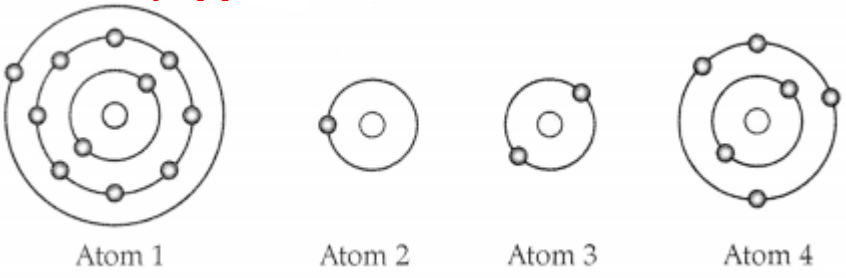
Section – A

(Select and write the most appropriate option out of the four options given for each of the questions 1- 20. There is no negative mark for in correct response:)

Question 1.

The pictures show the arrangement of electrons in the shells of different atoms. which two atoms have the same valency? [1]



(A) Atom 1 and Atom 2
(B) Atom 2 and Atom 3
(C) Atom 3 and Atom 4
(D) Atom 4 and Atom 1

Answer:

Option (A) is correct

Explanation: Valence electrons are the electrons in the outermost shell, or energy level, of an atom. As both the atoms, Atom 1 and atom 2 have only one valence electron, their valency will be the same.

2. Which of these is common for all chemical changes? [1]

(A) Change in shape
(B) Absorption of heat
(C) Increase in volume
(D) Formation of a new substance

Answer:

Option (D) is correct.

Explanation: Chemical reaction is associated with the formation of a new substance.

Question 3.

Which of the following molecules is triatomic? [1]

(A) H_2
(B) C
(C) CO
(D) O_3

Answer:

Option (D) is correct.

Explanation: H_2O has two atoms of hydrogen and one atom of oxygen.

Question 4.

Which of the following atoms are isobars? [1]

(A) ${}_{6}^{12}C$ and ${}_{6}^{14}C$
(B) ${}_{18}^{40}Ar$ and ${}_{20}^{40}Ca$
(C) ${}_{6}^{14}C$ and ${}_{18}^{40}Ar$
(D) ${}_{3}^{6}Li$ and ${}_{6}^{12}C$

Answer:

Option (B) is correct.

Explanation: Isohars have different atomic numbers but the same atomic mass number. Ar and Ca have the same atomic mass number, i.e., 40 but different atomic numbers i.e., 18 and 20 respectively.

Question 5.
What would be the valency of an element that is chemically inactive? [1]
(A) 0
(B) 1
(C) 2
(D) 5
Answer:
Option (A) is correct.
Explanation: Elements with valency zero are chemically inactive as they have completely filled octet/duplet state.

Question 6.
A few substances are arranged in the increasing order of forces of attraction between their particles. Which one of the following represents a correct arrangement? [1]
(A) Water, air, wind
(B) Air, sugar, oil
(C) Oxygen, water, sugar
(D) Salt, juice, air
Answer:
Option (C) is correct.
Explanation: It is because the force of attraction increases in the order: Gas

Question 7.
On converting 25°C, 38°C and 66°C to Kelvin scale, the correct sequence of temperatures will be: [1]
(A)298K,311K and 339K
(B) 298K,300K and 338K
(C) 273 K, 278 K and 543 K
(D) 298 K, 310 K and 338 K
Answer:
Option (A) is correct.
Explanation: On converting 25°C, 38°C and 66°C, to Kelvin scale, we get the following temperatures:
25C + 273 = 298 K
38°C + 273 = 311 K
66°C+273 = 339K

Question 8.
Why do cells of apical meristem lack vacuoles? [1]
(A) They store food materials
(B) They have thin cell walls.
(C) They contain dense cytoplasm.
(D) They are actively dividing cells.
Answer:
Option (D) is correct.
Explanation: Apical meristem cells are young cells and are actively dividing, so they require food instantly and there is no requirement of storing food. Also, they do not produce large amount of waste. Hence, they lack vacuoles.

Question 9.
Which of these cells is the longest? [1]
(A) Bone cell
(B) Nerve cell
(C) Stomach cell
(D) Heart muscle cell

Answer:
Option (B) is correct.
Explanation: Nerve cell is the longest cell in the human body

Question 10.
Amoeba acquires its food through a process, termed: [1]
(A) Exocytosis
(B) Endocytosis
(C) Plasmolysis
(D) Both exocytosis and endocytosis
Answer:
Option (B) is correct.
Explanation: Amoeba acquires its food through a process, termed endocytosis. Endocytosis is the ingestion of material by the cells through their plasma membrane.

Question 11.
The kitchen of the cell is: [1]
(A) Mitochondria
(B) Endoplasmic reticulum
(C) Chloroplast
(D) Golgi apparatus
Answer:
Option (C) is correct.
Explanation: Chioroplasi has a green pigment called chlorophyll and they are involved in the photosynthesis of food. Hence, they are also known as the 'Kitchen of the Cells'.

Question 12.
Flexibility in plants is due to: [1]
(A) Collenchyrna
(B) Sclerenchyma
(C) Parenchyma
(D) Chlorenchyrna
Answer:
Option (A) is correct.
Explanation: Collenchyrna is a mechanical tissue in young dicotyledonous stems and provides great tensile strength with flexibility to those organs in which it is found. It allows easy bending in various parts of a plant.

Question 13.
What is the correct unit for measuring the acceleration of a moving object? [1]
(A) m
(B) s
(C) ms^{-2}
(D) ms
Answer:
Option (C) is correct.
Explanation: Acceleration of a moving object is measured in metres per second per second or metre per second square.

Question 14.
Which of these involves the conversion of kinetic energy to potential energy? [1]
(A) A person diving into a pool of water from a board.
(B) A person gliding in the air with the help of a parachute.
(C) A person sliding down from the top of a water slide.

(D) A person riding a motorbike to the top of an overbridge.
Answer:
Option (D) is correct.
Explanation: The person riding motorbike has kinetic energy due to motion, which gets converted into potential energy after getting to the top of an overbridge.

Question 15.
Which of these nutrients is required by plants in large quantities? [1]
(A) Iron
(B) Zinc
(C) Potassium
(D) Manganese
Answer:
Option (C) is correct.
Explanation: Potassium is a macronutrient that means plants require potassium in larger quantities.

Question 16.
To solve the food problem of the country, which among the following is necessary? [1]
(A) Increased production and storage of food grains.
(B) Easy access of people to the food grains.
(C) People should have money to purchase the grains.
(D) All of the above
Answer:
Option (D) is correct.
Explanation: To solve the food problem of the country there should be increase in the production and storage of food grains, There should be easy access of people to the food grains and people should have money to purchase the grains.

Assertion-Reason-Based Question's

Question No. 17 to 20 consist of two statements — Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(A) Both (A) and (R) are true, and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true, and (R) is not the correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.
Question 17.
Assertion (A): When heat energy is supplied to the solid, it starts melting.
Reason (R): Solid particles take up the heat and help in melting. [1]
Answer:
Option (A) is correct.
Explanation: When heat energy is supplied to the solid, the solid particles take up the heat energy supplied to them and vibrate
more rapidly as they absorb kinetic energy. Eventually, the organisation of the particles within the solid structure begins to break down, and the solid starts to melt.

Question 18.
Assertion (A): Guard cells are specialised epidermal cells.
Reason (R): Stomata are found in the epidermis of leaves. [1]
Answer:
Option (B) is correct.
Explanation: Stomata are present in the epidermis of leaves. They are essential for transpiration and gaseous exchange. Stomata are minute apertures bounded by two specialised epidermal cells called guard cells.

Question 19.
Assertion (A): Mass of an object is always zero.
Reason (R): Mass of an object is the measure of its inertia and the substance contained by the body. [1]
Answer:
Option (D) is correct.
Explanation: Mass of an object can never be zero because mass of an object is the measure of its inertia and the substance contained by the body.

Question 20.
Assertion (A): The presence of weeds affects the crop field.
Reason (R): Weeds compete for food, space and light. [1]
Answer:
Option (A) is correct.
Explanation: Vecds are unwanted plants in the cultivated field. e.g., Xanthiurn, Partheniurn, Cyperusrotundus. '&eds take up nutrients and reduce the growth of the crop. Therefore, their removal is necessary.

Section – B
(Questions No. 21 to 26 are very short answer questions)

Question 21.
What are polyatomic ions? list two examples. [2]
Answer:
A group of atoms carrying a charge is known as polyatomic ion.
e.g., PO_4^{3-}' , SO_4^{2-}, NH_4^+

Question 22.
List two points of differences between parenchyma and sclerenchyma. [2]
Answer:
Parenchyma: In this, cells with thin cell walls are found and are usually loosely packed so that large intercellular spaces are found.
Sclerenchyma: In this, cells are dead and cell wall is thickened due to lignin It provides strength to plants.

Question 23.
What is plasrnolvsis? What happens to a plasmolysed cell when it is placed in water? [2]
OR
Differentiate the following activities on the basis of voluntary(V) or involuntary (IV) muscles.
(a) Jumping of frog
(b) Pumping of the heart
(c) Writing with hand
(d) Movement of chocolate in your intestine.
Answer:
Shrinkage of protoplast from the cell wall in the presence of hypertonic solution due to exosmosis is known as plasmolysis. When a plasmolyse cell is placed in water, the concentration of water in the outside medium is more than the concentration of water inside the cell, Hence, water moves inside the cell leading to its swelling.

OR

(a) Voluntary muscle: Jumping of a frog is a voluntary activity as a frog jumps on its own will.
(b) Involuntary muscle: Pumping of the heart is an involuntary activity as in the heart, there are cardiac muscles which contract
and relax rhythmically throughout their life involuntarily.

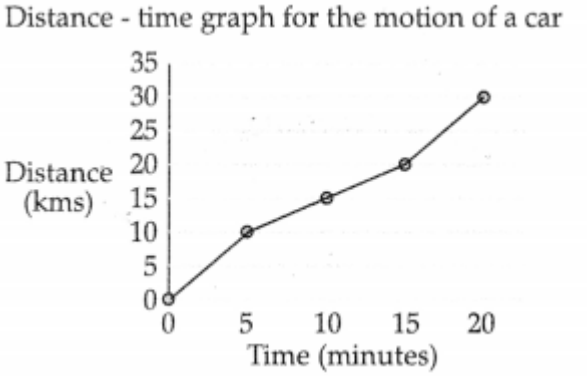
(c) Voluntary muscle: Writing with hand is a voluntary activity because we write on our will.
(d) Involuntary muscle: Movement of chocolate in your intestine is an involuntary activity due to the presence of smooth muscles in the intestine.

Question 24.
A man pushes four boxes of different mass. [2]
The table shows the acceleration produced for each box during the push.

Mass of the box (kg)	Acceleration produced (m/s^2)
10	200
20	100
40	50
80	25

What amount of force does the man exert on each box? Is the force acting on each box unbalanced? Explain ‘our answer.
Answer:
By using the formula for force,
F = ma
Here, in each case, it will be 2000 N.
To have unbalanced forces means that the force applied in one direction is greater than the force applied in the opposite direction, When unbalanced forces are acting on an object, there is a change in speed and, or direction. Here, the force acting on each box is unbalanced as acceleration is produced in each case and each box gets pushed.

Question 25.
The given graph shows how the car travelled from house to school. [2]
Distance – time graph for the motion of a car



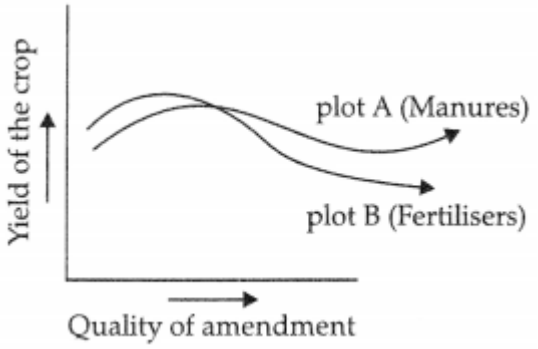
Did the car move with uniform motion from house to school? Explain your answer.
OR
While driving a vehicle how does the use of safety belts prevents accidents? To show that a body remains at rest unless acted upon by an unbalanced force, mention one situation from everyday life.
Answer:
No, the car did not travel with uniform motion. This is because the car moved with different speed in between 10 km and 20 km in its way. The speed (distance/time) up to 10 km was 2 km/mm, then it travelled at a speed 1 km/min till it reached 20 km distance. Afterwards, it again resumed with the speed of 2 km/mm to reach 30 km distance. So, the car travelled in non-uniform motion as it travelled with different speeds at different time intervals.

OR
As per Newton's first law of motion, when a car abruptly stops or crashes, Due to inertia of motion, a person sitting in a moving car may be pushed forward potentially causing damage.

To prevent the above accident, a seat belt must be used while driving a car. An example to show that a body remains at rest unless acted upon by an unbalanced forcer: is pedalling of the bicycle.

when we stop pedalling, the bicycle begins to slow down. In order to keep the bicycle moving, we have to start pedalling again. It thus appears that an object maintains its motion under the continuous application of an unbalanced force and as soon as the unbalanced force is removed it tends to get back to its rest position.

Question 26.
The graph below shows two crop yields Eplot A and B that have been treated by manures and chemical fertilisers respectively, keeping other environmental factors the same. [2]
Answer the following questions:



(a) Why does plot B show sudden increase and then gradual decrease in yield?
(b) Why is the highest peak in plot A graph slightly delayed?
Answer:
(a) Addition of chemical fertilisers in plot B will increase yield suddenly due to availability of NPK nutrients which improve the soil fertility but it is for short duration so there is a gradual decrease in yield afterwards.

(b) In plot A, manures supply nutrients slowly to the soil. Manures contain large quantity of organic matter that is slowly decomposed by microbes to release nutrients in small quantities. Thus, manures enrich soil fertility gradually.

