

**Q1)** Seema prepared mixtures of urea in water, chalk in water and starch in water and left them undisturbed. After some time, the appearance of which mixture will change?

**Solution:**

The mixture of chalk in water forms a suspension. On leaving it undisturbed for some time, the particles of chalk settle at the bottom of the container. Thus, the appearance of this mixture will change.

**Q2)** Why are cartilages **not** as rigid as bones?

**Solution:**

In cartilage tissue, cells are embedded in a protein-containing matrix, which is strong yet flexible in nature. On the other hand, bone cells are embedded in a hard matrix that is formed of calcium and phosphorus compounds.

**Q3)** A car travelling at a uniform speed of 20 m/s approaches a signal. The driver applies the brake and the car retards uniformly at the rate of  $2 \text{ m/s}^2$ . How much time will be taken by the car to come to rest?

**Solution:**

Here,

Initial speed of the car,  $u = 20 \text{ m/s}$

Acceleration of the car,  $a = -2 \text{ m/s}^2$

From the 1<sup>st</sup> equation of motion, we have

$$v = u + at$$

$$0 = 20 - (2) t$$

$$\text{Or, } 2t = 20$$

$$\text{Or, } t = 10 \text{ s}$$

Therefore, the car will come to rest 10 s after the application of the brake.

**Q4)** Neha takes some amount of a certain substance and tries to separate its constituents. She observes that the constituents of the substance cannot be separated by any physical means. She adds a little amount of the substance in half-a-beaker of water and stirs the contents. On stirring, she obtains a clear solution. She then evaporates the clear solution and gets back the substance. On heating to dryness, she observes that some solids get decomposed and become black.

What can she conclude from her experiment?

**Solution:**

Adding the substance in water and then getting it back on evaporating the solution represents a physical change. This means that the two substances are present in the form of a mixture. Since a clear solution is formed, the mixture is homogeneous in nature.

A compound is formed by the combination of two or more substances. Also, it can decompose on heating. This represents a chemical change. The constituents of the compounds cannot be separated by any physical means.

Hence, the given substance is a pure compound as it decomposes on heating to give a new black substance. This new substance has different characteristic properties and its constituents cannot be separated by any physical methods.

**Q5)** What role does the structure of sclerenchyma play in its function?

**Solution:**

Sclerenchyma is made up of long, narrow, and thick-walled cells. The walls of these cells are thick because of the deposition of a chemical substance called lignin. Also, the cells with thick walls are arranged very tightly with no intercellular spaces. These factors make sclerenchyma a hard tissue.

Since sclerenchyma is hard, it provides strength to various parts of plant. Thus, its function can be attributed to its structure.

**Q6)** A boy travels 30 m towards North–West to point A and takes a left to travel another 70 m to point B. At B, the boy turns left again to travel 30 m to point C. What was his

- i. speed, if the total journey took him 30 min
- ii. displacement

**Q7)** Describe two methods of irrigation which can be used to irrigate lands lying close to rivers.

**Solution:**

Some of the methods that can be utilised for irrigating lands lying close to rivers are enumerated as follows:

- Canals – They are the man made water channel systems. They are used to deliver adequate water to the fields. Canals are connected with water reservoirs or rivers to distribute water in the fields.
- River lift system – In this system, water is directly drawn from the river and is supplied to irrigate fields closer to the river. This is because in some regions, canals are irregular and insufficient because of low water levels in the river.

**Q8)** Give the difference between the three types of muscle fibres?

**Solution:**

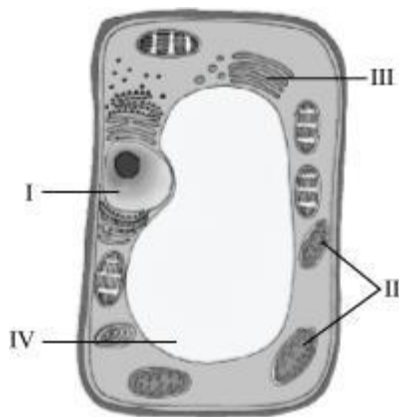
Muscle fibres are of three types: striated muscles, smooth muscles and cardiac muscles.

Striated muscles are also called voluntary muscles as they can be moved according to will. They show alternate light and dark bands. They are composed of long, unbranched, cylindrical and multi-nucleated cells. They are found attached to the bones.

Smooth muscles are involuntary muscles as they cannot be moved as per will. They are composed of spindle-shaped, uni-nucleate cells. They are found in stomach, ureters etc.

Cardiac muscles are also involuntary muscles. They are composed of cylindrical, branched, and uni-nucleated cells. They are present in the heart.

**Q9)**



In the given figure, some organelles are labelled as I, II, III, and IV. Identify these given organelles and write at least two functions of each.

