Q1) Why does the rate of evaporation increase on increasing the temperature?

Solution:

The kinetic energy of particles increases with increase in temperature. As kinetic energy increases, more particles can go into the vapour state. Hence, the rate of evaporation increases on increasing the temperature.

Q2) What is the significance of cristae in mitochondria?

Solution:

The inner mitochondrial membrane gets folded to form numerous cristae. Cristae are the main sites for ATP production.

Q3) Which type of irrigation system is used to get access to water tables located deeper in the earth?

Solution:

Tube-wells are used to get access to water tables located deeper in the earth

Q4) Why are cotton clothes preferred in summers?

Solution:

Cotton allows air to pass through it. Therefore, it facilitates evaporation and keeps the person cooler. Also, cotton absorbs sweat from our body and exposes it to the air. This also increases the rate of evaporation. Hence, cotton clothes are preferred in summers.

Q5) Differentiate between plant cell and animal cell.

Solution:

	Animal cell		**Plant cell**
i.	Animal cells are smaller in size.	i.	Plant cells are comparatively larger.
ii.	They lack a cell wall.	ii.	Cell wall is the outermost structure in a plant cell.
iii.	They lack plastids except *Euglena*.	iii.	Plastids are present in all plant cells.
iv.	Many vacuoles are present and they are smaller in size.	iv.	They have a single large central vacuole.
v.	They have centrioles.	v.	They lack centrioles.

Q6) Give a brief account of any two of the abiotic factors that affect the growth of crop plants.

Solution:

Two of the abiotic factors that affect the growth of crop plants are given as follows:

- Rainfall − The amount of rainfall affects the crop plants. Both flood and drought conditions adversely affect the growth of crop plants.
- Soil condition − In coastal regions (sometimes in other regions too), soil has a high salt content. High salt content in soil is not good for the growth of plants. Therefore, producing plants which can resist a high salt content in soil is beneficial.

Q7) What is the speed of the moon in km/h, given that its distance from earth is 384,403 km and makes a complete orbit in every 27.3 days?

Solution:

Velocity, $v = \frac{2\pi r}{t}$

Where r = radius and t = time

Given that:

r = 384,403 km

t = 27.3 days

= 27.3 × 24

= 655.2 h

Therefore, velocity, $v = \frac{2\pi \times 384,403}{655.2}$ = 3686.32 km/h

The speed of the moon is 3686.32 km/h.

Q8) Amit took a pinch of a colour used during *Holi* and dissolved it in a mug of water. As a result, a very dark-yellow-coloured solution was formed. He then added more water to the solution and observed that the solution became slightly less dark in colour. He kept on adding water till the solution became almost colourless.

Explain the given observation.

Solution:

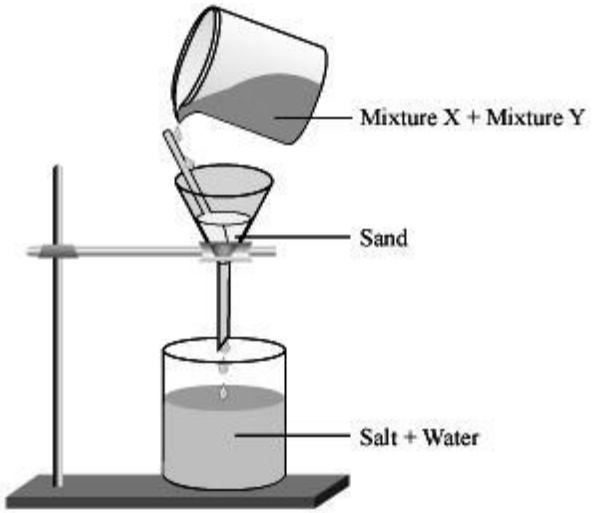
The given observation can be explained by the fact that matter is made of particles. The colour consists of some salt crystals. Each crystal of salt is made of many small particles. These particles spread uniformly among the particles of water. On the addition of more water, the number of water particles keeps increasing, while the salt crystals remain the same. This decreases the intensity of the colour of the solution. Thus, on diluting the solution, it becomes almost colourless.

Q9) Mixture X contains salt in water and mixture Y is made by adding some sand to water. Mixture X is added to mixture Y.

Which separation technique can be used to separate the three components of the final mixture?

