SOLUTIONS

SAMPLE PAPER - 1

SECTION - A

1. *(d) iodine in alcohol*

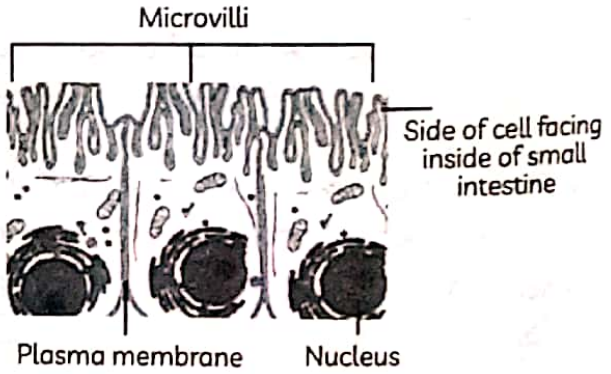
Explanation: Tincture of iodine is a solution of iodine as solute and alcohol as solvent.

Related Theory

- *An antiseptic tincture of iodine is used to disinfect wounds.*
- *The iodine tincture is made up of 2 to 7% iodine and the rest is sodium or potassium iodide.*

2. *(c) Increases the cell's ability to absorb nutrients.*

Explanation: Microvilli (singular = microvillus) are finger-like projections on the plasma membrane of cells that specialise in absorption. The surface area of the plasma membrane is increased by this folding like structures in the small intestine, which absorbs nutrients from digested food.



Microvilli, appear on cells lining of the small intestine, increases the surface area available for absorption

3. *(a)* $\frac{F}{4}$

Explanation: The gravitational force between two objects is proportional to their masses and inversely proportional to the square of their distance.

$$F = G\frac{Mm}{r^2}$$

If the masses are halved and there is no change in distance.

New masses are:

$$M' = \frac{M}{2} \text{ and } m' = \frac{m}{2}$$

$$F' = G\frac{M'm'}{r^2}$$

$$= G\frac{Mm}{2\times 2\times r^2}$$

$$F' = G\frac{Mm}{4r^2}$$

$$F' = \frac{F}{4}$$

4. *(c) remains constant*

Explanation: Since the total energy of the system is always conserved, so when a body falls freely towards the Earth, its total energy remains constant which means that the sum of the body's potential and kinetic energy is same at all sites.

5. *(c) (II) and (III)*

Explanation: The atomicity of ozone, sulphur, phosphorus and argon are 3, 8, 4 and 1 respectively.

Hence, highest atomicity out of 4 elements is of Sulphur and lowest atomicity is of Argon.

Related Theory

- *The number of atoms in a molecule of an element is referred to as atomicity.*
  Monatomic: *Composed of one atom, e.g., He, Ne, Ar, Kr (all noble gases are monatomic).*
  Diatomic: *Composed of two atoms, e.g., H_2, N_2, O_2, F_2, Cl_2 (all halogens are usually diatomic).*
  Triatomic: *Composed of three atoms, e.g., O_3*
  Polyatomic: *Composed of three or more atoms, e.g., P_4, S_8*

6. *(a) Double the original momentum*

Explanation: Momentum is the product of mass and velocity.

Momentum, $p_1 = mv$

Now, new mass, $m_n = 4\ m$

New velocity, $v_n = \frac{1}{2}v$

$$p_2 = m_n v_n$$

$$p_2 = 4\ m \times \frac{1}{2}v$$

$$p_2 = 2\ mv$$

$$p_2 = 2\ p_1$$

7. *(c) mechanical energy*

Explanation: A clock's oscillating pendulum has both kinetic and potential energy. The oscillating pendulum of a clock can be said to have mechanical energy.

Related Theory

- *Mechanical energy is the sum of potential and kinetic energy.*

8. *(d) (II) and (IV)*

Explanation: In an atom, Number of electrons = Number of protons which defines atomic number.

The mass number is the sum of the number of protons and neutrons which is called nucleons.