**Solution:**

In the given figure, organelle labelled I represents nucleus. The functions of nucleus are given as follows:

- Genetic material is present inside the nucleus. The nucleus plays an important role in cellular reproduction as it divides and passes the genetic material to the offspring.
- Nucleus is the brain of the cell. It controls all the cellular activities.

In the given figure, organelle labelled II represents mitochondria. The functions of mitochondria are given as follows:

- Mitochondria are responsible for the production of most of the energy (ATP) in cells. Therefore, mitochondria are also known as the powerhouse of cells.
- It also regulates the free calcium ion concentration in the cytosol.

In the given figure, organelle labelled III represents Golgi apparatus. The functions of Golgi apparatus are given as follows:

- It is involved in the transport of lipids in cells.
- It also plays an important part in the formation of lysosomes.

In the given figure, organelle labelled IV represents vacuole. The functions of vacuole are given as follows:

- They store all the waste products of cells.
- They maintain the turgor pressure within cells.

**Q10)** Why are transgenic plants called so? Give any one example of transgenic plants and justify it being classified under this category.

**Solution:**

Transgenic plants are the plants with a foreign gene. Since they carry a foreign gene, they are called transgenic.

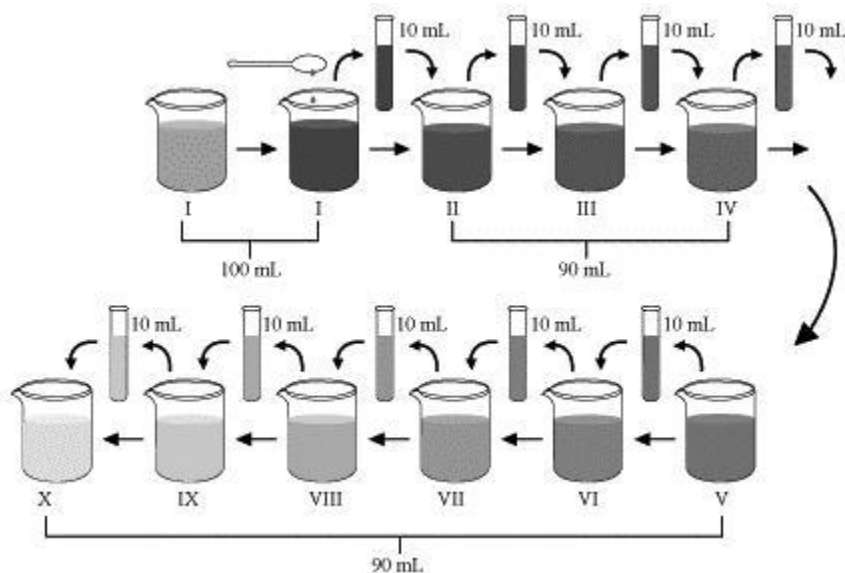
Example – Bt cotton

This cotton plant has Bt gene from bacteria *Bacillus thuringiensis* introduced in it. Bt cotton is resistant against attack by insects. This resistance is attributed to the foreign Bt gene. Due to the presence of foreign Bt gene, Bt cotton is classified under transgenic plants.

**Q11)** Write an activity to show that matter is made up of small particles.

**Solution:**

2-3 crystals of potassium permanganate ( $\text{KMnO}_4$ ) were taken and dissolved in a beaker containing 100 mL water. 10 mL of this solution was taken and added to another beaker containing 90 mL water. The procedure was repeated till the colour in the beaker became very light.



### Figure: Serial dilution of potassium permanganate solution

We will observe that as soon as the crystals of potassium permanganate are dissolved in the first beaker, the water becomes violet-pink. When the solution is repeatedly diluted, the intensity of the colour gradually decreases.

Thus, we can conclude that 2-3 crystals of potassium permanganate consist of millions of particles that can be transferred from one beaker to another, causing the water present in each beaker to become pink in colour. Hence, we can say that particles of matter are very small and are not visible to the naked eye.

**Q12)** A ball moving with a velocity of 2 m/s is stopped by a player in 1 s. If the mass of the ball is 50 g, then what is the force applied by the player to stop the ball?

**Solution:**

Given that,

Initial velocity,  $u = 2 \text{ m/s}$

Final velocity,  $v = 0 \text{ m/s}$

Time,  $t = 1 \text{ s}$

We know that,

$$v = u + at \text{ [Where, } a \text{ is acceleration]}$$

$$0 = 2 + a \times 1$$

$$a = -2 \text{ m/s}^2$$

$$\text{Also, force, } F = m \times a = \frac{50}{1000} \times (-2) = -0.1 \text{ N}$$

Therefore, the force applied by the player to stop the ball is  $-0.1 \text{ N}$ . The negative sign indicates that the direction of force is opposite to the direction of motion of the ball.

**Q13)** Sun's mass and that of Neptune are  $1.98 \times 10^{30} \text{ kg}$  and  $1.02 \times 10^{26} \text{ kg}$  respectively. The mean distance between these celestial bodies is  $4.5 \times 10^9 \text{ km}$ . Determine the gravitational force exerted by the sun on Neptune?