Solution:

Sand particles remain undissolved in water. The process of filtration is used to separate the undissolved particles in a solution. Therefore, sand can be separated by the process of filtration.



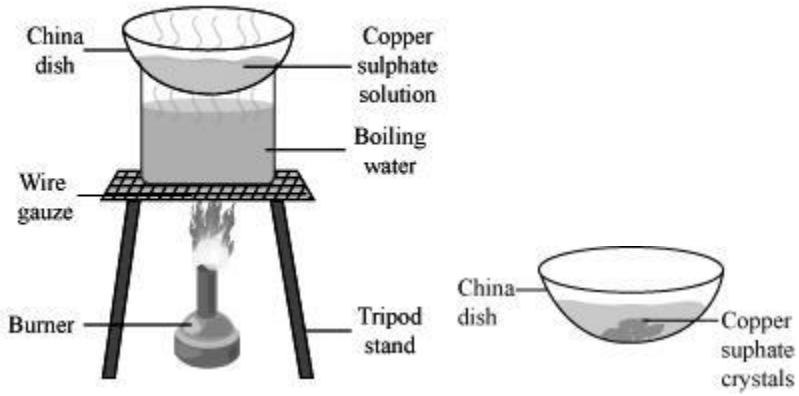
Now, a mixture of salt and water is left. Salt is separated from this solution by the process of evaporation. The process of evaporation is used to separate a solid substance dissolved in water. On evaporating the salt solution, salt is obtained as a residue.

Q10) How can pure copper sulphate be obtained from its impure sample?

Solution:

We can obtain pure copper sulphate from an impure sample through the process of **crystallization**. It is a process in which solid crystals are formed by cooling the saturated solution of a substance.

Make a saturated solution of a substance that has to be purified. Then, heat the solution and dissolve more solid into it. Then, filter the solution to remove insoluble impurities. Let the filtrate stand for some time. The crystals will separate out.



Q11) What will be the mole fraction of ethanol and water in a sample of rectified spirit containing 95 percent of ethanol by weight?.

Solution:

Rectified spirit contains 95% ethanol by weight.

Hence, 95 g ethanol is present in 100 g of spirit.

Mass of ethanol in the spirit = 95 g

Mass of water in the spirit = (100−95) = 5 g

Now, molar mass of ethanol = 46 g mol^{-1}

95 g ethanol has $\frac{95}{46}$ moles of ethanol = 2.07 moles

5 g water has $\frac{5}{18}$ moles of water = 0.28 moles of water

($\because$ Molar mass of water = 18 g mol^{-1})

Mole fraction of ethanol = $\frac{2.07}{2.07+0.28} = \frac{2.07}{2.35} = 0.88$

Therefore, mole fraction of water = 1 − 0.88 = 0.12

Q12) An aqueous solution of a dibasic acid, having molecular mass of 118 g, contains 35.4 g of acid per litre of solution. It has a density of 1.0077 g/cm^3. Express the concentration of the solution in terms of−

i. molarity
ii. normality
iii. molality

Solution:

Given, W_B = 35.4 g

M_B = 118 g

Density = 1.0077 g/cm^3

i. Molarity $= \frac{35.4}{118} \text{mol L}^{-1} = 0.3 \text{ M}$

ii. Normality $= \frac{\frac{35.4}{118}}{2} \text{g eq L}^{-1} = 0.6 \text{ N}$

iii. 1000 cm^3 solution = 1000 × 1.0077 g = 1007.7 g

Weight of solvent (water) = 1007.7 − 35.4 = 972.3 g = 0.9723 kg

∴Molality = $\frac{\left(\frac{35.4}{118}\right) \text{mol}}{0.9723 \text{ kg}} = 0.31 \text{ mol kg}^{-1}$

Q13) *The given figure represents an organelle of a cell. Study the figure and answer the following questions.*

(i) Identify the organelle.

(ii) Give any one function of the organelle.

(iii) Name the structures, which may be attached to the surface of this organelle.

(iv) Label the parts marked ‘I’ and ‘II’.

(v) The given organelle helps in the synthesis of _____ and _____.

Solution:

(i) Endoplasmic reticulum (ER)

(ii) It acts as a skeletal framework for the cell and circulatory system for the cell.

(iii) Ribosomes

(iv) I − Smooth ER

II − Rough ER

(v) The given organelle helps in the synthesis of proteins and lipids.