Section – C
(Questions No. 27 to 33 are short answer questions)

Question 27.
(a) Define latent heat of vaporisation. [3]
(b) Give reasons for the following: You feel cold when you pour some nail polish remover on your palm.
(c) Explain: During summer, sitting under a fan makes us comfortable.
Answer:
(a) The amount of heat energy required to change 1 kg of a liquid to gas at atmospheric pressure at its boiling point is called latent heat of vaporisation.
(b) Particles gain heat energy from the palm and evaporate causing the palm to feel cool.
(c) When we sit under a fan during summer, rate of evaporation of sweat increases due to increase in wind speed. Sweat takes heat from body to evaporate leaving us cool.

Question 28.
Rahul and Manav each were given a mixture of iron filings and sulphur powder. Rahul heated the mixture strongly and a new substance was formed. Write three points of difference between the two. [3]
OR
A teacher told three students A, B and C to prepare 25% solution (mass by volume) of KOH. Student A dissolved 25 g of KOH in 1oo g of water, student B dissolved 25 g of KOH in 100 mL of water and student C dissolved 25 g KOH in water and made the volume 1X mL Which one of them has made required 25% solution? Give your answer with reason. [3]
Answer:
Rahul has a compound formed after heating the two components of a mixture, Manav still has an untreated mixture. The difference between a compound and mixture are as follows:

Compound	Mixture
(i) Elements react to form a compound.	Elements of compounds get mixed together.
(ii) Fixed composition.	Variable composition.
(iii) Totally different properties.	Shows properties of constituent substances.

OR
'C' has made the desired solution. 'C' dissolved the 25g of KOH in water and made the volume up to 100 ml, which is 25% solution of KOH (mass by volume). 'A' dissolved 25 g of KOH is 1oo g of water that made the volume 150 g. 'B dissolved the 25 g of KOH in 100 ml of water which also made the volume 150 ml.

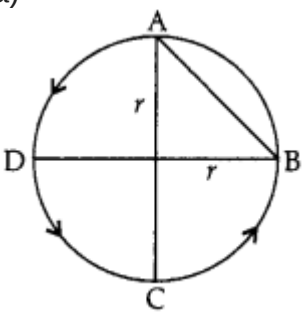
Question 29.
Why are lysosomes known as suicidal bags? [3]
Answer:
Lysosomes are a kind of waste disposal system of cell. They help to keep the cell clean by digesting any foreign material as well as worn-out cell organelles. Foreign material entering the cell such as bacteria or food ends up in lysosomes.

During the disturbance in cellular metabolism, lysosomes may burst and the enzymes digest their own cell. Therefore, lysosomes are also known as suicidal bags. Lysosomes are able to do this because they contain powerful enzymes capable of breaking down all organic material.

Question 30.
Classify meristematic tissues on the basis of the region the are present. Also, mention their functions. [3]
Answer:
On the basis of the region they are present, meristems can be of following types:

- Apical meristems: Increase the length of stem and roots.
- Lateral meristems: Increase girth.
- Intercalary meristems: Increase the length of internodes.

Question 31.
A particle moves over three-quarters of a circle of radius r cm. Calculate the magnitude of:
(a) its distance and
(b) displacement.
Answer:
(a)



A particle moves over three-quarters of a circle to radius r cm.
Distance travelled = $2\pi r \times \frac{3}{4} = \frac{3}{2}\pi r$ cm
(b)
AB is the displacement
To find AB, let us use Pythagoras' theorem in Δ AOB
$AB^2 2 = OA^2 + OB^2$
Or $AB^2 = r^2 + r^2$
Or $AB2 = 2r^2$
or $AB = \sqrt{2r^2}$
$AB = r\sqrt{2}$
Thus the magnitude of the displacement is $r\sqrt{2}$
Question 32.
Explain:
(a) Universal gravitational constant
(b) Free fall
Answer:
(a) Universal gravitational constant is the constant 'G' appearing in Newton's law of gravitation.
$F = \frac{GMm}{r^2}$

where F is the force between two masses m and M at a distance r apart. The numerical value of G is equal to 6.673×10^{-11} Nm^2kg^{-2} The value of G was found out by Henry Cavendish (1731- 1810) by using a sensitive balance.
(b) Free fall: Whenever objects fall towards the Earth under the effect of gravitational force alone, we can say that the objects are in free fall. While falling there is no change in the direction of motion of the objects. But the objects get accelerated towards earth with acceleration due to gravity $9.8 m/s^2$.

Question 33.
In which direction do the following forces act when an object is in motion:
(a) Frictional force
(b) Gravitational force
(c) Centripetal force
Answer:
(a) Opposite to the direction of motion.
(b) Downwards
(c) Towards the centre

Section – D
(Questions No. 34 to 36 are long answer questions)

Question 34.
(a) Can a homogeneous mixture have a variable composition? Justify giving an example.
(b) What happens when:
(i) Dilute sulphuric acid is added to a mixture of iron filings and sulphur powder.
(ii) Dilute sulphuric acid is added to a mixture of iron filings and sulphur powder heated to red hot followed by cooling. [5]
OR
(a) List any two properties that liquids have in common with gases.
(b) Give two reasons to justify that an iron almirah is a solid at room temperature.
(c) What happens to the heat energy which is supplied to the solid once it starts melting?
Answer:
(a) Homogenous mixtures can have variable composition A mixture with a variable composition means that it is composed of
molecules or atoms of differing types. These may have intermolecular bonds or bonds between molecules, but such bonds are
not nearly as strong as those formed when elements bond to form a compound. Example: sugar solution.

(b)
(i) Results in the formation of ferrous sulphate and evolution of hydrogen.

$$Fe + H_2SO_4(aq) \longrightarrow FeSO_4 + H_2$$

Iron — Sulphuric Acid — Ferrous Sulphate — Hydrogen

(ii) Results in the formation of iron sulphide which reacts with sulphuric acid to form ferrous sulphate and release ol hydrogen
disulphide gas.

$$FeS + H_2SO_4(aq) \longrightarrow FeSO_4 + H_2S$$

Iron — Suphuric Acid — Ferrous Sulphate — Hydrogen Sulphide

Question 35.
On the basis of the number of cells. living organisms are classified as unicellular and multicellular.
(a) Name two unicellular organisms.
(b) What is meant by division of labour ii multicellular organisms?

(c) Name one prokaryotic and one eukaryotic unicellular organism.
(d) 'Every multicellular organism has come from a single cell.' Justify this statement.
(e) Write one common feature between an Amoeba and white blood cells of humans.[5]

OR

(a) Name the connective tissue which is the hardest. What makes it so hard?
(b) List any three important functions of this tissue. [5]
Answer:
(a) Amoeba and Euglena arc unicellular organisms.

(b) Multicellular organisms are made up of millions and trillions of cells. All these cells perform specific functions. All the cells
specialised for performing similar functions are grouped together as tissues in the body. Hence, a particular function is carried out by a group of cells at a definite place in the body. Similarly, different functions are carried out by different groups of cells in an organism. This is known as the division of labour in multicellular organisms.

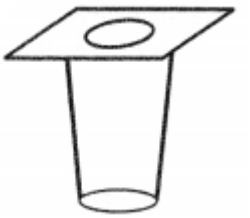
(c) Prokaryotic- Bacteria, Eukaryotic – Amoeba.

(d) Yes, every cell of the multicellular organism has come from a single cell. After fertilisation, a single cell is formed. The zygote is actually a single cell. The zygote gives rise to all the cells of our body.

(e) Both, Amoeba and white blood cells of humans do not have any fixed shape.

OR
(a) Bone is the hardest connective tissue. Hard matrix composed of Ca and P compounds makes it hard.
(b) Functions:
(i) Forms framework of body.
(ii) Anchors muscles.
(iii) Supports the main organs of body and provides protection to them (e.g., brains, lungs).

Question 36.
(a) State Newton's Second Law of Motion. Express it mathematically and find the SI unit of force from it.
(b)



In the diagram given above, if the card is flicked away with a jerk, what will you observe? Explain the reason for this observation. [5]
OR
(a) Define momentum. Write iLs 5.1. unit.
(b) How much momentum will an object of mass 10 kg transfer to the floor, if it falls from a height of 5 m (g =10 m/s^2)?
(c) Explain how a karate player can break a pile of bies with a sng1e blow of his hand?
Answer:
(a) Newton's Second Law of Motion states that the rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of force. It is expressed mathematically as,

Mathematical formulation: If a body of mass (m), moving with velocity (u) accelerates uniformly for time (t), so that its velocity
changes to v, then
Initial momentum $p_1 = mu$
Final momentum $P_2 = mv$
Change in momentum = $P_2 - P_1$
$= m_v - m_u$
$= m (v - u)$

According to the second law of motion, force change in momentum
$F \propto \frac{\text{change in momentum}}{\text{time}}$
$F \propto \frac{p_2 - p_1}{t}$
$F \propto \frac{m(v-u)}{t}$
$F = \frac{km(v-u)}{t}$
F = kma
F = ma
Thus,
we know that
$\therefore a = \frac{v-u}{t}$
(Here k= 1)
Unit of force = kg m^{-2}
The SI unit of force is Newton (N).
(b) We will observe that the card moves ahead allowing the coin to fall vertically into the glass. This is due to inertia. The inertia of the countries to maintain its state of rest.

OR

(a) The momentum of an object is the product of its mass and velocity and has the same direction as that of the velocity.
SI unit of momentum is kg m/s.

(b) $v^2 = u^2 + 2gh$
$v^2 = (0)^2 + 2(10)(5)$
$v^2 = 100$
$\therefore u = 10 m/s$
Momentum, $p = m \times v$
$= 10 \times 10 = 100$ kgm/s

(c) The karate player strikes the pile of tiles with his hand very fast. In doing so, the large momentum of a fast-moving hand is reduced to zero in a very short time. This exerts a very large force on the pile of tiles which is sufficient to break them.

Section – E

(Questions No. 37 to 39 are case-based! data-based questions with 2 f03 short sub-parts. Internal choice is provided in one of these sub-parts.)

Question 37.
The following data represents the distribution of electrons, protons and neutrons in atoms of four elements A, B, C, and D. Understand the data carefully and answer the following questions.

Element	Protons	Neutrons	Electrons
A	9	10	9
B	16	16	16
C	12	12	12
D	17	18	17

(a) State the electronic configuration of element B. What will he the vaìencv of element B? [4]
(b) What will he atomic number of element D?
OR
Calculate the atomic mass number for element D.
Answer:
(a) The electronic configuration of element B = 2, 8, 6.. There are six valence electrons in its outermost shell, So, valency = (8 – no. o
valence electrons) = 8 – 6 = 2.

(b) Atomic number of elements = Number of protons in that element = Number of electrons, so the atomic number of element D will be 17.
OR
Mass number = Number of Protons + Number of Neutrons, so for element D it will be 17 + 18 = 35.

Question 38.
Study the given figure and answer the following questions.

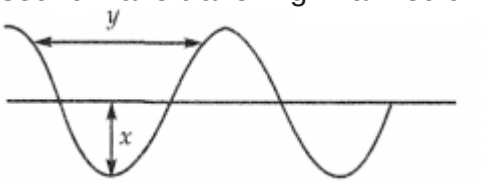

A-Cells


B-Cells

(a) Identify A and B cells.
(b) What will happen if B cells are kept in a hypotonic solution?
(c) What is an isotonic solution? [4]
OR
What is plasmolysis? [4]
Answer:
(a) A cells – Turgid cells, B cells – Plasmolysed cells
(b) B cells kept in a hypotonic solution will become deplasmolysed if done so immediately after plasmolysis.
(c) Isotonic solution: A solution that has the same tonicity as another solution with which it is compared.

OR
Shrinkage of protoplast mainly caused due to loss of water in the cell.

Question 39.
A sound wave travelling in a medium is represented as shown in the figure:



(a) Which letter represents the amplitude of the sound wave?
(b) Which letter represents a wavelength of the wave?
(c) What is the frequency of the source of sound if the vibrating source of sound makes 360 oscillations in two minutes? [4]
OR
Calculate the time period of the source of sound in the above case. [4]
Answer:
(a) x
(b) y

m = Number of oscillations Time
= 3602×60
= 3 Hz
OR
Time period. T = 1n=13 = s.

Section – D
(Questions No. 34 to 36 are long answer questions)

Question 34.
(a) Can a homogeneous mixture have a variable composition? Justify giving an example.
(b) What happens when:
(i) Dilute sulphuric acid is added to a mixture of iron filings and sulphur powder.
(ii) Dilute sulphuric acid is added to a mixture of iron filings and sulphur powder heated to red hot followed by cooling. [5]
OR
(a) List any two properties that liquids have in common with gases.
(b) Give two reasons to justify that an iron almirah is a solid at room temperature.
(c) What happens to the heat energy which is supplied to the solid once it starts melting?
Answer:
(a) Homogenous mixtures can have variable composition A mixture with a variable composition means that it is composed of
molecules or atoms of differing types. These may have intermolecular bonds or bonds between molecules, but such bonds are
not nearly as strong as those formed when elements bond to form a compound. Example: sugar solution.

(b)
(i) Results in the formation of ferrous sulphate and evolution of hydrogen.

$$Fe + H_2SO_4(aq) \longrightarrow FeSO_4 + H_2$$

Iron — Sulphuric Acid — Ferrous Sulphate — Hydrogen

(ii) Results in the formation of iron sulphide which reacts with sulphuric acid to form ferrous sulphate and release ol hydrogen

disulphide gas.

$$FeS + H_2SO_4(aq) \longrightarrow FeSO_4 + H_2S$$

Iron — Suphuric Acid — Ferrous Sulphate — Hydrogen Sulphide

Question 35.
On the basis of the number of cells. living organisms are classified as unicellular and multicellular.
(a) Name two unicellular organisms.
(b) What is meant by division of labour ii multicellular organisms?
(c) Name one prokaryotic and one eukaryotic unicellular organism.
(d) 'Every multicellular organism has come from a single cell.' Justify this statement.
(e) Write one common feature between an Amoeba and white blood cells of humans.[5]

OR

(a) Name the connective tissue which is the hardest. What makes it so hard?
(b) List any three important functions of this tissue. [5]
Answer:
(a) Amoeba and Euglena arc unicellular organisms.

