Q1) *Answer the following questions.*

(i) What is Tyndall effect? Which solution shows Tyndall effect?

(ii) Write the properties of a true solution.

(iii) What is the size of the particles of a true solution?

Solution:

(i) Tyndall effect is observed when a fine beam of light enters a dark room through a small opening. It happens because of the scattering of light by the dust and smoke particles present in air.

A colloidal solution shows Tyndall effect.

(ii) *Properties of a true solution*:

(a) A true solution is a homogeneous mixture.

(b) The particles of a true solution are too small to be seen by the naked eye.

(c) The particles do not scatter a beam of light passing through the solution.

(iii) The particles of a true solution are smaller than 1 nm.

Q2) Study the distance−time graph and answer the following questions.
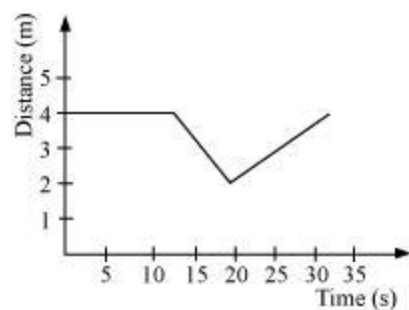
(a). Which part of the graph represents absence of motion?

(b). Which part of the graph represents the fastest motion?

(c). How can it be deduced from the graph if the motion is away from the origin or towards the origin?

Solution:

(a). The line graph between the time 0 s and 15 s represents absence of motion.

(b). The line graph between the time 15 s and 20 s represents the fastest motion.

(c). During 0 s to 15 s, there is no motion as there is no change in its distance from the origin.

During 15 s to 20 s, there is motion towards the origin as the distance reduces from 4 m to 2 m.

During 20 s to 35 s, there is motion away from origin as the distance increases from 2 m to 4 m.

Q3) A truck having a mass 10000 kg is moving with a velocity of 15 m/s. It collides with a stationary car with a mass 1500 kg. If both the vehicles get stuck with each other, then what will be the velocity with which the system of the two vehicles will move?

Solution:

Before collision:

Mass of the truck, m_t = 10000 kg

Velocity of the truck, v_t = 15 m/s

∴Initial momentum of the truck, p_t = 10000 × 15 = 150000 kg m/s

Mass of the car, m_c = 1500 kg

Velocity of the car, v_c = 0

∴Initial momentum of the car, p_c = 0

Initial momentum of the system of the two vehicles = $p_c + p_t$ = 150000 kg m/s

After collision:

Both the vehicles get stuck together.

Total mass of the system = $m_c + m_t$ = 11500 kg

Velocity of the system = v

∴Final momentum of the system = 11500v

From the law of conservation of momentum:

Initial momentum = Final momentum

150000 = 11500v

$$\therefore v = \frac{150000}{11500} = 13.04 \text{ m/s}$$

Hence, the system of the two vehicles will move with a velocity of 13.04 m/s.

Q4) (i) A car starting from rest is accelerated uniformly at the rate of 2 m/s^2. Determine the velocity of the car when it covers a distance of 50 m.

(ii) A cyclist is cycling around a circular track with a radius of 56 m. What is the velocity of the cyclist if he takes 1 minute to complete one round?

Solution:

(i) Initial velocity of the car, $u = 0$

Acceleration, $a = 2$ m/s^2

Distance travelled, $s = 50$ m

From the second equation of motion, the time taken (t) can be obtained as:

$$s = ut + \frac{1}{2}at^2$$

$$50 = 0 + \frac{1}{2} \times 2 \times t^2$$

$t^2 = 50$

$$\therefore t = \sqrt{50} = 7.07 \text{ s}$$

From the first equation of motion, the final velocity (v) can be obtained as:

$v = u + at$

$= 0 + 2 \times (7.07) = 14.14$ m/s

(ii) Radius of the given track, $r = 56$ m

Time, $t = 1$ min $= 60$ s

∴Velocity (v) of the cyclist is given by the relation:

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

$$= 2 \times \frac{22}{7} \times \frac{56}{60}$$

$$= 5.87 \text{ m/s}$$

Q5) Give a brief account of the ways in which maximum benefit can be derived by the farmers from a single piece of land.