**Solution:**

Mass of sun,  $M_S = 1.98 \times 10^{30} \text{ kg}$

Mass of Neptune,  $M_N = 1.02 \times 10^{26} \text{ kg}$

Distance between the celestial bodies,  $r = 4.5 \times 10^9 \text{ km} = 4.5 \times 10^{12} \text{ m}$

Universal gravitational constant,  $G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$

From Newton's law of gravitation, force is defined as:

$$\begin{aligned} F &= \frac{G M_S M_N}{r^2} \\ &= \frac{6.67 \times 10^{-11} \times 1.98 \times 10^{30} \times 1.02 \times 10^{26}}{(4.5 \times 10^{12})^2} \\ &= \frac{6.67 \times 1.98 \times 1.02}{4.5 \times 4.5} \times 10^{-11+30+26-24} = 6.65 \times 10^{20} \text{ N} \end{aligned}$$

**Q16)** A mass of two kilograms is thrown vertically upwards with a velocity of 40 m/s. How much height will it gain? ( $g = 10 \text{ m/s}^2$ )

**Solution:**

It is given that:

Initial velocity,  $u = 40 \text{ m/s}$

$g = -10 \text{ m/s}^2$  (as the mass is thrown up)

Final velocity,  $v = 0$  (as at maximum height, the velocity of the mass will become zero)

Applying 3<sup>rd</sup> equation of motion:

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

$$0 - (40)^2 = 2 \times (-10) \times s$$

$$s = \frac{1600}{20}$$

$$= 80 \text{ m}$$

The mass gains a height of 80 m.

**Q14)** Solids are rigid whereas liquids are not. Why?

**Solution:**

The particles in solids are very closely packed and the intermolecular forces of attraction between them are very strong. Therefore, the particles in solids cannot easily move from their positions.

Hence, solids are rigid in nature. Liquids, on the other hand, are loosely packed and the intermolecular forces of attraction between their particles are not as strong as they are in case of solids. Hence, particles are free to move within the liquid. Thus, liquids are not rigid and take the shape of the container in which they are kept.

**Q15)** Answer the following questions.

- (i) What is cohesive force?
- (ii) What are the various factors affecting evaporation?
- (iii) Write two characteristics of matter.

**Solution:**

- (i) The force present between the particles of matter is called cohesive force.
- (ii) The various factors affecting evaporation are surface area, temperature, wind speed and humidity.
- (iii) Matter has a definite mass and it occupies space.

**Q16) (a)** What is the concentration of a solution?

**(b)** A solution contains 80g of glucose in 420 g of water. Calculate the concentration of glucose solution in terms of mass by mass percentage of the solution.

**Solution:**

**(a)** The concentration of a solution can be defined as the amount of solute dissolved in a given amount (mass or volume) of the solution.

**(b)** Mass of solute (glucose) = 80 g (given)

Mass of solvent (water) = 420 g (given)

Mass of solution = Mass of solute + Mass of solvent

= (80 + 420) = 500 g

Mass by mass percentage of solution

$$\begin{aligned} &= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100 \\ &= \frac{80 \text{ g}}{500 \text{ g}} \times 100 \end{aligned}$$

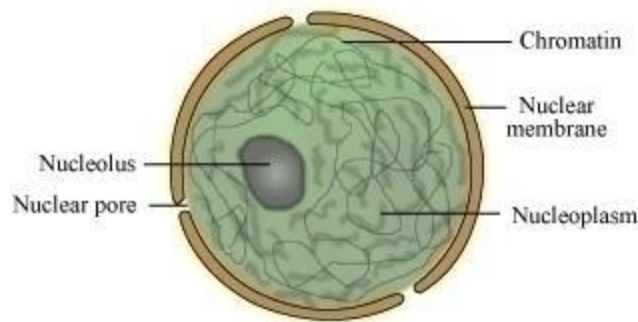
= 16 %

Thus, the concentration of the given solution in terms of mass by mass percentage is 16%.

**Q17)** Explain the structures of the nucleus and its components with the help of a diagram. Write the function of each component.

**Solution:**

The components of a nucleus are shown in the following diagram.



(i) **Nuclear membrane** – It is a double-layered membrane with pores in it. It separates the contents of the nucleus from the cytoplasm. The nuclear pores allow the movement of specific substances in and out of the nucleus.

(ii) **Nucleoplasm** – It is a homogenous and dense fluid present inside the nucleus. Chromatin and nucleolus are suspended in the nucleoplasm.

(iii) **Chromatin** – Chromatin network is an entangled mass of thread-like structures. At the time of cell division, chromatin gets organised into chromosomes. The DNA present on them contains genes, which are the functional units of heredity. DNA is concerned with the transmission of hereditary information.

(iv) **Nucleolus** – It is rich in proteins and RNA molecules, and is the site of ribosome formation.