(b) Multicellular organisms are made up of millions and trillions of cells. All these cells perform specific functions. All the cells
specialised for performing similar functions are grouped together as tissues in the body. Hence, a particular function is carried out by a group of cells at a definite place in the body. Similarly, different functions are carried out by different groups of cells in an organism. This is known as the division of labour in multicellular organisms.

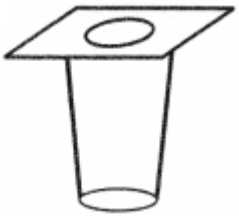
(c) Prokaryotic- Bacteria, Eukaryotic – Amoeba.

(d) Yes, every cell of the multicellular organism has come from a single cell. After fertilisation, a single cell is formed. The zygote is actually a single cell. The zygote gives rise to all the cells of our body.

(e) Both, Amoeba and white blood cells of humans do not have any fixed shape.

OR
(a) Bone is the hardest connective tissue. Hard matrix composed of Ca and P compounds makes it hard.
(b) Functions:
(i) Forms framework of body.
(ii) Anchors muscles.
(iii) Supports the main organs of body and provides protection to them (e.g., brains, lungs).

Question 36.
(a) State Newton's Second Law of Motion. Express it mathematically and find the SI unit of force from it.
(b)



In the diagram given above, if the card is flicked away with a jerk, what will you observe? Explain the reason

for this observation. [5]
OR
(a) Define momentum. Write iLs 5.1. unit.
(b) How much momentum will an object of mass 10 kg transfer to the floor, if it falls from a height of 5 m (g =10 m/s^2)?
(c) Explain how a karate player can break a pile of bies with a sng1e blow of his hand?
Answer:
(a) Newton's Second Law of Motion states that the rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of force. It is expressed mathematically as,

Mathematical formulation: If a body of mass (m), moving with velocity (u) accelerates uniformly for time (t), so that its velocity
changes to v, then
Initial momentum $p_1 = mu$
Final momentum $P_2 = mv$
Change in momentum = $P_2 - P_1$
$= m_v - m_u$
$= m (v - u)$

According to the second law of motion, force change in momentum
F ∝ *[Math Processing Error]*
F ∝ *[Math Processing Error]*
F ∝ *[Math Processing Error]*
F = *[Math Processing Error]*
F = kma
F = ma
Thus,
we know that
∴ a = *[Math Processing Error]*
(Here k= 1)
Unit of force = kg m^{-2}
The SI unit of force is Newton (N).

(b) We will observe that the card moves ahead allowing the coin to fall vertically into the glass. This is due to inertia. The inertia of the countries to maintain its state of rest.

OR

(a) The momentum of an object is the product of its mass and velocity and has the same direction as that of the velocity.
SI unit of momentum is kg m/s.

(b) $v^2 = u^2+2gh$
$v^2 = (0)^2 + 2(10) (5)$
$v^2 = 100$
∴ u = 10m/s
Momentum, p = m × v
= 10 × 10 = 100 kgm/s

(c) The karate player strikes the pile of tiles with his hand very fast. In doing so, the large momentum of a fast-moving hand is reduced to zero in a very short time. This exerts a very large force on the pile of tiles which is sufficient to break them.

Section – E

(Questions No. 37 to 39 are case-based! data-based questions with 2 f03 short sub-parts. Internal choice is provided in one of these sub-parts.)

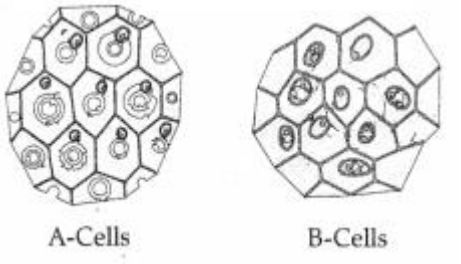
Question 37.
The following data represents the distribution of electrons, protons and neutrons in atoms of four elements A, B, C, and D. Understand the data carefully and answer the following questions.

Element	Protons	Neutrons	Electrons
A	9	10	9
B	16	16	16
C	12	12	12
D	17	18	17

(a) State the electronic configuration of element B. What will he the vaìencv of element B? [4]
(b) What will he atomic number of element D?
OR
Calculate the atomic mass number for element D.
Answer:
(a) The electronic configuration of element B = 2, 8, 6.. There are six valence electrons in its outermost shell, So, valency = (8 – no. o
valence electrons) = 8 – 6 = 2.

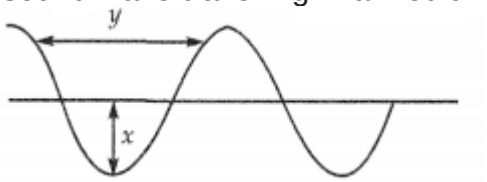
(b) Atomic number of elements = Number of protons in that element = Number of electrons, so the atomic number of element D will be 17.
OR
Mass number = Number of Protons + Number of Neutrons, so for element D it will be 17 + 18 = 35.

Question 38.
Study the given figure and answer the following questions.



(a) Identify A and B cells.
(b) What will happen if B cells are kept in a hypotonic solution?
(c) What is an isotonic solution? [4]
OR
What is plasmolysis? [4]
Answer:
(a) A cells – Turgid cells, B cells – Plasmolysed cells
(b) B cells kept in a hypotonic solution will become deplasmolysed if done so immediately after plasmolysis.
(c) Isotonic solution: A solution that has the same tonicity as another solution with which it is compared.
OR
Shrinkage of protoplast mainly caused due to loss of water in the cell.

Question 39.
A sound wave travelling in a medium is represented as shown in the figure:



(a) Which letter represents the amplitude of the sound wave?
(b) Which letter represents a wavelength of the wave?
(c) What is the frequency of the source of sound if the vibrating source of sound makes 360 oscillations in two minutes? [4]
OR
Calculate the time period of the source of sound in the above case. [4]
Answer:
(a) x
(b) y

m = *[Math Processing Error]*
= *[Math Processing Error]*
= 3 Hz
OR
Time period. T = *[Math Processing Error]* = s.

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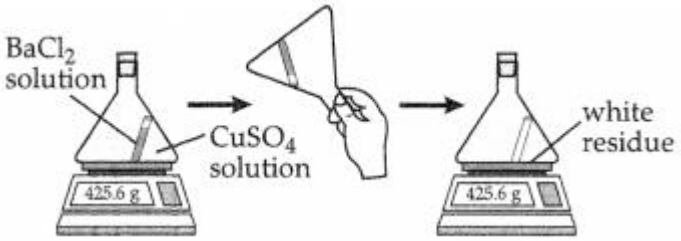
Section – A

(Select and write the most appropriate option out of the four options given for each of the questions 1 -20. There is no negative mark for incorrect response:)

Question 1.
Alia mixed $Bacl_2$ solution and $CuSO_4$ solution in a closed conical flask. [1]



What can he concluded from the result of the experiment?
(A) Total mass of the chemicals remains the same.
(B) Total volume of the chemicals remains the same.
(C) State of matter of the chemicals remains the same.
(D) Composition of the chemicals remains the same.
Answer:
Option (A) is correct.
Explanation: As per the law of conservation of mass, total mass of the chemicals remains the same.

Question 2.
During summer, water kept in an earthen pot becomes cool because of the phenomenon of: [1]
(A) Diffusion
(B) Transpiration
(C) Osmosis
(D) Evaporation
Answer:
Option (D) is correct.
Explanation: It is because of the phenomenon called evaporation. An earthen pot has a large number of tiny pores in its walls and some of the water molecules continuously keep seeping through these pores to outside the pot. This water evaporates continuously and takes the latent heat required for vaporization from the remaining water. In this way, the remaining water loses heat and gets cooled.

Question 3.
Which of the following are chemical changes? [1]
(i) Decaying of wood
(ii) Burning of wood
(iii) Sawing of wood
(iv) Hammering of a nail into a piece of wood
(A) (i) and (ii)
(B) (ii) and (iii)
(C) (iii) and (iv)
(D) (i) and (iv)
Answer:
Option (A) is correct.
Explanation. Decaying of wood and burning of wood are chemical changes because in these processes, the chemical composition of wood is changed and new substances are formed. which cannot be converted back into their original form. Sawing of wood and hammering of a nail into a piece of wood are physical changes. I

Question 4.
The picture shows the symbol for sodium. [1]

$$^{23}_{11}Na$$

What can be concluded about sodium from the symbol?
(A) It contains 11 neutrons
(B) It contains 12 protons
(C) It contains 12 neutrons

(D) It contains 34 electrons
Answer:
Option (C) is correct.
Explanation: Atomic number, i.e., the number of protons in the element is written at the bottom and atomic mass number which is the sum of protons and neutrons is written at the top of the symbol. It means the sodium atom contains 11 protons and 12 (23-11) neutrons.

Question 5.
Rutherford's alpha particle scattering experiment resulted into the discovery of: [1]
(A) Electron
(B) Proton
(C) Nuclens in the atom
(D) Atomic mass
Answer:
Option (C) is correct.
Explanation: Rutherfords' alpha particle experiment led to the discovery of the nucleus in the atom.

Question 6.
Which condition out of the following will increase the evaporation of water? [1]
(A) Increase in temperature of water
(B) Decrease in temperature of water
(C) Less exposed surface area of water
(D) Adding common salt to water.
Answer:
Option (A) is correct.
Explanation: On increasing the temperature, kinetic energy of water molecules increases and more particles get enough kinetic energy to go into the vapour state- This increases the rate of evaporation. On the other hand, decrease in temperature of water, less exposed surface area of water, and addition of common salt to water decrease the rate of evaporation.

Question 7.
The boiling points of diethyl ether, acetone, and n-butyl alcohol are 35°C, 56°C and 118°C, respectively. Which one of the following correctly represents their boiling points in Kelvin scale? [1]
(A) 306K,329K,391K
(B) 308K,329K,392K
(C) 308K,329K,391K
(D) 329K,392K,308K
Answer:
Option (C) is correct.
Explanation: On applying the formula,
T°C + 273 = K,
The boiling point of diethyl ether 35°C + 273 = 308 K
Boiling point of acetone = 56° C + 273 = 329 K
and Boiling point of n-butvl alcohol = 118°C+273 = 391K.
Hence, the correct order of boiling points in Kelvin scale is 308 K, 329 K, and 391 K.

Question 8.
Girth of stem increases due to: [1]
(A) Apical meristem
(B) Lateral meristem
(C) vertical meristem
(D) Intercalary meristem
Answer:

Option (B) is correct.
Explanation: Girth of the Stem increases due to lateral meristematic tissue. They are found beneath the bark (called cork cambium) and in vascular bundles of dicot roots and sterns (called vascular cambium) as thin layers. This increase in the diameter or girth of the plant is called secondary growth.

Question 9.
The undefined nuclear region of prokaryotes is also known as: [1]
(A) Nucleus
(B) Nucleolus
(C) Nucleic acid
(D) Nucleoid
Answer:
Option (D) is correct.
Explanation: The undefined nuclear region of a prokaryotic cell is called nuclecid. The prokaryotic cells lack true nucleus. A circular
DNA lies naked in the cytoplasm.

Question 10.
The proteins and lipids, essential for building the cell membrane, are manufactured by: [1]
(A) Endoplasmic reticulum
(B) Golgi apparatus
(C) Plasma membrane
(D) Mitochondria
Answer:
Option (A) is correct.
Explanation: Rough endoplasmic reticulum (RER) is associated with the synthesis of proteins while smooth endoplasmic reticulum (SER) is associated with the synthesis of lipids.

Question 11.
Which muscles act involuntarily? [1]
(i) Striated muscles
(ii) Smooth muscles
(iii) Cardiac muscles
(iv) Skeletal muscles
(A) (i) and (ii)
(B) (ii) and (iii)
(C) (iii) and (iv)
(D) (i) and (iv)
Answer:
Option (B) is conect.
Explanation: The working of both smooth and cardiac muscles arc involuntarily while skeletal (also known as or striated) muscles move according to our will i.e. are voluntary in action.

Question 12.
Which of these properties qualifies Amoeba as eukaryote? [1]
(A) It is unicellular
(B) It needs food for energy
(C) It has a membrane-bound nucleus
(D) It is surrounded by a plasma membrane
Answer:
Option (C) is correct
Explanation: Amoeba has membrane-bound nucleus which is a characteristic found in eukaryotic cells only.

Question 13.
Area under the v – t graph represents a physical quantity, which has the unit: [1]
(A) m^2
(B) m
(C) ms^2
(D)ms^{-1}
Answer:
Option (B) is correct.
Explanation: Area under v-t graph represents displacement whose unit is metro or (m).
It is because, unit of velocity v = m/s and unit of time = s.
Hence, unit of (v-t) graph m/s × s = m.
Hence, the unit of (v-t) graph is metre (m).

Question 14.
In case of negative work, the angle between the force and displacement is? [1]
(A) 0°
(B) 45°
(C) 90°
(D) 180°
Answer:
option (D) is correct
Explanation: In case of negative work, the angle between the force and displacement is 18o°.

Question 15.
Which one of the following nutrients is not available in fertilisers? [1]
(A) Nitrogen
(B) Phosphorus
(C) Iron
(D) Potassium
Answer:
Option (C) is correct
Explanation: Fertilisers supply nitrogen, phosphorus and potassium (NPK), but not iron.

Question 16.
The quality of honey differs from sample to sample. Which of these decides the quality of a honey sample? [1]
(A) Time of the day when the bees collect nectar.
(B) Time taken b' the bees to build the beehive.
(C) type of flower from which the bees collect nectar.
(D) Size of the beehive from which the honey is collected.
Answer:
Option (C) is coned.
Explanation: The type of flower from which the bees collect nectar decides the quality of honey.

Assertion-Reason Based Questions
Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:
(A) Both (A) and (R) are true, and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true, and (R) is not the correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.

Question 17.
Assertion (A): è prefer to wear cotton clothes during summer.

Reason (R): Cotton clothes are good absorber of water. [1]
Answer:
Option (A) is correct.
Explanation: Cotton being good absorber of water helps in absorbing the sweat, which on evaporation gives a cooling sensation in the body.