9. *(b) when breadth and width form the base.*

Explanation: The force exerted by the box on base = Weight of object = W

Pressure exerted on box, $P = \frac{\text{Force}}{\text{Area}} = \frac{W}{A}$

As a result, the pressure is maximum at the base's smallest area, which is produced by breadth and width.

10. *(a)* Ba, O

Explanation: Ionic compounds are made up of ions kept together by the attraction of oppositely charged ions. Barium oxide molecule is formed by one barium cation Ba^{2+} and one oxide anion O^{2-}. Both ions are bound by one ionic bond.

Related Theory

- *The positive ion's name always comes first, followed by the negative ion's name. For example, the molecule sodium chloride is made up of positive sodium ions and negative chloride ions. Calcium chloride is a chemical made up of positive calcium ions and negative chloride ions.*

11. *(a) 7638 J*

Explanation: Work done is mathematically represented as:

$$W = F s \cos\theta$$

Where, W is work done

F = Force applied

s = Displacement

θ = Angle between force applied and displacement

$F = mg$

$F = 20 \times 9.8 = 196$ N

$W = F \times s \times \cos\theta$

$W = 196 \times 30 \times \cos 30°$

$W = 5092$ J

12. *(c) frequency of the sitar string with the frequency of other musical instruments*

Explanation: Because the frequency of the sitar is determined by the tension in the string, the sitarist adjusts the frequency of the sitar string in relation to the frequency of other instruments.

13. *(a) Frictional force, -10 N*

Explanation: Given,

Mass of stone, $m = 2$ kg

Distance covered, $s = 40$ m

Initial velocity, $u = 20$ m/s

As stone comes to rest, final velocity, $v = 0$ m/s

According to the third equation of motion,

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

$$0 = 20^2 + 2(a)(40)$$

$$80a = -400$$

$$a = \frac{-400}{80}$$

$$= -5 \text{ m/s}^2$$

Negative sign shows the retardation of stone

$\therefore$ Force, $F = ma$

$F = 2 \times (-5)$

$F = -10$ N

Negative sign shows that the force is opposing the force applied.

This opposing force is known as Frictional force as it acts between two surfaces of contact.

14. *(c) is least on equator*

Explanation: The equator has the least value of gravitational acceleration because the distance between the Earth's surface and its centre is greater near the equator than at the poles. The Earth's radius is smaller at the poles than at the equator, the value of g is higher at the poles and least at the equator.

15. *(b) 40%*

Explanation: Solute = 500 – 300 = 200 mL

Percentage of Solute

$$= \frac{\text{Volume of Solute}}{\text{Volume of Solution}} \times 100$$

$$= \frac{200 \text{ mL}}{500 \text{ mL}} \times 100 = 40\%$$

16. *(c) Tendons are non-fibrous and delicate tissue.*

Explanation: A tendon is a fibrous connective tissue that joins muscle and bone. Tendons provide a variety of purposes, including passively regulating forces during locomotion and providing additional stability without the need for active work. They have a lot of strength, but they're not very flexible.

Related Theory

- *Red blood cells, white blood cells, and platelets are suspended in a fluid matrix containing proteins, salts, and hormones in blood, which is a type of connective tissue.*
- *Ligaments are fibrous connective tissues that connect one bone to another.*
- *Cartilage is a connective tissue made up of widely separated cells that are interspersed in a protein and sugar matrix.*
- *The Achilles tendon is the largest and strongest tendon in the human body. It is also the human body's thickest tendon.*

Caution

- *Most of the students get confused when asked about ligaments and tendons. They should remember that a ligament is a fibrous connective tissue that attaches bone to bone whereas, tendors connect skeletal muscles to the bones.*

17. *(a) Both A and R are true and R is the correct explanation of A*

Explanation: The european bee is the common name for *Apis mellifera*. Like the small bee, this species dances in a relatively predictable pattern to advertise the presence of food. They are frequently raised by beekeepers due to their huge amount of honey producing capacity. They exhibit a greater rate of breeding and can remain in a beehive for considerably longer time.

