed organic material that is produced when bacteria and fungi present in the soil break down biodegradable debris and trash. When the compost is prepared using earthworms, it is called vermicompost.

Q4) Why does matter change state?

Solution:

Temperature determines the state of a substance. Change of state takes place because the molecules of matter that make up a substance vibrate faster when the substance is heated. When heated, the solid state changes into the liquid state, and the liquid state changes into the gaseous state.

When cooled, the gaseous state condenses into the liquid state, and the liquid state condenses into the solid state.

Q5) Why are lysosomes known as ‘suicide bags’ of the cell?

Solution:

Lysosomes are cell organelles that contain hydrolytic enzymes surrounded by a single membrane. These hydrolytic enzymes are digestive in nature. They digest foreign materials such as bacteria. They also digest old and non-functional cell organelles. When the cell is damaged or old, the hydrolytic enzymes are released that digest the entire cell. Therefore, they are called ‘suicide bags of the cells’.

Why are mitochondria and chloroplasts considered to be semi-autonomous organelles?

Solution:

Mitochondria and chloroplasts have their own DNA and ribosomes and can synthesise some of their own proteins. Hence, they are considered to be semi-autonomous.

Q6) A farmer grows two varieties of rice. One of the varieties produces nutritionally-rich grains but only during the monsoon season. The other variety produces grains throughout year but they are poor in nutrition. Is it possible for the farmer to grow nutritionally-rich grains in all seasons? How?

Solution:

It is possible for the farmer to grow nutritionally-rich grains in all seasons by the process of hybridisation. Hybridisation is the method of crossing two organisms having different characteristics so as to bring different useful characteristics together into one organism. A hybrid plant produced from two varieties will have characteristics from both the parent plants. Therefore, by using hybridisation, the farmer will be able to produce nutritionally-rich grains, which can be cultivated throughout the year.

Q7) What is the angular velocity of the tip of the seconds' hand of a watch whose dial is of radius 3 cm?

Solution:

One complete revolution of the tip of the seconds' hand covers $2\pi r = 2\pi \times \frac{3}{100} = \frac{3\pi}{50}$ m

Time taken = 60 s

Angular velocity $= \frac{\text{Angular distance}}{\text{Time taken}} = \frac{3\pi}{50 \times 60} = \frac{\pi}{1000}$ m/s

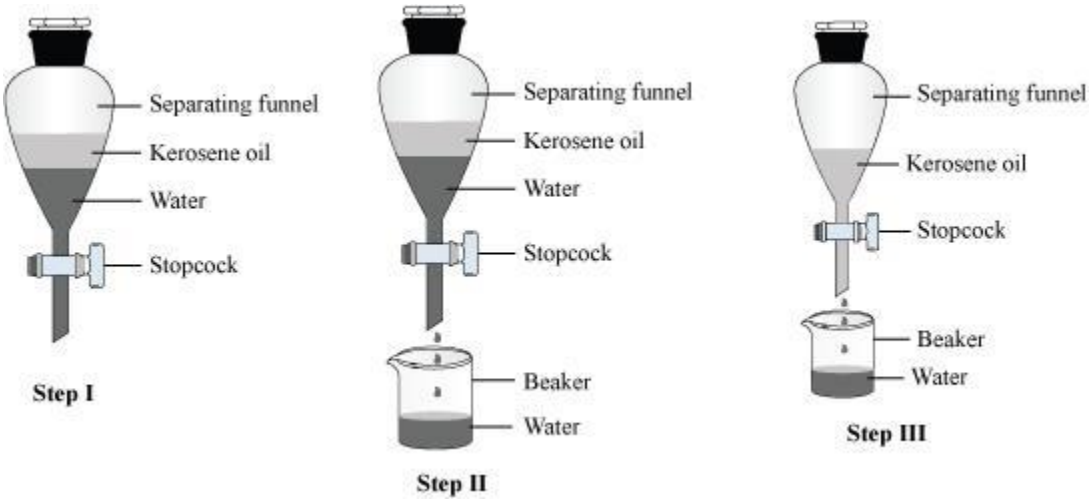
Thus, the angular velocity of the seconds' hand is $\frac{\pi}{1000}$ m/s.

Q8) How can a mixture of kerosene oil and water be separated?

Solution:

A mixture of kerosene oil and water can be separated by using a separating funnel.

A mixture of kerosene oil and water was poured in a separating funnel (as shown in the given figure). The mixture was left undisturbed for 2-3 hours. During this period, oil and water separated into two separate layers. After this, the stopcock of the funnel was opened and the individual liquid samples were separated. Water being heavier is the first to come out of the separating funnel and is collected in the beaker kept below. Kerosene is retained in the separating funnel.



Q9) Differentiate between mixtures and compounds.