Question 18.
Assertion (A): Mitochondria are semi-autonomous cell organdies.
Reason (R): Mitochondria generate energy. [1]
Answer:
Option (B) is correct.
Explanation: Mitochondria have their own DNA and ribosome to make proteins. They can replicate independently of nuclear DNA. Hence, they are known as semi-autonomous organelles. They are also associated with ATP production.

Question 19.
Assertion (A): On Moon, humans feel lighter than on Earth.
Reason (R): It is due to more gravitational force exerted by Moon on man. [1]
Answer:
Option (C) is correct.
Explanation: On Moon, humans feel lighter than on Earth. It is due to less gravitational force exerted by Moon on man.

Question 20.
Assertion (A): Cattles are fed with roughage and concentrates.
Reason (R): Roughage provides fibers while concentrates provide proteins and other nutrients. [1]
Answer:
Option (A) is correct.
Explanation: Roughage produces fibres while concentrates provide proteins and other nutrients. Hence cattle are fed with roughage and concentrates.

Section – B
(Questions No. 21 to 26 are very short answer questions)

21. Write the chemical formula for: [2]
(a) Zinc phosphate
(b) Lead carbonate
Answer:
(a) $Zn_3(PO_4)_2$
(b) $PbCO_3$

Question 22.
Distinguish between cell wall and cell membrane. [2]
Answer:
Differences between cell wall and cell membrane:

Cell wall	Cell membrane

(1) It is present only in plant cells.	It occurs both in animal cells and plant cells.
(2) It is dead in nature and permeable.	It is a living membrane and is semi-permeable.

Question 23.
Why is the plasma membrane called a selectively permeable membrane? [2]
OR
Differentiate between voluntary and involuntary muscles. Give one example of each type.
Answer:
The plasma membrane is called a selectively permeable membrane because it allows only some substances to pass through it.
OR
Differences between voluntary and involuntary muscles:

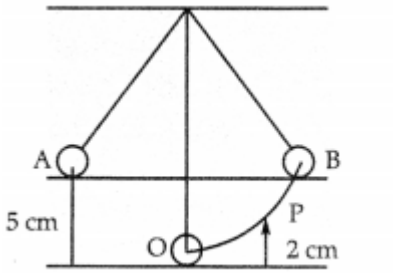
Voluntary muscles	Involuntary muscles
(1) Those muscles whose action is normally controlled by an individual's will,	Those muscles that contract without conscious control.
(2) Example: Skeletal muscles which are present in limbs (quadriceps, biceps, and pectoralis. etc.)	Example: Smooth muscles which are present in iris or the eye, bronchi of the lungs, and ureter.

Question 24.
The table below shows the speed of a bus in three hours of its travel.

Time	First hour	Second-hour	Third hour
Speed of the bus	35 km/h	60 km/h	40 km/h

Calculate the average speed of the bus.
Answer:
Average speed = Total distance covered Total Time taken
Here is the total distance covered
35 km +60 km + 40 km 135 km
Total time taken = 3 hours

Therefore.
Average speed = 1353 = 45 km/hr
Hence, the average speed of the bus is 45 knVhr.
Question 25.
The following diagram shows a simple pendulum consisting of a bob of mass 100 g. Initially, the bob of the pendulum is at rest at 'O'. Ills then displaced to one side at A. The height of 'A' above 'O' is 5 cm. What is the value of kinetic energy and potential energy of the bob at the position P' whose height above O is 2 cm? [2]
OR
When an object is immersed in the fluid name the two forces acting on it? [2]

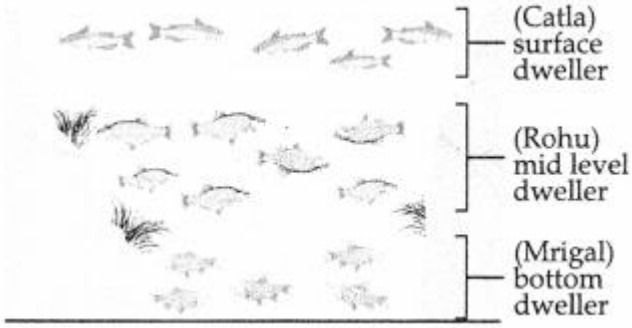


Answer:
We know that potential energy RE. is given by formula,
P.E. = mgh
Therefore, at height 5 cm
P.E. = 0.1 kg × 10 m/s^2 × 0.05m
P.E. = 0.05 J

Now, at point A,
Total energy = P.E. + K.E.
E = 0.05 + 0 = 0.05 J (As the bob starts (rom
rest, K.E. will be zero.)

Now, at point P (at height 2cm),
P.E = 0.1 kg ×10 m/s^2 × 0.02 m
P.E = 0.02 J
Now
K.E. = Total energy -PE.
K.E. = 0.05-0.02 = 0.03 J
OR
When an object is immersed in the fluid name the two forces acting on it are downward gravitational force and upward buoyant force.

Question 26.
The diagram shows a composite fish culture pond. [2]



(a) What is composite fish culture?
(b) What is the advantage of such composite fish culture?
Answer:

(a) Composite hsh culture is a process of growing different types of fish in the same pond.
(b) Its advantage is, all areas of the pond are utilized for better fish production.

Section – C
(Questions No. 27 to 33 are short answer questions)

Question 27.
(a) Why path of light is not visible in a solution when a beam of light is passed through it?
(b) Classify each of following as solution, colloid or suspension:
(i) A mixture whose particles are big enough to scatter a beam of light passing through it.
(ii) A mixture whose particles settle down when it is left undisturbed. [3]
Answer:
(a) Because of small size, the particles cannot scatter a beam of light that is why path of light is not visible in a solution when a beam of light is passed through it.
(b)

- Colloids
- Suspension.

Question 28.
What is the effect of change of pressure on physical state of matter? Explain with an example of a gas. [3]
OR
There are. two elements A and B. Find the number of sub-atomic particles in each of these elements. What is the relationship between the two elements?
Answer:
The physical state of matter can be changed by changing the pressure. By lowering the temperature and increasing the pressure, gases can be changed into liquids and some solids can be changed into gases on decreasing the pressure. This happens with gases as there is lots of space between the particles of a gas and upon applying high pressure, particles come down to each other which upon cooling gets liquefied.
OR
A_{13}^{26} electrons = 13 protons + 13 neutrons
Atomic number = 26-13 13
B_{14}^{26} electrons = 14 protons + 12 neutrons
Atomic number = 26- 12 = 14
They are isobars.
Isobars are any member of a group of atomic or nuclear species all of which have the same mass number and have different atomic numbers.

Question 29.
Write three differences between prokaryotic and eukaryotic cells. [3]
Answer:
Differences between prokaryotic and eukaryotic cells:

Prokaryotic cell	Eukaryotic cell
(1) Size: Generally small (1 – 10 µm)	Size: Generally large (5-100 µm)

$1\mu m=10^{-6}$ m.	
(2) Nuclear region: Contains only nucleic acid and is undefined due to the absence of nuclear membrane and is known as nucleoid.	Nuclear region: Well-defined and surrounded by a nuclear membrane.
(3) Membrane-bound cell organelles absent.	Membrane-bound cell organelles (e.g., chloroplasts, Golgi bodies, etc.) present.

Question 30.
Explain in brief any three roles of epidermis in plants. [3]
Answer:

1. The epidermis protects all parts of the plants.
2. Epidermal cells on the aerial part of the plant often secrete a waxy, water-resistant layer which helps in protection against water loss and mechanical injury.
3. The epidermis protects against invasion of parasitic fungi.

Question 31.
State the law of inertia. Why do we fall in forward direction if a moving bus stops suddenly and fall in the backward direction if it suddenly accelerates from rest? [3]
Answer:
Law of inertia: An object remains in its state of rest or of uniform motion in a straight line until an external unbalanced force acts on it. When a moving bus stops suddenly, the bus slows down but our body tends to remain in the state of motion due to inertia of motion, Sudden start of bus brings motion to the bus as well as our feet but rest of the body still has inertia of rest due to which we fall backward.

Question 32.
Name the physical quantities denoted by:
(a) the slope of the distance-time graph
(b) the area under velocity-time graph
(c) the slope of velocity-time graph. [3]
Answer:
(a) Speed
(b) Displacement
(c) Acceleration

Question 33.
In the musical instrument jal-tarang, the bowls contain different amounts of water.
(a) Which of the howls produces a low pitch sound?
(b) Which of the bowls produces a high-pitched sound?
(c) Which wave property determines the pitch? [3]
Answer:
(a) The bowl that contains the maximum quantity of water produces low pitch sound.

(b) The bowl that contains the least quantity of water produces high pitch sound.
(c) Frequency of sound waves determine the pitch.

Section – D
(Questions No. 34 to 36 are long answer questions)

Question 34.
(a) State two ways by which you can change a saturated solution to unsaturated solution.
(b) Distinguish between homogeneous and heterogeneous mixtures by giving one example of each. [5]
OR
When a solid melts the temperature of the system does not change after the melting point is reached even when we continue to supply heat. Give reason. Define latent heat of vaporisation. Which will cause more severe burns-boiling water or steam and why? [5]
Answer:
(a) Two ways by which we can change a saturated solution to unsaturated solution are:

- By increasing the temperature/by heating the solution.
- By increasing the amount of solvent.

Homogeneous Mixture	Heterogeneous Mixture
(i) Uniform composition.	Non-uniform composition.
(ii) No distinct boundaries of separation. e.g., sugar ± water.	Distinct boundaries of separation. e.g. sand + water.

OR
When a solid melts the temperature of the system does not change after the melting point is reached even when we continue to supply heat because the supplied heat energy gets used up in changing the state by' overcoming the forces of attraction between the particles. This is called latent heat.

Latent heat of vaporisation: The amount of heat energy that is required to change 1 L of a liquid into gas at atmospheric pressure at its boiling point. Steam will give more severe burns because particles of steam have extra energy in the form of latent heat of vaporisation.

Question 35.
(a) What are the consequences of the following conditions?
(i) A cell having higher water concentration than the surrounding medium.
(ii) A cell having lower water concentration than the surrounding medium.
(iii) A cell having equal water concentration to its surrounding medium.
(b) Name the materials of which the cell membrane and cell wall are composed of,
OR
The growth of plant occurs only in specific regions:
(a) Name the tissue which is responsible for this growth.
(b) State the different types of this tissue.

(c) Write one function of each of the above-mentioned tissue. [5]
Answer:
(a)

- When a cell possesses higher water concentration than the surrounding medium then exosmosis occurs in the cell due to the difference in concentration. As a result, the cell shrinks.
- When a cell has low water concentration than surrounding medium then endosmosis occurs that results in the swelling of the cell.
- A cell having equal water concentration to its surrounding medium will not show any change.

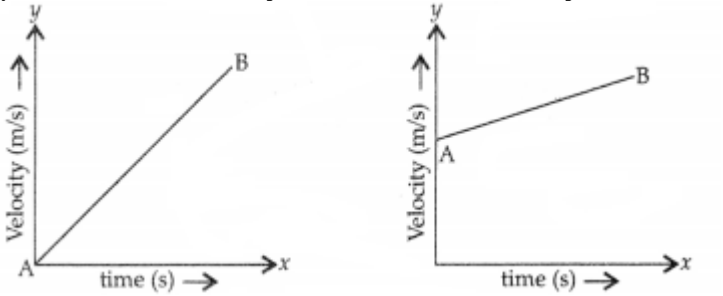
(b) Cell wall is composed of cellulose and cell membrane is composed of lipids and proteins.
OR

- Meristematic tissue
- The different types of meristematic tissue arc:
- Apical Meristem
- Iritercalary Meristem
- Lateral Meristem.

(c) Apical meristem: Helps in growth of the stem and the root.

- Intercalary meristem: Helps in elongating internodes of plants like sugarcane.
- Lateral meristem: Helps in growth and development of plant's girth (both shoot and root).

Question 36.
(a) Give one similarity and one dissimilarity between the two graphs.



(b) What do you understand by the term acceleration? What is meant by its being positive or negative? Explain with example. Write its SI units. [5]
OR
(a) Write the formula to find the magnitude of gravitational force between the Earth and an object on the Earth's surface.
(b) Derive how does the value of gravitational force 'F' change between two objects when the:
(i) distance between them is reduced to half, and
(ii) mass of one object is increased four times.
Answer:
(a) Similarity: Both the graphs show uniform acceleration. 2
Dissimilarity: In first graph, the body starts from rest (u = O) while in the second graph the initial velocity is non-zero (u ≠ 0).
(b) Acceleration of a body is defined as the rate of change of its velocity with time Acceleration being positive means the velocity of the body is increasing while it being negative means the velocity is decreasing.
The Si unit of the acceleration is m/s^2.
OR

(a) $F = GMmR2$
(b) According to the law of gravitation, the force of attraction acting between two bodies is given by,

$F = \frac{GMmR^2}{=G\frac{Mm}{(R2)^2}}$

$= 4G\frac{MmR^2}{} = 4F$

Thus, when the distance between the objects is reduced to half, the gravitational force increases by four times the original force

$F=GM \times \frac{4\ mR^2}{} =4F$

So, as the mass of any one of the objects is increased four times, the force is also increased by four times.

Section – E

(Questions No. 37 to 39 are case-based! data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.)

Question 37.

In the following table, the mass number and the atomic number of certain elements are given. Study the given data and answer the following questions:

Elements	Mass No.	Atomic No.
A	1	1
B	7	3
C	14	7
D	40	18
E	40	20

(a) Which of the elements A, B, C, D will tend to form a cation?

(b) Which of the above elements is a noble gas?

(c) Which of the elements A, B, C, and D will tend to form an anion? [4]

OR

Which two elements are isobars of each other?

Answer:

(a) Element B has number of protons greater than number of electrons. So, it will tend to form a cation.