18. *(a) Both A and R are true and R is the correct explanation of A.*

Explanation: Isotopes have the same number of protons and electrons. So, they show similar chemical properties.

19. *(a) Both A and R are true and R is the correct explanation of A.*

Explanation: A tendon is a strong, resilient band of fibrous connective tissue that connects muscle to bone. The tendon that attaches a skeletal muscle to the body is inflexible and rigid.

20. *(a) Both A and R are true and R is the correct explanation of A.*

Explanation: Distance is a scalar quantity and measures how far the object moves from the initial point to the final point. Distance traveled by an object never decreases. So, it can never be negative.

Displacement is a vector quantity. It can be negative, as it describes a change in an object's position while monitoring its direction. If the

object moves in a backward direction with respect to the frame of reference. In that case, displacement can be negative.
When an object returns to its original position, then the displacement is zero.

Related Theory

The negative and positive sign along with the magnitude of displacement indicates the direction of the motion of the object.

SECTION - B

21. The four factors that used to be considered for broiler production are:

(1) Broilers chicken are feed with vitamin A and K protein rich diet.

(2) Maintenance of temperature and hygienic conditions.

(3) Prevention and control of diseases and pest.

(4) Check on mortality and to maintain feathering and carcass quality.

22. (A) It happens because of sublimation, as this state changes directly from solid state to gaseous state without going into liquid. So, it disappears with time without leaving any solid residue.

(B) Due to the high speed of the particles and large space between them, gases diffuse quickly.

23. (A) Dendrite
(B) Cell body
(C) Axon
(D) Nerve ending

OR

(A) Intercalary Meristem
(B) Growth of new leaves and increase the length of the internodes

24. Weight of the man, $(W_1) = 400$ N
Weight of the load, $(W_2) = 200$ N
Height, $(h) = 3$ m
Time taken, $(t) = 3$ s
So the total weight,

$$W = W_1 + W_2$$
$$= (400 + 200)\ N$$
$$= 600\ N$$

We can calculate the work done against gravity as,

Work done by the man = (Total weight) × (Vertical distance)
$= 600 \times 3$
$= 1800$ J

Now, we can calculate the power of the man as,

$$\text{Power} = \frac{\text{Work done}}{\text{Time}}$$

$$\text{Power} = \frac{1800}{3}$$

Hence, power of the man is 600 W.

25. (A) When salt is sprinkled over mango pieces, the solution becomes hypertonic, thus, the water present inside the mango pieces flows out by the process of exosmosis.

Related Theory

Exosmosis is the mechanism through which water molecules flow out of the cell.

(B) (1) If the rupture or breakdown of plasma membrane occurs, the cell will not be able to exchange material from the surroundings as plasma membrane acts as a mechanical barrier.

(2) It would result in the exposure of all the cell organelles to the external environment and the protoplasmic material will get mixed with the surroundings which would ultimately result in cell death or cell lysis.

26. (A) It has electronic configuration = 2, 8, 5. Its outermost shell has 5 electrons, so to complete its octet, it can gain three electrons. Hence, its valency = – 3.

(B) It has electronic configuration = 2, 8, 1. It can easily lose one electron to complete its outermost octet. Hence, its valency = + 1.

OR

Atomic Number = Number of protons
Atomic Mass = Number of protons + Number of neutrons

Valency of atoms is calculated by checking the number of electrons in the outermost shell so that we can make atoms stable.

Elements	Number of Protons	Number of Neutrons	Atomic Number	Mass Number	Electronic Configuration	Valency
X	5	6	5	11	2, 3	3
Y	8	10	8	18	2, 6	2
Z	15	16	15	31	2, 8, 5	3

SECTION - C

27. The spoiled seeds in storage are a result of both biotic and abiotic causes. Abiotic variables like moisture in the food grains from improper drying, humidity, and temperature, as well as biotic factors like insects and rodents, can damage the grains by producing discolouration, a loss of germination ability, and degradation.

28. (A) In smoke and fog, the dispersion medium is same, namely air, but the dispersed phase differs. Smoke disperses solid carbon particles in the air, whereas fog disperses water particles in the air.