Solution:

	Mixture		Compound
	It is obtained by the physical combination of any two substances.	**1.**	It is formed when two or more substances chemically combine in a fixed ratio.
	The composition of the constituents present in a mixture is not fixed.	**2.**	The composition of elements present in a compound is fixed.
	It displays the properties of all its constituents.	**3.**	It may or may not show the properties of its constituent elements.
	The constituents of a mixture can be separated using physical methods.	**4.**	The constituent elements of a compound can be separated only by using chemical methods

Q10)

(a) Define the term 'molality'.

(b)Calculate the molality of 20% (mass/mass) aqueous KI solution.

(Molar mass of KI =166 g mol^{-1})

Solution:

(a) Molality (m) can be defined as the number of moles of a solute present in per kilogram (kg) of a solvent. It can be expressed as:

Molality (m) = $\frac{\text{Moles of solute}}{\text{Mass of solvent in kg}}$

(b)Mass of KI = 20 g

Mass of the solution = 100 g

∴Mass of the solvent = (100 − 20) g

= 80 g

= 0.08 kg

Molar mass of KI = 166 g mol^{-1}

Number of moles = $\frac{20\,\text{g}}{166\,\text{g mol}^{-1}}$

= 0.12 mol (approx)

Molality of 20% solution = $\frac{\text{Number of moles of KI}}{\text{Mass of the solvent in kg}}$

$= \frac{0.12\,\text{mole}}{0.08\ \text{kg}}$

= 1.5 mol kg^{-1}

∴Molality of 20% KI solution = 1.5 mol kg^{-1}

Q11)

(a) Define the term ‘molality’.

(b)Calculate the molality of 20% (mass/mass) aqueous KI solution.

(Molar mass of KI =166 g mol^{-1})

Solution:

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= 1.5 mol kg^{-1}

∴Molality of 20% KI solution = 1.5 mol kg^{-1}

Q12) The nucleus plays an important role in distinguishing cell types. Explain.

Solution:

The cells are mainly classified as prokaryotes or eukaryotes on the basis of type of nucleus (karyon) they possess. In some organisms such as bacteria, definite nucleus is not present. However, they contain DNA and RNA. The cells in which nucleus is absent or the nuclear region is poorly defined are known as prokaryotic cells. On the other hand, cells that possess well-defined nucleus and other cell organelles are known as eukaryotes. Thus, nucleus plays an important role in distinguishing cell types.

Q12) The nucleus plays an important role in distinguishing cell types. Explain.

Solution:

The cells are mainly classified as prokaryotes or eukaryotes on the basis of type of nucleus (karyon) they possess. In some organisms such as bacteria, definite nucleus is not present. However, they contain DNA and RNA. The cells in which nucleus is absent or the nuclear region is poorly defined are known as prokaryotic cells. On the other hand, cells that possess well-defined nucleus and other cell organelles are known as eukaryotes. Thus, nucleus plays an important role in distinguishing cell types.

Q14) A man takes two steps forward and one step backward in one second. If the length of his step is 0.5 m, then what is the distance covered by him in 10 seconds? Also calculate his displacement at the end of this time period.

Solution:

In one second, the man takes a total of 3 steps.

Therefore, in 10 s, the man takes a total of (3 × 10) steps = 30 steps

Distance covered with one step = 0.5 m

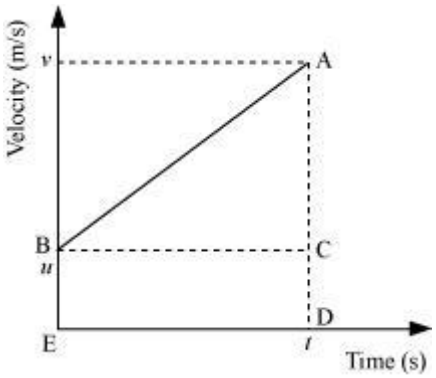
Therefore, in 10 s, the man covers a total distance of (30 × 0.5) m = 15 m

Net displacement in one second = [(2 − 1) × 0.5] m = 1 × 0.5 m

Therefore, net displacement in 10 s = (10 × 0.5) m = 5 m

Q15) Derive graphically the second equation of motion.

Solution:



In the graph, initial velocity = *u*

Final velocity = *v*

Time taken = *t*

Distance *s* travelled = Velocity × Time

Thus, *s* = Area under the straight line

= Area of triangle ABC + Area of rectangle BCDE

$$= \frac{1}{2}(AC \times BC) + BC \times CD$$
$$= \frac{1}{2}(v-u) \times t + ut$$
$$= \frac{1}{2}at \times t + ut \qquad \left(\text{Since} a = \text{Slope} = \text{Acceleration} = \frac{v-u}{t}\right)$$

$s = ut + \frac{1}{2}at^2$ is the second equation of motion.