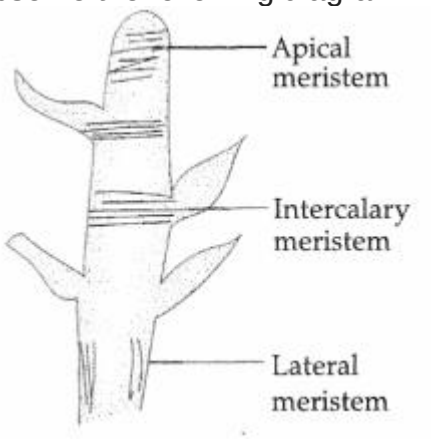
(b) The atomic number of element D is 18. So, its electronic configuration will be 2. 8, 8. The outermost shell is complete, so, it is a noble gas.

(c) Element A has number of electrons greater than number of protons. So, it will tend to form an anion.

OR

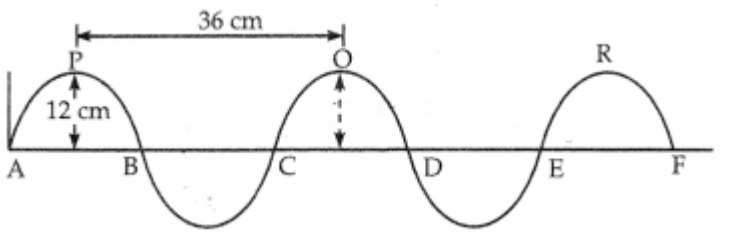
Element D and E both have same mass number, i.e., 40 but different atomic numbers so they are isobars of each other.

Question 38.
Observe the following diagram which shows some Localised tissues and answer the questions:



(a) Identify the diagram.
(b) What is apical meristem? Where do we find it?
(c) Which type of meristem, is found at the base of leaves and internodes? [4]
OR
which part helps in growth and development of plant's girth?
Answer:
(a) The diagram shows meristematic tissues.
(b) Meristem present at the growing tips of stem and root is called apical meristem. It brings about increase in length of the stem and the root.
(c) Intercalary meristem is found at the base of leaves and internodes.
OR
Meristem located on the lateral portion of plant (lateral meristem) is responsible for increasing the girth of root and stem.

Question 39.
Waves of frequency 200 Hz are produced in a string as shown in the figure. Answer the following questions as given:



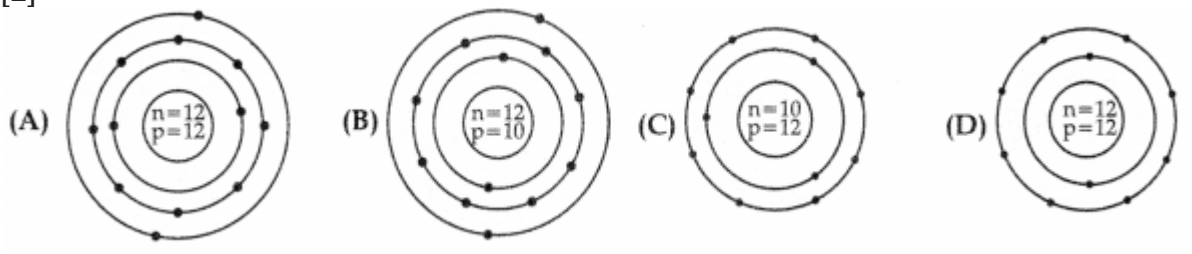
(a) Find the amplitude of the wave.
(b) Find the velocity of the wave.
(c) Find the wavelength of the wave.
OR
What is the frequency of a sound wave? [4]
Answer:
(a) Amplitude = Maximum displacement = 12 cm
(b) Frequency (n) = 200 Hz, Wavelength (λ)= 0.36m,
Now, $v = n\lambda$
$v = 200Hz \times 0.36m$
$v=72m/s$

(c) Wavelength = Distance between two crests = 36 cm = 0.36m
OR
The frequency of a sound wave is the number of oscillations per second.

Section – A

(Select and write the most appropriate option out of the four options given for each of the questions 1 – 20. There is no negative mark for incorrect response:)

Question 1.
Identify the Mg ion from the figure where n and p represent the number of neutrons and protons respectively. [1]



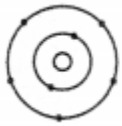
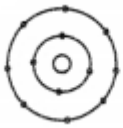
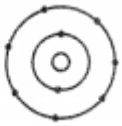
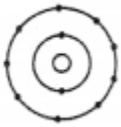
Answer:
Option (D) is correct
Explanation: E'ectronic configuration of Mg atom = 2,8,2 and that of Mg^{2+} ion = 2, 8
Number of protons in Mg atom = 12
Number of neutrons in Mg atom 24 – 12 = 12 [as mass number of Mg atom = 24 and number of neutrons = mass number – number of protons].

Question 2.
Which one of the following sets of phenomena would increase on raising the temperature? [1]
(A) Diffusion, evaporation, compression of gases
(B) Evaporation, compression of gases, solubility
(C) Evaporation, diffusion, expansion of gases
(D) Evaporation, solubility, diffusion, compression of gases.
Answer:
Option (D) is correct
Explanation: Evaporation rate increases because on increasing temperature. kinetic energy of molecules increases, so the molecules present at the surface of the liquid leave the surface quickly and go into the vapour state.

Diffusion and expansion of gases also increase as the molecules move more rapidly and try to occupy more space. As the temperature of the solution increases, the average kinetic energy of the solute molecules also increases. This causes the molecules to be less able to hold together and hence they dissolve more readily. Hence increase in temperature increases the solubility of solid states.

Question 3.
A mixture of sulphur and carbon disulfide is: [1]
(A) Heterogeneous and shows Tyndall effect
(B) Homogeneous and shows Tyndall effect
(C) Heterogeneous and does not show Tyndall effect
(D) Homogeneous and does not show Tyndall effect.
Answer:
Option (A) is correct
Explanation: A mixture of sulphur and carbon disuiphide is a heterogeneous colloid and shows Tyndall effect. In a colloidal solution, the particles are big enough to scatter light. This phenomenon of scattering of light by colloidal particles is known as Tyndall effect.

Question 4.
Which of the following figures does not represent Bohr's model of an atom correctly? [1]

(i)  (ii)  (iii)  (iv) 

(A) (i) and (ii)
(B) (ii) and (iii)
(C) (ii) and (iv)
(D) (i) and (iv)
Answer:
Option (C) is correct.
Explanation: Figures (ii) and (iv) do not correctly represent the Bohr's model of an atom. It is because maximum number of electrons in K (I) shell is 2, not 4, so (ii) is wrong and maximum capacity of L. (II) shell is 8 electrons, not 9. So, (iv) is also wrong.

Question 5.
The chemical symbol for sodium is: [1]
(A) So
(B) Sd
(C) NA
(D) Na
Answer:
Option (D) is correct.
Explanation. The chemical symbol for sodium is 'Na' derived from Latin word natrium.

Question 6.
The property to flow is unique to fluids. Which one of the following statements is correct? [1]
(A) Only gases behave like fluids.
(B) Gases and solids behave like fluids.
(C) Gases and liquids behave like fluids.
(D) Only liquids are fluids.
Answer:
Option (C) is correct.
Explanation: Gases and liquids tend to flow due to less Force of attraction between their particles. Solids do not flow.

Question 7.
Which of these is an alloy? [1]
(A) Silver
(B) Copper
(C) Bronze
(D) Aluminium
Answer:
Option (C) is correct.
Explanation: Bronze is an alloy made from copper and tin.

Question 8.
Chromosomes are made up of: [1]
(A) DNA
(B) Protein
(C) DNA and protein
(D) RNA

Answer:
Option (C) is correct.
Explanation: Chromosomes are thread-like structures usually present in the nucleus which become visible only during cell division. Each chromosome is made up of DNA and proteins.

Question 9.
Which of the following tissues has dead cells? [1]
(A) Parenchyma
(B) Sclerenchyma
(C) Collenchvma
(D) Epithelial tissue
Answer:
Option (B) is correct.
Explanation: Sderenchyma provides hardness and stiffness to the plant and is composed of dead cells.

Question 10.
If the tip of the sugarcane plant is removed from the field, even then it keeps on growing in length. It is due to the presence of: [1]
(A) Carnhium
(B) Apical meristem
(C) Lateral meristem
(D) Intercalary meristem
Answer:
Option (D) is correct.
Explanation: Intercalary meristem divides and form new cells and add to the length of internodes. Thus, sugarcane can grow even when its tip is removed.

Question 11.
A person met with an accident in which two long bones of hand were dislocated Which among the following may he the possible reason? [1]
(A) Tendon break
(B) Break of skeletal muscle
(C) Ligament break
(D) Areolar tissue break
Answer:
Option (C) is correct.
Explanation: Dislocation of joint occurs when there is an abnormal separation in joint, which are held together by a ligament. Therefore ligament breaks and results in dislocation of bone.

Question 12.
Which of these options are not the functions of ribosomes?
(i) It helps in manufacture of protein molecules.
(ii) It helps in manufacture of enzymes.
(iii) It helps in manufacture of hormones.
(iv) It helps in manufacture of starch molecules.
(A) (1) and (ii)
(B) (ii) and (iii)
(C) (iii) and (iv)
(D) (iv) and (1)
Answer:
Option (C) is correct.
Explanation: Rihosomes are involved in protein synthesis. Almost all enzymes are proteins. Hence, ribosomes make enzymes too. Chemical structure of hormones is diverse including steroids, amino acids

derivatives, proteins, and peptides. Hence, except proteinaceous hormones, all other types of hormones cannot be synthesized by ribosomes. Ribosomes are not involved in starch manufacture.

Question 13.
The slope of a velocity-time graph gives: [1]
(A) Distance
(B) Displacement
(C) Acceleration
(D) Speed.
Answer:
Option (C) is correct.
Explanation: Slope of velocity-time graph gives acceleration. It is because,
slope of the curve = ut where ut = acceleration
Question 14.
The gravitational force between two objects is F. If masses of both objects are halved without changing distance between them, then the gravitational force would become: [1]
(A) F/4
(B) F2
(C) F
(D) 2F
Answer:
Option (A) is correct.
Explanation: We know that, gravitational force,
F = $Gm_1 m_2 r_2$
(G = Gravitational constant)
where m_1 and m_2 are the masses of two objects respectively. And r is the distance between the two masses Now, according to the question, if masses of both objects are halved. i.e., $m_1 = m_{12}$ and $m_2 = m_{22}$
New force,
F = $Gm'_1 m'_2 r_2 = G(m_{12})(m_{22})r_2$
= $14 Gm_1 m_2 r_2$
= $F4$ where $Gm_1 m_2 r_2$ = F
So, new Force F = $F4$
Thus, the new gravitational force will become 14 times of its original gravitational force. I
Question 15.
Weeds affect the crop plants by: [1]
(A) Killing of plants in the field before they grow
(B) Dominating the plants to grow.
(C) Competing for various resources of crops (plants) causing low availability of nutrients.
(D) All of the above.
Answer:
Option (D) is correct.
Explanation: Weeds are unwanted plants in the cultivated fields. They compete with main crop plants for nutrients and reduce the growth of crops in many ways.

Question 16.
Which one is an oil-yielding plant among the following? [1]
(A) Lentil
(B) Sunflower
(C) Cauliflower
(D) Lotus
Answer:
Option (B) is correct.
Explanation: Sunflower is an oil-yielding plant.

Assertion-Reason Based Questions

Question No. 17 to 20 consist of two statements — Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(A) Both (A) and (R) are true, and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true, and (R) is not the correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.

Question 17.
Assertion (A): A gas exerts pressure on the walls of the container.
Reason (R): Rate of diffusion of gases is more than that of liquids. [1]
Answer:
Option (B) is correct.
Explanation: In the gaseous state, the particles move randomly at certain speed. Due to this movement, they hit each other and also on the walls of the container. This force exerts pressure on the walls.

Question 18.
Assertion (A): Permanent tissue is composed of mature cells.
Reason (R): Meristematic tissue is a group of actively dividing cells. [1]
Answer:
Option (B) is correct.
Explanation: Meristematic tissues are made up of actively dividing cells, present in the growing areas of the plant body where as Permanent tissue is a well-differentiated plant tissue derived from meristematic tissue, which has lost its ability to divide.

Question 19.
Assertion (A): The effect of thrust on sand is larger while standing than while lying.
Reason (R): Thrust is a force acting on an object perpendicular to the surface. [1]
Answer:
Option (B) is correct.
Explanation: When you stand on loose sand, the force is acting on the area equal to your feet. When you lie down, same force acts on the area equal to the whole body. Effect of the thrust depends upon the area on which it acts.

Question 20.
Assertion (A): Nitrogen is a micronutrient.
Reason (R): Micronutrients are nutrients required in small quantity. [1]
Answer:
Option (D) is correct.
Explanation: Nitrogen is a macronutrient. Macronutrients are nutrients required in large quantity while micronutrients are nutrients required in small quantity.

Section – B
(Questions No. 21 to 26 are very short answer questions)

Question 21.
List any two characteristics of colloid. [2]
Answer:
It is a heterogeneous mixture.
Particles of colloids scatter a beam of light (Tyndall effect).

Question 22.
What is endoplasmic reticulum? Name the two types of endoplasmic reticulum, Write its main functions.
Cell size may range from a few micro metre to a metre. Support this statement with the help of examples.
OR
Name the tissue which helps in transportation of oxygen that we inhale to various parts of our body. Write the composition of this tissue.[2]
Answer:
Endoplasmic reticulum is a membranous network enclosing a fluid-filled lumen. The two types of endoplasmic reticulum are Rough Endoplasmic Reticulum (RER) and Smooth Endoplasmic Reticulum (SER). RER has ribosomes attached to its surface. The ribosonies take part in protein synthesis.

SER does not have any ribosomes on it and secretes lipids. Some protcins and lipids synthesised in ER are used for producing new cellular parts, specially the cell membrane, by biogenesis.

Question 23.
Cell size may range from a few micro metre to a metre. Support this statement with the help of examples. [2]
OR
Name the tissue which helps in transportation of oxygen that we inhale to various parts of our body. Write the composition of this tissue.
Answer:
Cell size may range from few micrometers to a metre. This can be explained with the help of many examples like size of a bacterial cell is about 2-10 micrometers while cell of amoeba ranges from 10-100 micrometers An ostrich egg is about 15 cm in length and a nerve cell of giraffe is about 2m long.
OR
The tissue which helps in transportation of oxygen that we inhale to various parts of our body is blood.
It is composed of:

- RBC (red blood corpuscles),
- ‘NBC (white blood corpuscles) and
- Platelets.