(B) By bringing a colourless liquid to a boil, we can determine if it is pure or not. It is regarded to be pure if it boils at 100°C. However, if the boiling point drops or rises, we can assume that the water has been contaminated and is no longer clean.

Under one atmospheric pressure, the boiling point and freezing point of the given liquid are 100 °C or 373 K and 0 °C or 273 K, respectively.

29. (A) Pear fruit has stone cells or sclereids which are a type of sclerenchyma. These cells give crunchy and granular sensation while chewing.

Related Theory

- *Sclereids are plant tissues that can be found in the walls of nuts and the pulp of some fruits like guava. Sclereids are sclerenchyma cells that have had their cellular walls thickened and lignified.*

Caution

- *Students should know that sclereids are small, round shaped cells which are also called stone cells. They are hard with highly thickened cell walls.*

(B) Collenchyma can be found at the end of a branch. It is a flexible tissue. As a result, tree branches can move and bend freely in high wind velocity.

(C) Sclerenchyma tissue lacks intercellular spaces because the cells are dead and the cell walls are thickened due to lignin deposition which acts as a cement.

30. (A) The law involved here is Newton's first law of motion. The inertia of the coin tries to maintain a state of rest even when the card flows off.

The law states that an object remains in the state of rest or of uniform motion in a straight line unless compelled to change that state by an applied force.

(B) The resistance offered by an object to change its state of motion. If it is at rest, it tends to remain at rest; if it is moving, it tends to keep moving. This property of an object is called its inertia.

OR

Example of each:

(1) **Inertia of rest:** We tend to remain at rest with respect to the seat until the driver applies a braking force to stop the motor car. With the application of brakes, the car slows down but our body tends to continue in the same state of motion because of its inertia of motion.

(2) **Inertia of motion:** When we are standing in the bus and the bus begins to move suddenly, we tend to fall backward. This is because the sudden start of the bus brings motion to the bus as-well-as to our feet in contact with the floor of the bus. But the rest of our body opposes this motion because of its inertia of rest.

(3) **Inertia of direction:** When a motor car makes a sharp turn at a high speed, we tend to get thrown to one side. When an unbalanced force is applied by the engine to change the direction of motion of the motorcar, we slip to one side of the seat due to the inertia of direction of our body.

31. (A) The density of the substance formula is,

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{50}{20} = 2.5 \text{ g/cm}^3$$

If density of water = 1 g/cm^3, the substance's density is higher than that of water. As a result, the substance sinks.

(B) A sheet of paper experiences more air resistance than a crumpled ball because it has a larger surface area. Its speed diminishes as it encounters greater air resistance. As a result, it will drop more slowly than a crushed ball.

32.

S. No	Bacterial Cell	Onion Peel Cell
(1)	They are prokaryotic cell.	They are eukaryotic cell.
(2)	They lack membrane-bound organelles.	They have membrane-bound organelles.

S. No	Bacterial Cell	Onion Peel Cell
(3)	They lack a well defined membrane-bound nucleus.	They have a well defined membrane-bound nucleus.
(4)	Ribosomes are small in size.	Ribosomes are large in size.
(5)	Cell wall is present in all prokaryotes.	Cell wall is present only in plants and fungi.

(Any three)

33. (A) Atomic number of Neon atom is 10 which is electrically neutral having 10 protons and 10 electrons whereas, Fluoride ions are negatively charged having 9 protons and 10 electrons.

Related Theory

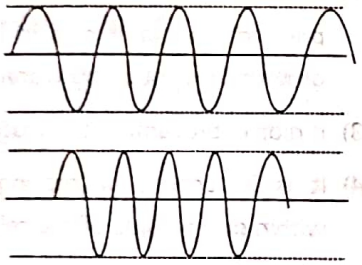
Since fluorine has atomic number 9, to complete its octet it will take one more electron in its outermost shell. Gaining electrons make the element negatively charged.