Three different cropping patterns − mixed cropping, intercropping, and crop rotation are generally practised in order to obtain maximum benefit from a single piece of land.

- **Mixed cropping** − In this cropping pattern, two or more crops are sown simultaneously in the same land. In mixed cropping, crops are chosen in such a way that they require different amounts of minerals. This ensures proper utilisation of all minerals present in the soil. In absence of competition for nutrition, plants are able to derive maximum benefit from the land. Wheat and gram, wheat and mustard, groundnut and sunflower, etc. are some examples of common crop pairs used in mixed cropping.

- **Intercropping** − In this cropping pattern, farmers grow two or more crops simultaneously in the same field in a definite pattern. To ensure the maximum utilisation of nutrients applied, crops are selected in such a way that their nutrient requirements are different. For example, cauliflower and chilli plants are grown together in alternating rows.
- **Crop rotation** − In this cropping pattern, two or more varieties of crops are grown in the same region in sequential seasons. This system also helps in preventing crops from pests and diseases. The crops selected vary in nutrient requirements. This ensures complete and uniform utilisation of nutrients. A common example of crop rotation is to cultivate maize followed by soyabean

Q6) How will you show that the formation of iron sulphide is a chemical change? You are provided with iron fillings, sulphur powder and a magnet.

Step 1: Take two china dishes and label them as **I** and **II**.

Step 2: Add 5 g of iron filings and 3 g of sulphur powder in each china dish. Mix the contents in both the dishes thoroughly.

Step 3: Heat the contents of dish **II** till it turns red-hot.

Step 4: Then, use a magnet to separate the iron filings from both the dishes. Compare the texture and colour of the materials obtained in both the dishes.

Burner

It will be observed that the material obtained in dish **I** is a mixture of two substances. The substances present in dish **I** are iron and sulphur. However, the substance obtained in dish **II** is a compound called iron sulphide. On heating iron and sulphur, ferrous sulphide (FeS) is formed. Ferrous sulphide (FeS) is a compound having completely different properties from that of iron and sulphur, which are its constituents. But, the composition of the compound (FeS) is same throughout.

Q7) How is law of conservation of momentum a consequence of Newton's third law of motion?

Solution:

According to Newton's third law, every action has an equal and opposite reaction. For two interacting objects, each object experiences a force that is equal in magnitude and opposite in direction. As a result, the changes in their momentum are also equal and oppositely directed. Even though these forces are equal and opposite, they do not cancel out and produce a change in the velocities of the object. This happens because the action and reaction forces act on the same object.

Let us consider a collision between two balls A and B of masses m_A and m_B with initial velocities u_A and u_B respectively.

Let their velocities after collision be v_A and v_B.

Change in their momenta of ball A = $m_A (v_A - u_A)$

Change in their momenta of ball B = $m_B (v_B - u_B)$

F_{BA} = Force exerted by A (on B)

$$= \frac{m_A (v_A - u_A)}{t}$$
(Where, t = Time for which collision lasts)

F_{BA} = Force exerted by B (on A)

$$= \frac{m_B (v_B - u_B)}{t}$$

According to Newton's third law of motion,

$F_{AB} = F_{BA}$

Or, $\dfrac{m(v_A - u_A)}{t} = \dfrac{m(v_B - u_B)}{t}$

$mv_A - mu_A = mv_B - mu_B$

$mv_A + mv_B = mu_A + mu_B$

Therefore,

Total final momentum = Total initial momentum

Thus, the law of conservation of momentum is a direct consequence of Newton's third law of motion

Q8) In a laboratory experiment, a student focussed a strong beam of light on a solution of starch in water. Which of the following observations regarding the given experiment is correct?