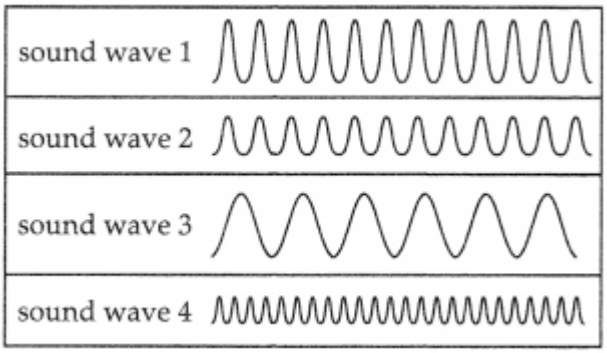
Question 24.
Peter pours the same amount of four different liquids in separate cylinders.
The cylinders are of the same size.
He then drops a glass marble in each of the four cylinders.
He also notes the time the marble takes to reach the bottom of each cylinder.
The table shows the results.

Liquid	Time taken by the marble to reach the bottom of the cylinder (in seconds)
Liquid 1	1.8 s
Liquid 2	1.5 s

Liquid 3	0.8s
Liquid 4	1.0s

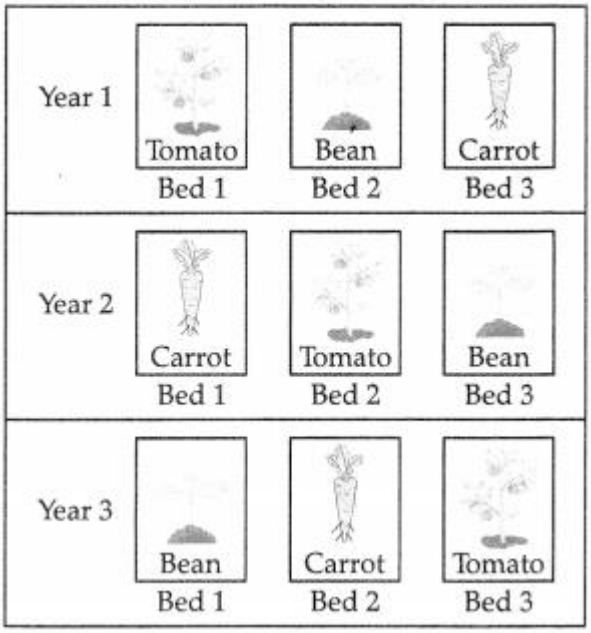
Which liquid exerted the most upward force on the marble? Justif your answer. [2]
Answer:
Liquid 1 exerted the most upward force on the marble. Due to this, the time taken by the marble dropped in liquid I to reach the bottom was more, as it had to overcome more force than other ones.

Question 25.
The picture shows four sound waves.



Which two sound waves have almost the same loudness? [2]
OR
Name the positions on Earth where the value of ‘g’ is
(i) maximum
(ii) minimum?
Justify your answer.
Answer:
Sound wave I and sound wave 3 will have almost the same loudness as they have almost same amplitude.
OR
On Earth, value of g is maximum at poles and minimum at the equator. We know;
$g=GM/R^2$
At poles radius of Earth is less so value of g is more, at equator radius of Earth is more so value of g is less.

Question 26.



The diagram shows the crop harvesting pattern followed by a farmer. Bed 1, Bed 2, and Bed 3 are different parts of the farm.
(a) What is the common term used for this pattern of crop harvesting?
(b) What is the advantage of the crop harvesting pattern shown in the diagram? 2
Answer:
(a) Common term used for the pattern of crop harvesting shown in the diagram: Crop rotation
(b) Advantage of this method: Different nutrients present in the farm soil are evenly used over time.

Section – C
(Question No. 27 to 33 are short answer questions)

Question 27.
After winters, people pack off their woollens by keeping naphthalene balls in them. With passage of time these balls become smaller in size.
(a) Why does this happen?
(b) What type of change is involved during this process?
(c) How can you convert a saturated solution into an unsaturated solution? [3]
Answer:
(a) With time, naphthalene balls sublime directly into vapour.
(b) It is a physical change and the process is known as sublimation.
(c) We can convert a saturated solution into an unsaturated solution by adding large quantities of the solvent into the solution.

Question 28.
What do you mean by a concentration of a solution? Mention two ways, of expressing the concentration of a solution.
OR
Show the formation of chemical formulae of following compounds using their ions:
(a) Ammonium sulphate
(b) Magnesium nitrate
(c) Aluminium sulphide. [3]
Answer:
The concentration of a solution is the amount of solute present in a given amount (mass or volume) of solution, or the amount of solute dissolved in a given mass or volume of solvent. Two ways of expressing the

concentration of a solution:

(i) Mass by mass percentage of a solution

$$= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

(ii) Mass by volume percentage of solution

$$= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

OR

(a) NH_4^+ SO_4^{2-}

+1 −2

$(NH_4)_2SO_4$

(b) Mg^{2+} NO_3^-

+2 −1

$Mg(NO_3)_2$

(c) Al^{3+} S^{2-}

+3 −2

$(Al)_2S_3$

Question 29.
What is the energy currency of the cell? Write it in expanded form. Which cell organelle is related to the currency? [3]
Answer:
ATP is the energy currency of the cell. Its expanded form is Adenosine Triphosphate. Mitochondria is organelle related to the currency.

Question 30.
What are the small pores observed in the epidermis of the leaf called? Write its two main functions. [3]
Answer:
The small pores in the epidermis of the leaf are Stomata.
Two main functions of stomata are:

1. They help in gaseous exchange.
2. They help in loss of water in the form of water vapours from the leaves thereby causing cooling of leaves (transpiration).

Question 31.
A body of mass 1000 kg moving at a speed of 10 rn/s reaches the speed of 50 mi's in 20s. Calculate the force required to do so.[3]
Answer:
Initial velocity (u) = 100 m/s
Final velocity (v) = 50 m/s
Time (t) = 20s
Mass (m) = 1000 kg
Force = ms = m(v – u)/t
Or
F = 1000 $(50-10)20$
= 2000 kgm/s^2 = 2000 N

Question 32.
What happens to the magnitude of the force of gravitation between two objects if:
(a) mass of one of the objects is tripled?
(b) distance between the objects is doubled?
(c) mass of both objects is doubled? [3]
Answer:
The force between two objects is given by 'Universal gravitation law.' It is numerically stated as,
$F = G(m_1 m_2)d_2$
(a) Mass of one object is tripled:
$F' = G(3 m_1)m_2 d_2$
$F' = 3G(m_1 m_2)d_2 = 3F$
Force will be tripled.
(b) Distance between the objects is double:
$F' = G(m_1 m_2)(2d)_2$
$F = G(m_1 m_2)4d_2$
$F = 14(Gm_1 m_2 d_2) = F4$
Force will reduce to one-fourth of its previous value.
(c) Masses of both objects are doubled:
$F' = G\{(2m_1)(2m_2)\}d_2$
$F' = 4G\{m_1 m_2\}d_2 = 4F$
Force will be four times greater than its previous value.
Question 33.
(a) Name the principle used to check purity of milk with lactometer.
(b) State the same principle.
(c) Write its another application. [3]
Answer:
(a) A lactometer is based on Archimedes' principle.
(b) It states that when a body is immersed fully or partially in a fluid, it experiences an upward force that is equal to the weight of the fluid displaced by It.
(c) It is used in designing ships and submarines. It is also used in hydrometers used for determining density of liquids.

Section – D
(Question No. 34 to 36 are long answer questions)

Question 34.
(a) Out of boiling and evaporation which is a surface phenomenon? Explain. In the absence of a refrigerator, butter is kept wrapped in a wet cloth during summer. Why?
(b) Why does ice cream appear colder than water at the same temperature? [5]
OR
Classify different types of pure substances. Differentiate them on the basis of their chemical properties giving examples of each.
Answer:
(a) Evaporation is a surface phenomenon. Particles from the surface gain enough energy to overcome the forces of attraction present in the liquid and change into vapour state. Due to wet cloth, the temperature is comparatively lower than room temperature. So, butter does not melt when remain wrapped in wet clothes.

(b) It is because the fact that water has latent heat of fusion present in it. But ice cream is in solid form; i.e. it has released its latent heat fusion of while coming in solid state. So due to less energy of ice cream in comparison to that of water; ice cream appears cooler to mouth than that of water at the same temperature.

OR
Two types of pure substances are elements and compounds.
Differences between elements and compounds are:

Compound	Element
(1) A compound contains atoms of different elements chemically combined together in a fixed ratio.	An clement is a pure chemical substance made of same type of atom.
(2) Compounds contain different elements in a fixed ratio arranged in a defined manner through chemical bonds.	Elements are distinguished by their atomic number (number of protons in their nucleus).
(3) A compound can be separated into simpler Substances chemical methods/ reactions.	Elements cannot be broken down into simpler substances by chemical reactions.
(4) The list of compounds is endless.	There are about 117 elements that have been observed and can be classified as metal, non-metal or metalloid.
(5) A compound is represented using a formula.	An element is represented using symbols.
(6) e.g… Water (H_2O), sodium chloride (NaCl), Sodium bicarbonate ($NaHCO_3$), etc.	e.g., iron, copper, silver, gold, and nickel, etc.

Question 35.
Identify the following tissues:
(a) The epithelial tissue which has pillar-like tall cells?
(b) The cells of this tissue are filled with fat globules.

(c) The movement of this tissue pushes the mucus forward to clear respiratory tract.
(d) It gives buoyancy to lotus to help it stay afloat.
(e) Tissue present in lung alveoli. [5]

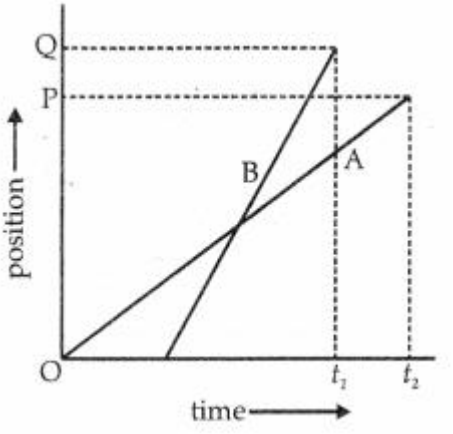
OR
(a) Explain the terms:
(i) Endocytosis,
(ii) Plasmolysis.
(b) What will happen if the organisation of a cell is damaged due to certain physical or chemical reasons?
(c) How do substances like CO_2, and water move in and out of the cell? [5]
Answer:
(a) Columnar
(b) Adipose
(c) Ciliated columnar
(d) Aerenehyma
(e) Squamous.
OR
(a) (i) Endocytosis: The flexibility of the cell membrane enables the cell to engulf food and other materials from its external environment. Such a process is known as endocytosis.

(ii) Plasmolysis: When a living plant cell loses water through osmosis, there is shrinkage or contraction of the contents of the cell away from the cell wall. This phenomenon is known as plasmolysis.

(b) When the organisation of a cell gets damaged, lysosomes will burst and their enzymes will eat up their own cell organdies. Therefore, lysosomes are also known as the “suicidal bags of the cell.

(c) Gases like CO_2 and O_2, move in and out of the cell by diffusion from their higher concentration to lower concentration. Water enters the cell by endosmosis through semi-permeable plasma membrane from its higher concentration to its lower concentration. Similarly, water moves out of the cell by exosmosis when a cell is placed in a hypertonic solution.

Question 36.
(a) Give four differences between distance and displacement. The position-time graph for children ‘A and B’ returning from their school ‘O’ to their homes ‘P’ and ‘Q’ is shown in fig. From the graph find:
(i) Which of the two ‘A’ or ‘B’ lives closer to school?
(ii) Which of the two ‘A’ or ‘B’ starts earlier from school?
(iii) Which of the two ‘A’ or ‘B’ walks faster?



(b) The speed of a car increases from 18 km/h to 36 km in 10 seconds. Find its acceleration. 5
OR
(a) A bar of metal has a mass of 200 g and a certain weight. Mass remains the same when weighed at equator but weight decreases. Why?

(b) Differentiate between mass and weight. Write any four differences.
Answer:
(a)

Distance	Displacement
(i) Distance is the length of the actual path covered by an object irrespective of its direction of motion.	Displacement is the shortest distance between the initial and final positions of an object in a given direction.
(ii) Distance is a scalar quantity.	Displacement is a vector quantity.
(iii) Distance covered can never be negative. It is always positive or zero.	Displacement may be positive. negative or zero.
(iv) Distance between two given points may be same or different for different paths chosen.	Displacement between two given points is always the same.

(i) A
(ii) A
(iii) B

(b) Given,
u = 18 km/h = 5 m/s
v = 36 km/h = 10 m/s,
t = 10s
a = \(\frac{(10-5)}{10}\\) = 0.5 m/s^2
OR
(a) Weight is dependent on gravitational force. Since, on equator, the gravitational force is less, so the weight of the bar of metal decreases.
(b) Difference between mass and weight :

Mass	Weight

(i) Its value remains constant at all places.	Its Value changes from place to place due to change in the'g'.
(ii) It is a scalar quantity.	It is a vector quantity.
(iii) It is never zero.	It is zero for away from the Earth.
(iv) Its unit is kg.	Its unit is N or kg-wt.

Section – E

(Questions No. 37 to 39 are case-based! data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.)

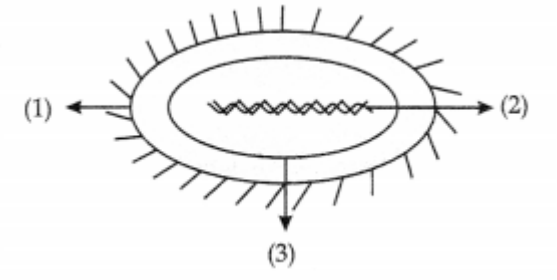
Question 37.
The following data represents the distribution of electrons, protons, and neutrons in atoms of three elements A, B, and C Understand the data carefully and answer the following questions.