Q14) Write a short note on a method which improves the yield of fishes with a suitable example.

Solution:

An intensive way of farming fishes is the composite fish culture system. In such a system, five or six different species of fishes are grown together in a single fishpond. Fishes with different food habitats are chosen, so that they do not compete for food among themselves. For example, *Catla* feed on the surface of water while *Rohu* are middle zone feeders. *Mrigal* and *common carp* are bottom feeders while *grass carp* feed on weeds. This ensures complete utilisation of food resources in the pond. Such a system increases the fish yield.

Q15) A box is pushed up an inclined plane with a velocity of 30 m/s. It takes 10 s to travel 1.5 m along the incline and then starts sliding back. What is the retardation it faces on its way up?

Solution:

Given that:

u = Initial velocity = 30 m/s

s = Distance = 1.5 m

t = Time = 10 s

It is known that $s = ut + \frac{1}{2}at^2$ from the second equation of motion, where *a* = acceleration.

Thus,

$$1.5 = 30 \times 10 + \frac{1}{2}a(10)^2$$

or, $$\frac{1}{2}a(10^2) = 1.5 - 300$$

$$a = \frac{(1.5 - 300) \times 2}{100}$$
$$= -5.97 \text{ m/s}^2$$

It faces a retardation of −5.97 m/s^2.

Q16) A ball is thrown up with a velocity of 30 m/s. How long will it take to come back? (g = 10m/s^2)

Solution:

Given that:

Initial velocity, u = 30 m/s

Final velocity, v = 0 m/s (at top)

Acceleration, a = −10 m/s^2 (retardation)

It is known from the first equation of motion that $v = u + at$ (where t = time)

Therefore, $t = \frac{v-u}{a}$ = Time taken to reach the top

$$= \frac{0 - 30}{-10}$$
$$= 3 \text{ s}$$

Time taken to come down $= \frac{u-v}{a}$

$$= \frac{30 - 0}{10}$$
$$= 3 \text{ s}$$

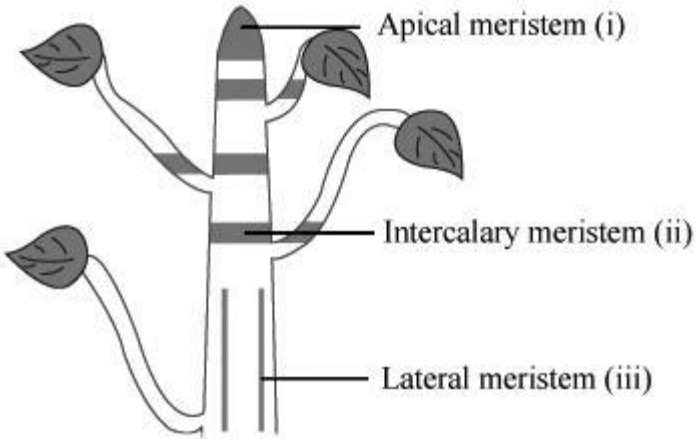
(Because u = 0 m/s and v = 30 m/s when it comes down and a = 10 m/s^2)

Thus, total time taken by the ball to go up and come back is 6 s.

Q17) Is the location of dividing tissues significant in the overall plant development? Discuss with the help of a diagram.

Solution:

Meristematic tissue is composed of immature and continuously dividing cells. Meristem can be further classified based on its position in the plant in three classes:



- **Apical meristem (i) −** They are present at the tips of stems, roots, and branches. They are responsible for the axial growth in a plant.
- **Intercalary meristem (ii) −** They are present at the base of internodes. They are responsible for the growth of internodal region.
- **Lateral meristem (iii) −** They are present on the lateral side of stems and roots. They are responsible for the radial growth of plants.

Hence, it is evident that different types of dividing tissues present at different locations result in different growth patterns in a plant.

Q18)

a. Complete the given table:

Mixture	**Separation Technique**
Sugar solution	
Sand containing pebbles	
Fruit juice containing seeds	
Mixture of ethanol and water	
Crude oil	
Naphthalene and sand	

b. Why distillation is a good technique to separate the components of vinegar?

Q18)

a. Complete the given table:

Mixture	**Separation Technique**
Sugar solution	
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Naphthalene and sand	

b. Why distillation is a good technique to separate the components of vinegar?