Q16) A girl of mass 50 kg jumps onto a stationary skateboard of mass 5 kg with a velocity of 5 m/s. What is her velocity as the skateboard moves? Assume that there are no other external forces at work here.

Solution:

According to the law of conservation of energy:

Total initial momentum, P_i = Total final momentum, P_f

$P_i = m_g \times v_g + m_s \times v_s$ (m_g = mass of girl, v_g = velocity of girl, m_s = mass of skateboard, v_s = velocity of skateboard)

Given that:

m_g = 50 kg

v_g = 5 m/s

m_s = 5 kg

v_s = 0 m/s

P_i = 50 × 5 = 250 kg m/s

$P_f = (m_g + m_s) \times v$ (where u = final velocity of girl and skateboard)

= 55 × v

Since $P_f = P_i$,

55v = 250

$v = \frac{250}{55}$

= 4.54 m/s

The velocity of the girl is 4.54 m/s.

Q17) Distinguish between the two types of complex permanent tissue found in plants.

Solution:

	Xylem		Phloem
i	The cells of this tissue transport water and minerals from the root to the other parts of the plant.	i.	The cells of this tissue transport food from the leaves to the other parts of the plant.
ii	Most of the components of xylem consist of dead cells with the exception of xylem parenchyma.	ii.	Most of the components of phloem consist of living cells with the exception of phloem fibres.
iii	The flow of substances through xylem is unidirectional.	iii.	The flow of substances through phloem is bidirectional.

Q18)

(a). Suggest an activity to show that matter is particulate in nature.

(b). How is the fragrance of a deodorant detected from a distance?

Solution:

(a). 50 mL water was in a beaker. The level of water in the beaker was marked. Some salt was added to the beaker and stirred well. The level of water was observed. Some more salt was added and the above procedure was repeated.

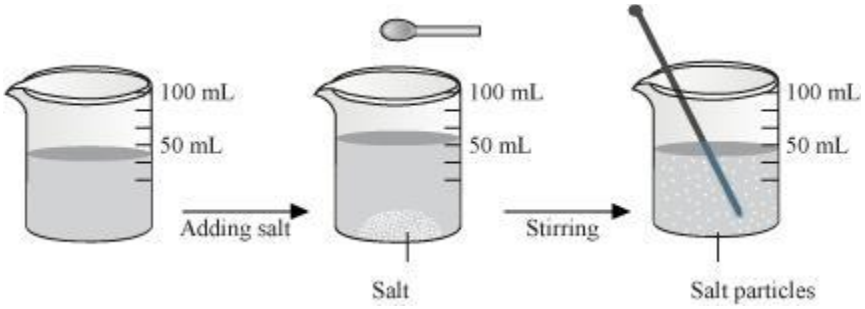


Figure: Dissolving salt in water

It will be observed that salt disappears after being added to water. However, there is no change in the level of water in the beaker.

This observation can be explained if we assume that matter is made up of particles. A chunk of salt consists of numerous salt crystals. Each crystal of salt is made up of many salt particles. These particles become dissociated from each other and spread uniformly among the particles of water. Thus, the level of water in the beaker remains the same. Hence, it can be concluded that matter is made up of particles i.e. matter is particulate in nature.

(b). The particles of a matter are in continuous motion. The particles of deodorant get mixed with air and get diffused in it. Since the process of diffusion is very fast in gases, the smell of a deodorant can be detected even from a distance.

Q19) Describe any three differences between a mixture and a compound.

Solution:

Mixtures	Compounds
1. They are obtained by the physical combinations of either elements or compounds or both.	1. They are obtained by the chemical combinations of elements.
2. The compositions of the constituents of mixtures are not fixed.	2. The compositions of the elements present in compounds are fixed.
3. A mixture shows the properties of all its constituents. For example, a mixture of sulphur and iron displays the properties of both sulphur and iron.	3. A compound may or may not show the properties of its constituent elements. For example, the compound obtained on heating sulphur with iron does not display the properties of iron.

Q20) Give an account of the various cropping patterns.

Solution:

Cropping patterns refer to the manner in which various crops are grown in a field in order to enhance production.

Mixed cropping generally involves the growing of two or more crops in a field at the same time. The crops chosen generally are a combination of crops that give the maximum yield and have broadly similar requirements in terms of water, nutrients, method of growth and harvesting time. For example, wheat and gram or wheat and mustard are cultivated by the method of mixed cropping. The mixed cropping method helps to protect the farmer against crop failure.

Inter-cropping refers to the growing of two or more crops in the same field in a definite pattern. For example, the growing of alternating rows of soyabean and maize in the same field is an instance of inter-cropping. Inter−cropping also prevents a total crop failure through diseases or an attack of pests and thus, helps in maximum utilization of nutrients.

Crop rotation refers to the growing of different crops on the same piece of land in succession. It helps in increasing fertility of the soil and prevents spread of diseases and pests.