A) The solution absorbed light.

B) The intensity of light increased.

C) Light just passed through the solution.

D) Light got scattered through the solution.

Answer:

D

Solution:

A solution of starch in water is an example of a colloidal solution. When a beam of light is focussed on a colloidal solution, it gets scattered in all directions and the path of the light becomes visible.

Hence, the correct option is D.

Q9) Which of the following solvents is most suitable for dissolving sulphur powder?

A) Carbon disulphide

B) Vinegar

C) Alcohol

D) Acetone

Answer:

A

Among the given solvents, sulphur most readily dissolves in carbon disulphide to form a yellow solution.

Hence, the correct option is A.

Q10) A student added some dilute sulphuric acid to a small amount of iron sulphide taken in a boiling tube. A gas having the smell of rotten eggs evolved during the reaction. Identify the gas.

A) H_2

B) H_2S

C) SO_2

D) SO_3

Answer:

B

Solution:

When some dilute sulphuric acid is added to a small amount of iron sulphide taken in a boiling tube, H_2S gas is evolved.

$FeS + H_2SO_4 \rightarrow FeSO_4 + H_2S\uparrow$

Hence, the correct option is B.

Q11) A student took some zinc granules in a test tube and added a small amount of dilute sulphuric acid in it. He/she noticed that a gas with some distinct characteristics was evolved during the reaction.

Which of the following sets of characteristics represents the gas evolved during the experiment?
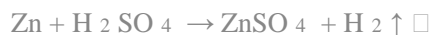
A) Brown coloured, odourless, burns with a pop sound

B) Colourless, pungent smelling, non-combustible

C) Colourless, odourless, burns with a pop sound

D) Brown coloured, odourless, non-combustible

Answer:

C

If zinc granules are added to dilute sulphuric acid, then hydrogen gas is evolved. The gas is colourless, odourless and burns with a pop sound.

$$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2 \uparrow$$

Hence, the correct option is D.

Q12) Given below are certain techniques employed to separate the components of a mixture containing ammonium chloride, sand and common salt:

I: Evaporation
II: Filtration
III: Sublimation
IV: Dissolution in water

What is the correct sequence in which these techniques are employed?

A) IV → III → I → II

B) III → I → IV → II

C) III → IV → II → I

D) II → IV → I → III

Answer:

C

Solution:

The correct sequence to separate ammonium chloride, sand and common salt is as follows:

III. Sublimation - Volatile ammonium chloride sublimes, then vapours condense on the inverted funnel placed over the container

IV. Dissolution in water - Common salt dissolves in water

II. Filtration - Sand is obtained as a residue on the filter paper

I. Evaporation - Common salt is obtained as a residue

Hence, the correct option is C.

Q13) Which of the following is **not** a technique employed to separate the components of a mixture of ammonium chloride, common salt and sand?

A) Sublimation

B) Evaporation

C) Dissolution in water

D) Magnetic separation

Answer:

D

Solution:

A magnet has no role in the separation of the components of a mixture of ammonium chloride, common salt and sand.

Hence, the correct option is D.

Q14) During an experiment to determine the boiling point of water, Ravi made the following observations regarding the temperature change. Which of the given observations is correct?

A) The temperature of water became constant.

B) The temperature of water decreased steadily.

C) The temperature of water kept on increasing.

D) The temperature of water became constant and then rose steadily.

Answer:

A

Solution:

The temperature of water becomes constant when it is boiled, even though heat is continuously supplied to it. The excessive heat energy is used to overcome the force of attraction between various particles to convert water into vapours.

Hence, the correct option is A.