(B) Inert gases like Helium have only a K shell and it is completely filled with 2 electrons. Argon and neon have 8 electrons in their outermost shell which is the maximum number of electrons that can be accommodated in the outermost shell, hence, inert gases have zero valency.

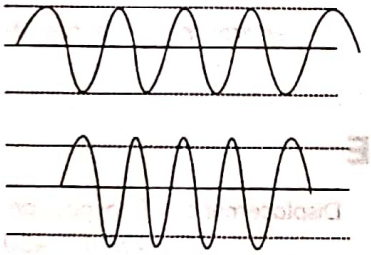
(C) There are three isotopes of the element hydrogen: hydrogen $_{1}^{1}H$, deuterium $_{1}^{2}H$, and tritium $_{1}^{3}H$.

SECTION - D

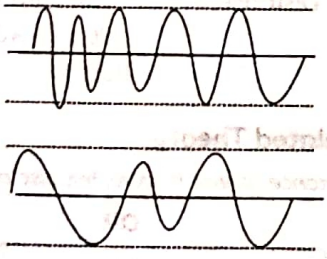
34. (A) Two sound waves having the same amplitude but different frequencies.



(B) Two sound waves having the same frequency but different amplitudes.



(C) Two sound waves having different amplitudes and also different wavelengths.



OR

(A) (i) The amplitude of a wave is its maximum displacement.

The wave's amplitude from the given figure is 5 cm.

(ii) The wavelength of a wave is the distance between two consecutive crests and troughs.

The wave's wavelength, as shown in the diagram, is 20 cm (0.2 m).

(iii) A wave's velocity is given by:

Velocity = Wavelength × frequency

Frequency of wave = 100 Hz (given)

$$v = 0.2 \times 100 = 20 \text{ m/s}$$

(B) The following factors have an impact on sound speed in the following ways:

(1) Air frequency — Sound speed is unaffected.

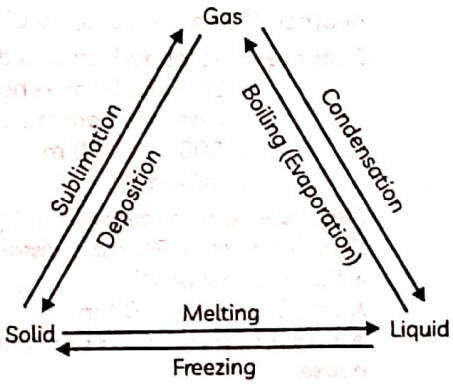
(2) Air temperature — As the temperature of the air rises, speed of sound increases.

(3) Air pressure — Sound speed is unaffected.

(4) Moisture in the air — As the moisture content in the air rises, so does the speed of sound.

35. (A) The two ways by which the physical state of the matter can be changed is either by melting or boiling.

(B) The states of matter triangle that demonstrate the inter-conversion of states of matter is as follows:



(C) The evaporation of liquids can be made faster by:

(1) Increasing the temperature of the liquid
(2) Increasing the surface area of liquid
(3) Increasing the wind speed

OR

(A) P represents the Gaseous state of matter.
Q represents the Solid state of matter.
R represents BEC which is the fifth state of matter.
S represents Plasma which is the fourth state of matter.
T represents the Liquid state of matter.

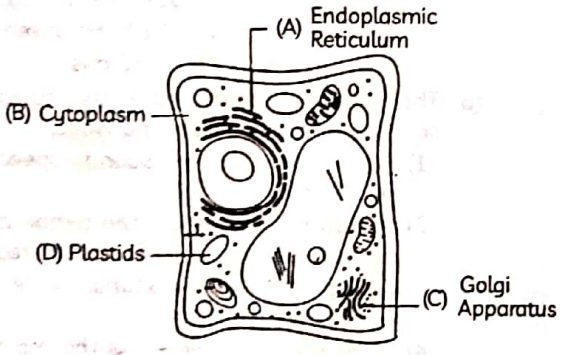
(B) The process is known as deposition. The direct change of gas to solid without changing into liquid is called deposition.