Element	Protons	Neutrons	Electrons
A	9	10	9
B	16	16	16
C	12	12	12

(a) What is the atomic number of element A?
(b) What will he the atomic mass number of element B?
(c) Atomic number of element C is 12. Identify the element and write its electronic configuration. [4]
OR
What will be the valency of element A? Justify your answer.
Answer:
(a) 9
(b) 32
(c) Element magnesium has atomic number 12. So, element C is magnesium. Its electronic configuration will be 2,8, 2.
OR

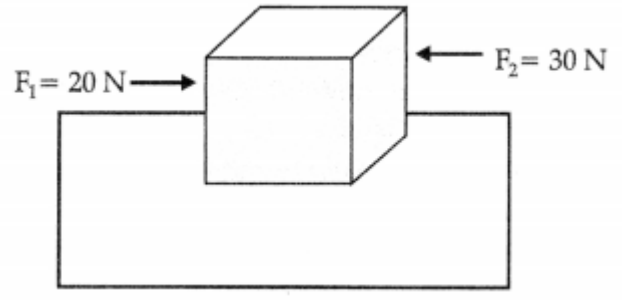
Valency of element A will be 1. This is because it will have electronic configuration: (2, 7).
It will accept one electron. So its valency will be 1.

Question 38.
Study the given diagram of bacterial cells and answer the following questions.
(a) The bacterial cell shown in the diagram does not have a well-defined nucleus. What type of cell it is?
(b) Identify and name the part numbered as (1) in the diagram.
(c) Identify the parts numbered as (3) in the diagram. What is its function? [4]
Or
Identify the part shown by number (2). What does it contain?



Answer:
(a) Prokaryotic cell
(b) Cell wall
(c) Plasma membrane function: Protection and transport.
OR
Nucleoid. it contains chromosomes.

Question 39.
Observe the diagram and answer the following below:
Two forces F_1 =20 N and F_2 = 30 N are acting on an object as shown in figure:
(a) Find the net force acting on the object.
(b) State the direction of the net force acting on the object.
(c) If the object still does not move under the application of these forces, what can be the possible reason for this? [4]
OR
Why no force is required to move an object with a constant velocity?



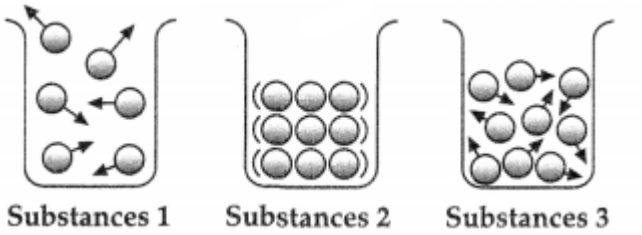
Answer:
(a) Net force acting on the object = $F_2 – F_1$ = 30 N-20N = 10N
(b) Net force acts in the direction of force F_2. As F_2 is greater than F_1.
(c) All forces acting on the object are balanced and that is why the object does not move. It needs unbalanced force for movement.
OR
We know, F = ma
When velocity is constant, then acceleration, a = 0. Hence, F = 0. Hence, no force is required to move an object with constant velocity.

Section – A

(Select and write the most appropriate option out of the four options given for each of the questions 1 – 20. There is no negative mark for incorrect response:)

Question 1.

The picture shows the arrangement of particles in three different substances. [1]



Which of the following is true about the state of the three substances?

(A) Substance 1: Solid, Substance 2: Liquid, Substance 3: Gas

(B) Substance 1: Gas, Substance 2: Liquid, Substance 3: Solid

(C) Substance 1: Liquid, Substance 2: Gas, Substance 3: Solid

(D) Substance 1: Gas, Substance 2: Solid, Substance 3: Liquid

Answer:

Option (D) is correct

Explanation: In solids, molecules are tightly packed as compared to liquid and gas. Substance 3 is solid as molecules are closely packed. Molecules in liquids are slightly loose while molecules in gases are very loosely packed. Hence, substance 2 is liquid and substance 1 is gas.

Question 2.

Rusting of an article made up of iron is called: [1]

(A) Corrosion and it is a physical as well as chemical change.

(B) Dissolution and it is a physical change.

(C) Corrosion and it is a chemical change.

(D) Dissolution and it is a chemical change.

Answer:

Option (C) is correct.

Explanation: Rusting of an article made up of iron is called corrosion. Corrosion is a chemical change because rust is a chemical compound (hydrated iron oxide), which is totally different from elemental iron (Fe).

Question 3.

In which of the following conditions, the distance between the molecules of hydrogen gas would increase? [1]

(i) Increasing pressure on hydrogen contained in a closed container.

(ii) Some hydrogen gas leaking out of the container

(iii) Increasing the volume of the container of hydrogen gas.

(iv) Adding more hydrogen gas to the container without increasing the volume of the container

(A) (i) and (ii)

(B) (i) and (iv)

(C) (ii) and (iii)

(D) (ii) and (iv)

Answer:

Option (C) is correct.

Explanation: Some hydrogen gas leaking from the container leaves some vacant space inside the container. So, hydrogen gas molecules inside the container will occupy all the space available and the distance between the molecules of hydrogen gas will be increased.

Similarly, on increasing the volume of the container of hydrogen gas, more space will be available inside the container and hydrogen gas molecules will occupy all the space available. As a result, the distance between the molecules will be increased. So, options (ii) and (iii) will increase the distance between the molecules of hydrogen gas.

On the other hand, on increasing pressure, hydrogen molecules will come closer and the distance between them will be decreased. Also, on adding more hydrogen gas molecules without increasing the volume of container will decrease the distance between molecules.

Question 4.
The formula and charge on ions of three different compounds are shown below.
Two ions, Zn^{2+} and S^{2-},combine to form a compound. What should be the formula of the compound formed? [1]
(A) ZnS
(B) Zn_2S
(C) ZnS_2
(D) Zn_2S_2
Answer:
Option (A) is correct.
Explanation: Two ions, Zn^{2+}' and S^{2-}, will form compound ZnS, as each of them has valency 2.

Question 5.
The number of electrons in an element X is 15 and the number of neutrons is 16. Which of the following is the correct representation of the clement? [1]
(A) $_{15}{}^{31}X$
(B) $_{16}{}^{31}X$
(C) $^{16}{}_{15}\ X$
(D) $_{16}{}^{15}\ X$
Answer:
Option (A) is correct.
Explanation: Given that, number of electrons in element X = 15 and number of neutrons = 16.
Atomic number = Number of protons = Number of electrons in neutral atom = 15

Mass number = number of protons + number of neutrons = 15 + 16 = 31
So, correct representation of element is $_{15}{}^{31}X$.
Question 6.
Choose the correct statement of the following. [1]
(A) Conversion of solid into vapours without passing through the liquid state is called vaporisation.
(B) Conversion of solid into vapour without passing through the liquid state is called sublimation.
(C) Conversion of vapours into solid without passing through the liquid state is called freezing.
(D) Conversion of solid into liquid is called sublimation.
Answer:
Option (B) is correct
Explanation: The conversion of liquid into gas (vapour) is called vaporisation. The conversion of liquid into solid is called freezing. The conversion of solid into liquid is called melting.

Question 7.
Two chemical species X and Y combine together to form a product P which contains both X and Y. X + Y → P, X, and Y cannot be broken down into simpler substances by simple chemical reactions. Which of the following concerning the species X, Y, and P are correct? [1]
(1) P is a compound.
(ii) X and Y are compounds.

(iii) X and Y are elements.
(iv) P has a fixed composition.
(A) (i), (ii) and (iii)
(B) (i), (ii) and (iv)
(C) (ii), (iii) and (iv)
(D) (i), (iii) and (iv)
Answer:
Option (D) is correct.
Explanation: In this reaction, X and Y cannot be broken down into simpler substances by chemical reactions; therefore, X and Y are elements A compound is a substance made up of two or more elements chemically combined in a fixed proportion by mass; therefore, P is a compound, having a fixed composition.

Question 8.
Which of the following are covered by a single membrane? [1]
(A) Mitochondria
(B) Vacuole
(C) Lysosome
(D) Both (B) and (C)
Answer:
Option (D) is correct
Explanation: Vacuole and lysosome are covered by a single membrane while mitochondria and plastid have a double membrane.

Question 9.
In desert plants, rate of water loss gets reduced due to the presence of: [1]
(A) Cuticle
(B) Stomata
(C) Lignin
(D) Suberin
Answer:
Option (A) ¡s corred.
Explanation: Cuticle minimises the water loss through transpiration (with the help ol stomata) and also reduces pathogen entry.

Question 10.
Cell theory was given by: [1]
(A) Schleiden and Schwann
(B) Virchow
(C) Hooke
(D) Haeckel
Answer:
Option (A) is correct.
Explanation: Schleiden (1836) and Schwann (1834) gave the cell theory which states that all the plants and animals are composed of cells and cell is the basic unit of life.

Question 11.
The water-conducting tissue generally present in gymnosperm is: [1]
(A) Vessels
(B) Sieve tube
(C) Tracheids
(D) Xylem fibers
Answer:
Option (C) is correct.

Explanation: The gymnosperms are characterised by the presence of tracheids as their major conducting tissue.

Question 12.
Voluntary muscles are found in: [1]
(A) Alimentary canal
(B) Limbs
(C) iris of the eye
(D) Bronchi of lungs
Answer:
Option (B) is correct.
Explanation: Voluntary muscles are the muscles, which are under our complete control. Example includes the muscles that control working and movement of limbs.

Question 13.
The numerical ratio of displacement and distance for a moving object is: [1]
(A) Always less than 1
(B) Always equal to 1
(C) Always more than 1
(D) Equal to or less than 1.
Answer:
Option (D) is correct.
Explanation: Displacement of an object can be less than or equal to the distance covered by the object, because the magnitude of displacement is not equal to distance. However, it can be same, if the motion is along a straight line without any change in direction.

Question 14.
The work done on an object does not depend upon the: [1]
(A) Displacement
(B) Force applied
(C) Angle between force and displacement
(D) Initial velocity of the object.
Answer:
Option (D) is correct.
Explanation: We know that,
$W = F. d \cos \theta$.
Here, F = force applied on the object, d = dis placement, and θ is angle between force and displacement. So, the work done on an object does not depend upon the initial velocity of the object.

Question 15.
Cattle husbandry is done for the following purposes. [1]
(i) Milk production
(ii) Agricultural work
(lii) Meat production
(iv) Egg production
(A) (i), (ii) and (iii)
(B) (ii), (iii) and (iv)
(C) (iii) and (iv)
(D) (i) and (iv)
Answer:
Option (A) is correct.
Explanation: Human beings domesticate cattle for milk production, agricultural work, meat production, transportation and leather, etc.

Question 16.
Oysters are cultivated in inland water bodies for food.
What else can he obtained from the cultivation of oysters? [1]
(A) Pearl
(B) Sponge
(C) Platinum
(D) Sand
Answer:
Option (A) is correct.
Explanation: Oysters are cultivated for obtaining pearls.

Assertion-Reason Based Questions

Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(A) Both (A) and (R) are true, and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true, and (R) is not the correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.

Question 17.
Assertion (A): Particles of gas intermix with each other.'
Reason (R): The intermixing of particles of two different types of matter on their own is called diffusion. [1]
Answer:
Option (A) is correct.
Explanation: Particles of a gas are loosely packed. So, they move randomly due to space between them and intermix with other particles present there.

Question 18.
Assertion (A): Lysosomes are known as suicidal hag of cells.
Reason (R): Lysosomes contain powerful enzymes capable of breaking down all organic material. [1]
Answer:
Option (A) is correct.
Explanation: During the disturbance in cellular metabolism lysosomes may burst and the enzymes digest their own cell. Therefore, lysosomes are also known as suicidal bags. Lysosomes are able to do this because they contain powerful enzymes capable of breaking down all organic material.

Question 19.
Assertion (A): Velocity is the speed of an object in a particular direction.
Reason (R): SI unit of velocity is same as speed. [1]
Answer:
Option (B) is correct.
Explanation: Velocity is the speed of an object moving in a direction, or the displacement of an object in unit time. Speed, on the other hand, is the distance travelled by an object in the given time. SI unit of velocity is same as speed i.e., m/s.

Question 20.
Assertion (A): Italian bee is commonly used for honey production.
Reason (R): Italian bees have high honey-collecting capacity, are stingless, and breed very well. [1]
Answer:
Option (A) is correct.

Explanation: An Italian bee, Apis melifera, is commonly used for honey production. It has high honey collecting capacity, is stingless, breeds very well arid staVs in bee hive for long periods.

Section – B
(Question No. 21 to 26 arc very short answer questions)

‘Question 21.
The electronic configuration of an element ‘X’ is 2, 8, 2.
(a) Find the number of electrons present in the atom of element ‘X’.
(b) Write its atomic number.
(c) Is element ‘X’ a meta l or a non-metal?
(d) Find out the valency of the element ‘X’. [2]
Answer:
(a) 12
(b) Atomic number = 12
(c) “X’ is a metal as it has two outer electrons that it can bosse quickly.
(d) Valency of T is + 2.

Question 22.
Write the main functions of cell wall. [2]
Answer:
(i) Cell wall provides shape as well as rigidity to the cell.
(ii) It protects the protoplasm.
(iii) Growth of cell wall determines the growth of cell.

Question 23.
What is apical meristem? What is its function? [2]
OR
Give differences between cytoplasm and nucleoplasm.
Answer:
Apical meristems are the meristematic tissues which are found at the growing tips of stems and roots. They increase the length of the stems and roots and are responsible for the growth of plants.
OR
Differences between cytoplasm and nucleoplasm:

Cytoplasm	Nucleoplasm
(i) Cytoplasm is the protoplasm which lies outside the nucleus, i.e., between the nucleus and the cell membrane.	It is the part of protoplasm that lies inside the nucleus.
(ii) It contains various organdies and inclusions.	It is a colloidal substance having similar composition to cytoplasm but contains more

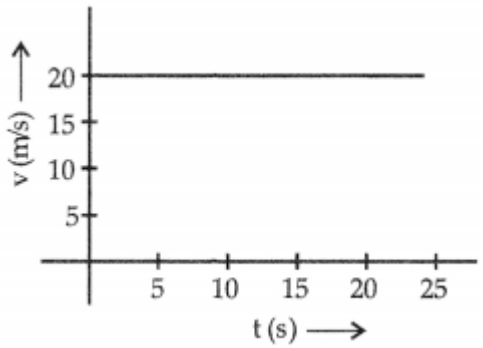
	of nucleotides.
(iii) It contains a number of inorganic substances forming clear true solution as well as organic substances lipids, protein, and carbohydrates.	It contains chromatin material.