Solution:

(a)

Mixture	**Separation Technique**
Sugar solution	Evaporation
Sand containing pebbles	Sieving
Fruit juice containing seeds	Filtration
Mixture of ethanol and water	Distillation
Crude oil	Distillation
Naphthalene and sand	Sublimation

(b) Distillation technique is used to separate the mixture of miscible liquids. This method is based on the difference in boiling points of various liquids and so far the best and easy method to separate the components of miscible solution. So, this method is used to separate acetic acid and water present in vinegar.

Q19) a. Why is molality preferred over molarity while expressing the concentration of a solution?

b. Why does the boiling point of water increase when sodium chloride is added to it?

c. Why is phenol partially soluble in water?

Solution:

a. While molarity decreases with an increase in temperature, molality is independent of temperature. This happens because molality involves mass, which does not change with a change in temperature, while molarity involves volume, which is temperature dependent. Hence, molality is preferred over molarity while expressing the concentration of a solution.

b. When a non-volatile solute such as sodium chloride is dissolved in water, the vapour pressure of water decreases. This happens because on addition of NaCl, some of the solvent molecules on the surface are replaced by the non-volatile solute molecules. Hence, the solution has to be heated at a higher temperature to make the vapour pressure equal to the external pressure. Hence, the boiling point of the solution increases.

c. As a general rule, like dissolves like. Phenol has a polar −OH group but an aromatic phenyl C_6H_5 group. Hence, it is partially soluble in water.

Q20) (a) What is organic manure? List its various advantages in soil productivity.

(b) How do farmers prepare compost manure from organic matter?

Solution:

(a) Organic manures are decomposed organic matter. These include cattle dung, oil cakes, vegetable wastes, etc. Animal or plant wastes are decomposed by microorganisms, such as bacteria and fungi. This decomposed matter is used as manure. It contains essential nutrients required by plants for their growth. Some of its advantages are as follows:

• Improves soil fertility

• Increases water holding capacity

• Assists in penetration of roots

• Helps in aeration

• Adds nutrients to the soil

• Increases microbial activity that is helpful for plants

(b) Compost is prepared from organic wastes, such as cow dung, sludge, vegetable wastes, fishmeal, bone meal, etc. Farmers collect such organic wastes and stack it in a heap inside a pit or tank. Then, microorganisms grow and decompose the organic matter, and convert it into a product called compost.

Q21) Derive the three linear equations of motion.

Solution:

First equation of motion

Acceleration $= \frac{\text{Change in velocity}}{\text{Time taken}}$

Or

Acceleration $= \frac{\text{Final velocity} - \text{Initial velocity}}{\text{Time taken}}$

So,

$$a = \frac{v-u}{t}$$

$$at = v-u$$

Therefore, $v = u + at$

Where,

v = Final velocity of the body

u = Initial velocity of the body

a = Acceleration

t = Time taken

Second equation of motion

Average velocity $= \frac{u+v}{2}$

Also,

Displacement = Average velocity × Time

So, $S = \frac{(u+v)}{2} \times t \qquad \text{(i)}$

From the first equation of motion, we have $v = u + at$.

On putting this value in equation (i), we get

$$S = \frac{(u+u+at)\times t}{2}$$

Or, $$S = \frac{(2u + at) \times t}{2}$$

Or, $$S = \frac{2ut + at^2}{2}$$

Or, $$S = ut + \frac{1}{2}at^2$$

Where,

S = Distance travelled by the body in time *t*

u = Initial velocity of the body

a = Acceleration

Third equation of motion

From the first equation of motion, we have $v = u + at$.

This can be rearranged and written as

$at = v - u$

Or, $$t = \frac{v - u}{a}$$

On putting this value of *t* in the second equation of motion, we have

$$S = \frac{u(v-u)}{a} + \frac{1}{2}a\left(\frac{v-u}{a}\right)^2$$

Or, $$S = \frac{uv - u^2}{a} + \frac{1}{2}\frac{a(v^2 + u^2 - 2uv)}{a^2} \quad \left[\because (v-u)^2 = v^2 + u^2 - 2uv\right]$$

Or, $$S = \frac{uv - u^2}{a} + \frac{v^2 + u^2 - 2uv}{2a}$$

Or, $$S = \frac{2uv - 2u^2 + v^2 + u^2 - 2uv}{2a}$$

Or, $2as = v^2 - u^2$

Or, $v^2 = u^2 + 2as$