(C) Solid carbon dioxide or dry ice belongs to Q but its solid form changes into a gaseous state.

(D) Indian Scientist Satyendra Nath Bose and famous physicist Albert Einstein both predicted that fifth state of matter called BEC (Bose-Einstein Condensate).

(E) The common substance belonging to T is water.

36.



(E) (i) Plant cell has cell wall outside the cell membrane but cell wall is absent in animal cell.

(ii) Centrioles are only found in animal cells not in plant cells.

OR

(A) The plant cell wall is mainly composed of cellulose. Cellulose is a complex substance and provides structural strength to plants.

(B) The cell wall serves a variety of crucial roles as an integral part of the plant cell. The following are some of the most significant cell wall activities noticed:

(1) Plant cell walls have distinct shapes, are strong, and rigid.

(2) It shields from mechanical stress and physical shocks. It aids in limiting cell growth brought on by water intake.

(3) It aids in preventing cell water loss.

(4) It is in charge of moving materials within and outside of the cell.

(5) Between the internal cellular components and the external environment, it serves as a barrier.

(Any three)

SECTION - E

37. (A) We must choose a reference point and a direction to compute his distance and displacement.
Let's take A's house as a reference point and perform the following calculations:
A covers a distance of 500 m to shop and another 300 m from shop to C's house.

Distance = Total path travelled
= Distance from A's house to shop + Distance from shop to C's house
= 500 m + 300 m
= 800 m

She covers a total distance of 800 m.
Displacement = Shortest distance between initial and final position.
A and C's house = 200 m
A's displacement is 200 m towards the C's house.

(B) D's house provides a reference point for the calculation.

Displacement = Final position – Initial position
= 400 m – 400 m
= 0 m

Distance = Total path travelled
= 400 m + 400 m
= 800 m

Related Theory

➥ *Distance cannot be zero, but displacement can be.*

OR

(B)

Distance	Displacement
The total length of the path covered by an object between two points *i.e.* initial and final point is called distance.	The shortest path covered by the object between the initial and final point is called displacement.

Distance	Displacement
The direction is not taken into account while calculating the distance.	The direction is taken into account when calculating displacement.
Distance is dependent on the path followed.	Displacement is independent of the path and solely depends on the body's initial and ending positions.
The distance can never be negative.	Displacement can be positive, negative or zero.

Related Theory

- *Distance is always equal to or greater than the displacement.*
- *The numerical ratio of displacement to distance is equal to one or less than one.*
- *Displacement is always indicated with an arrow as this is a vector quantity.*

38. (A) Since mass is converted into energy, nuclear reactions violate the law of conservation of mass.

(B) Balanced equation after electricity is passed

$$2H_2O \rightarrow 2H_2 + O_2$$

X

Hydrogen burns itself, generating explosions, whereas oxygen helps in combustion.

(C) When electric current is passed through liquid X it produces two elements Y and Z.

$$X \rightarrow Y + Z$$

Molar mass of liquid X is 18 amu and it is essential for living organisms for survival. Hence, compound X is water molecule (H_2O).

When electrolysis is done, it produces gases O_2 and H_2. Oxygen gas is produced on positive electrode and hydrogen gas is produced on negative electrode.

Hence, (ii) gas Y is oxygen and (iii) Z is hydrogen gas.

OR

(C) Molar mass of H_2O is 18 g/mol.

Atomic Mass of Hydrogen is 1g/mol. Hence, molar mass of H_2 is 2 g/mol.

Atomic mass of Oxygen is 16 g/mol.

Mass ratio of Z : Y = Mass ratio of $H_2 : O_2$

$= 2 : 16$

$= 1 : 8$

39. (A) Bone

(B) Calcium

(C) (1) B°nes are made up of bone cells called osteocytes.

(2) Bone cells are suspended in a hard matrix made up of calcium and phosphorus.

OR

(C)

Tendon	Ligament
It helps in connecting bone to muscles.	It helps in connecting bone to bone.
It is strong and non-flexible.	It is elastic and flexible.