Q15) The shape and arrangement of the cells of an onion peel observed under microscope is

A) spherical and loosely arranged

B) rectangular and loosely arranged

C) spherical and compactly arranged
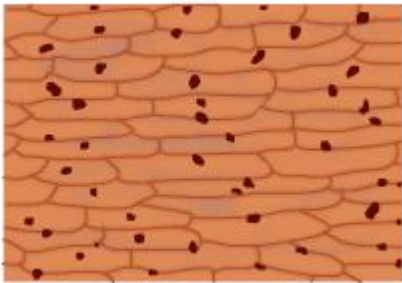
D) rectangular and compactly arranged

Solution:

The onion cells observed under a microscope are rectangular and compactly arranged with no intercellular space between them.

Hence, the correct option is D.

Q16) Which of the given diagrams correctly represents human cheek cells as observed under a microscope?
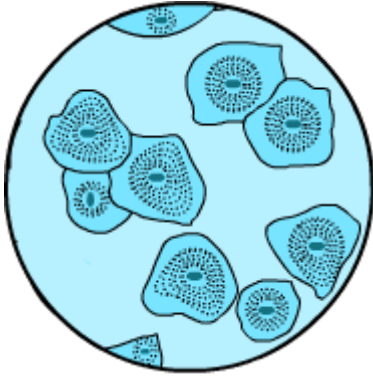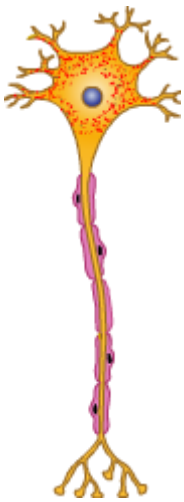
A)

B)

C)

D)

Answer:

C

Solution:

The human cheek cells appear flat and irregularly-shaped under a microscope. Hence, the correct option is C.

Q17) Which of the following stains is used for preparing a temporary mount of an onion peel?

A) Methylene blue

B) Sudan black

C) Crystal violet

D) Eosin

Answer:

A

Solution:

Methylene   blue   or   safranin   is   used   for   staining   an   onion   peel.

Hence, the correct option is A.

Q18) Which of the following cell organelles is present in an onion peel, but **not** in human cheek cells ?

A) Nucleus

B) Cell wall

C) Cytoplasm

D)Cell membrane

Answer:

B

Solution:

Cell wall is present in an onion peel as it is a plant cell. However, it is absent in human cheek cells.

Hence, the correct option is B.

Q19) Which of the following methods **cannot** be used for reducing friction?

 A) Painting

 B) Polishing

 C) Lubricating

 D) Decreasing area

Answer:

D

Solution:

Friction cannot be reduced by decreasing the area of contact.

Hence, correct option is D.

Q20) Which of the following is **not** an effect of friction force?

    A) Produce heat

    B) Oppose motion

    C) Make a body slide

    D) Cause wear and tear

Answer:

C

Solution:

Friction is an opposing force that acts on a body when a body moves or tries to move over the surface of another body. This force does not make a body to slide.

Hence, the correct option is C.

Q21) When a rectangular block is moving on the top of a table, the friction force is **independent** of

    A) the mass of the block

    B) the weight of the block

    C) the material of the block

    D) the surface area of the block

Answer:

D

Solution:

Friction force does not depend on the surface area in contact.

Hence, the correct option is D.

Q22) Which of the following statements is **incorrect** regarding friction force?

    A) It is a contact force.

B) It is a self-acting force.

C) It is a self-adjusting force.

D) It always acts in the direction of motion.

Answer:

D

Solution:

Friction force always acts in the direction opposite to the motion of the body.

Hence, the correct option is D.

Q23) Which of the following relations between force of limiting, sliding and rolling friction is correct for a given body and surface?

   A) Limiting friction < Sliding friction < Rolling friction

   B) Sliding friction < Limiting friction < Rolling friction

   C) Limiting friction < Rolling friction < Sliding friction

   D) Rolling friction < Sliding friction < Limiting friction

Answer:

D

Solution:

Sliding friction is always less than limiting friction. Rolling friction is always less than both sliding friction and limiting friction.

∴ Rolling friction < Sliding friction < Limiting friction

 Hence, the correct option is D.