Question 24.
In which of these conditions is the work done negative? [2]

(i) Wind force making a boat move forward on water.
(ii) Brake force resisting the motion of a moving wheel.
(iii) Buoyant force slowing the sinking of an iron nail in water.

Answer:
Negative work is done when the displacement is in the opposite orientation of the force delivered. So, the work done is negative in:
(ii) Brake force resisting the motion of a moving wheel.
(iii) Buoyant force slowing the sinking of an iron nail in water.

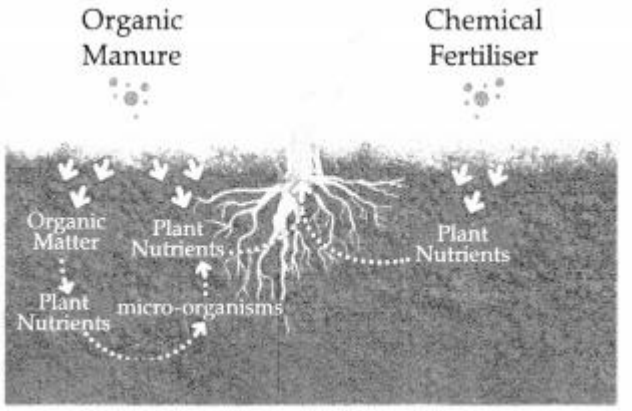
Question 25.
The velocity-time graph shows the motion of a cyclist. Find (i) the cyclist's acceleration, (ii) higher velocity after 20 s. [2]



OR
State why Newton's first law of motion is called law of inertia.
Answer:
a = 0 because velocity is constant.
v= 20 m/s (same reason as above)
OR

Inertia is the tendency of the object to resist change in its state. Newton's first law of motion also states the same, i.e., the object will remain in its present state unless an external force is applied. That is why Newton's first law is called law of inertia.

Question 26.
The picture shows how organic manure and chemical fertilizer are used by plants.



(a) Which of the two, organic manure and chemical fertiliser, provides food for the soil microorganism?
(b) Which of the two, organic manure and chemical Ierhliser is not harmful for the environment? Why? [2]
Answer:
(a) Organic manure
(b) Organic manure is not harmful for the environment as it is biodegradable.

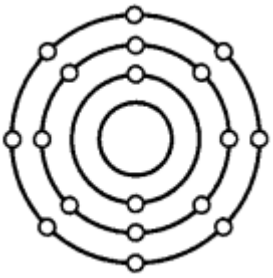
Section – C
(Question No. 27 to 33 are short answer questions)

Question 27.
(a) How can we say that sugar is a pure substance whereas milk is not?
(b) Which of the following materials fall in the category of a pure substance?
(i) Ice
(ii) Iron
(iii) Wood
(iv) Brick [3]
Answer:
(a) Sugar is a pure substance because it cannot be separated and is formed of only single type of molecule. In the case of milk, it can be separated by physical process into its components. It has components like water, fat and proteins, etc.

(b) Ice and iron are pure substances as they contain particles of only one kind of matter while wood and brick contain more than one kind of matter.

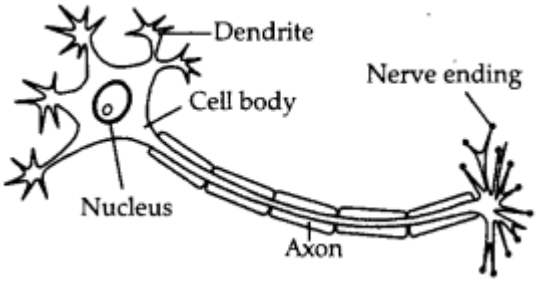
Question 28.
Give three reasons to justify that water is a liquid at room temperature. [3]
OR
Atomic number and mass number of an element are 18 and 40 respectively. Identify the element and write the number of electrons and neutrons present in its atom. Show the schematic atomic structure of the atom.
Answer:
At room temperature, water is liquid because it has the following characteristics of liquid:
(i) At room temperature, water has no shape but has a fixed volume.
(ii) It takes the shape of the container in which it is kept.
(iii) It can flow
OR

Name of element: Argon
Number of electrons = 18
Number of neutrons = 22 (40-18)
Structure: 2, 8, 8



Question 29.
Where are chromosomes present in the cell? What is their chemical composition? How many pairs of chromosomes are present in humans? [3]
Answer:
Chromosomes are present in the nucleus of a cell. Their chemical composition is of DNA, and proteins. Humans have 23 pairs of chromosomes.

Question 30.
Describe the structure, function, and location of the nervous tissue. [3]
Answer:
Structure: The nervous tissue is made up of neurons which consist of a cell body with a nucleus and cytoplasm. From the cell body, long thin hair-like parts called dendrites arise.



Function: On stimulation, the nerve cells transmit the stimulus very rapidly from one place to another within the body.
Location: Nervous tissues are located in the brain, spinal cord, and nerves.

Question 31.
(a) Define power. Derive its SI unit.
(b) An electric bulb is rated 15 watts. What does it mean?
(c) What is the energy consumed in joules if it is used for 10 minutes? [3]
Answer:
(a) Power is the rate of doing work. 1
Power = $\frac{\text{Work}}{\text{Time}} = \frac{1 \text{ Joule}}{1 \text{ second}}$ 1 watt or 1 W
(b) If the power of an electric bulb is 15 W it consumes 15 Joules of energy per second.
(c) Energy consumed by the bulb in 10 minutes 15 W x 600s = 9000 Joules

Question 32.
A man's weight when taken at the poles is 600 N. Will his weight remain the same when measured at the equator? Will there be an increase or decrease in his weight? Explain. [3]
Answer:
No, his weight will not remain same as that at the poles. There will be a decrease in his weight at the equator.

As the radius of the Earth increases from the poles to the equator, the value of 'g' becomes greater at poles decreasing towards equator. Also, the force of gravity decreases from poles to the equator.

Question 33.
(a) State Archimedes' principle.
(b) State the laws of floatation.
(c) Why is it easier to swim in sea water than in river water ? [3]
Answer:
(a) Archimedes' principle, states that when a body is immersed fully or partially in a fluid, it experiences an upward force that is equal to the weight of the liquid displaced by it.

(b) Laws of floatation:

- When the weight of the object is more than the buoyant force exerted by a fluid on the object, then the object sinks.
- When the weight of the object is less than the buoyant force exerted by the fluid on the object, then the object floats.

(c) Sea water has a higher density than river water. So, it will exert higher buoyant force than river water on the same object.
So, in order to swim, less amount of water needs to be displaced to balance our weight. Therefore, it is easier to swim in seawater.

Section – D
(Question No. 34 to 36 are long answer questions)

Question 34.
How the water changes into vapours at temperature below its boiling point? List the factors affecting evaporation. Mention two examples from daily life where evaporation causes cooling. [5]
OR
(a) Explain the term diffusion. Illustrate with an activity that rate of diffusion increases with temperature.
(b) Name two compressed gases (i) used in our homes for cooking (ii) supplied to hospital in cylinders. [5]
Answer:
The phenomenon of change of a liquid into vapour at a temperature below its boiling point is called evaporation. Fractions of particles at the surface having higher kinetic energy, are able to break away from the forces of attraction of other particles and get converted into vapour.

Factors which affect rate of evaporation:

- Surface area
- Temperature
- Humidity
- Wind speed

Two examples from daily life where evaporation causes cooling:
Sprinkling of water on the roof, cooling of water kept in earthen pots, etc.
OR
(a) Diffusion is the process resulting from random motion of molecules by which there is a net flow of matter from a region of high concentration to a region of low concentration. During diffusion particles of one substance occupy the vacant space present between the particles of the other substance.

Activity:

- Take 5 g of copper sulphate each in three beakers.
- Pour 100 ml of distilled water slowly in one of the beakers.
- Cover this beaker with a watch glass.
- Pour 100 mi of cold cater in the second beaker slowly.
- Place the third beaker containing 100 ml of water on a tripod stand for heating.
- Observe the diffusion process which begins in all the beakers.
- Record the time taken for the dissolution of copper sulphate in all the three cases.

Conclusion: The rate of diffusion of copper sulphate in water is in the order:
Beaker 3> Beaker 2> Beaker 1.
It illustrates with that rate of ditfusion increases with increase in temperature.

(b) Gas used in our home for cooking:

- liquified Petroleum Gas (LPG) Gas supplied to hospital in cylinder:
- Oxygen.

Question 35.
(a) Explain the terms:
(i) Endocytosis,
(ii) Plasmolysis.
(b) What wifl happen if the organisation of a cell is damaged due to certain physical or chemical reasons?
(c) How do substances like CO_2 and water move in and out of the cell?
OR
Identify the type of tissues in the following:
(a) Vascular bundle
(b) Inner lining of the intestine
(c) lining of the kidney tubule
(d) Iris of the eye
(e) Muscles of the heart
Answer:
(a)
(i) Endocytosis: The flexibility of the cell membrane enables the cell to engulf food and other materials from its external
environment. Such process is known as endocytosis.

(ii) Plasmolysis: When a living plant cell loses water through osmosis, there is shrinkage or contraction of the contents of the cell away from the cell wall. This phenomenon is known as plasmolysis.

(b) When the organisation of a cell gets damaged, lysosomes will burst and their enzymes will eat up their own cell organelles. Therefore, lysosomes arc also known as the “suicidal bags of the cell”.

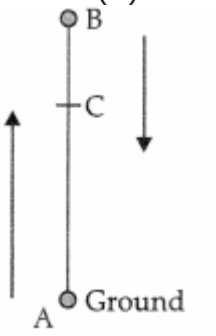
(c) Gases like CO_2 and O_2 move in and out of the cell by diffusion from their higher concentration to lower concentration. Water enters the cell by endosmosis through a semi-permeable plasma membrane from its higher concentration to its lower concentration. Similarly, water moves out of the cell by exosmosis when a cell is
placed in a hypertonic solution.

OR

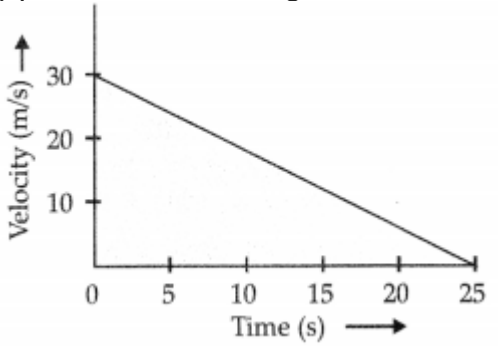
- Complex tissues
- Columnar epithelium

- Cuboidal epithelium
- Involuntary muscular tissues
- Cardiac muscles

Question 36.
(a) A stone is thrown upwards from a point A, as shown in the figure. After reaching the highest point B it comes down. Explain the transformation of energy from A to B and B to A and also mention the type of energy possessed by the stone at points A, B, and C of its journey.
(b) A body of mass 20 kg is dropped from a height of 101 m. Find its K.E. and PE. after (i) 1st second (ii) 2nd second (iii) 3rd second. [5]



OR
(a) State the law that provides the formula for measuring force and the law which provides the definition of force.
(b) Velocity time graph of a 50 g marble rolling on a floor is given below. Find:
(i) time in which it stops. ‘
(ii) negative acceleration produced on it.
(iii) positive force acting on the marble.



The definition of force is given by Newton’s first law
Answer:
(a) While going up, K.E → P.E. and while coming down P.E. → K.E.
At A → K.E
B → P.E.
C →K.E + P.E

(b) Total Energy = mgh
= 20 × 10 × 100
= 2×10^4 J

(i) After 1st” second:
v = u + gt = 10 × 1
= 10 m/s (u =0)

K.E. = 12
= $12 \times 20 \times 10 \times 10$
= 1000 J

P.E = T.E. – K.E = 20,000-l000
=19,000 J
(ii) After 2nd second:
v = 20 ms^{-1}'
K.E. = $12mv2=12\times20\times20\times20$
= 4,000 J
P.E. = T.E. – K.E.
= 20,000 – 4,000 = 16,000 J

(iii) After 3rd second:
v = 30ms^{-1}
K.E. = $12\times20\times30\times30$
= 9,000 J
PE. = T.E. – K.E.
= 20,000- 9,000 = 11,000 J
OR

(a) Formula for measuring force is given by Newton's 2nd law. It states that the rate of change of momentum of an object is directly proportional to the force applied and takes place in the sanie direction as that of the force. Second law of motion gives us a method to measure the force acting on an object as force is the product of its mass and acceleration.

Definition of force is given by Newton's first las it states that an obect continues to be in a state of rest or a body in motion will remain in uniform motion along a straight line unless acted upon by an unbalanced force.
(b) From graph
(i) t =25s
(ii) a = $(30-0)25$ = 1.2 m/s^2
(iii) F =ma
= (501000) × 1.2 = 0.06 N

Section – E

(Question No. 37 to 39 are case-based) data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.)

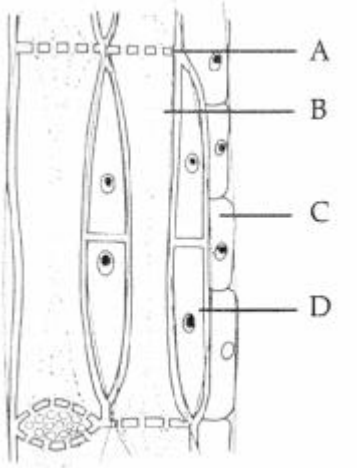
Question 37.
The table lists the properties of four substances.

	Is it shiny?	How does it conduct electricity?
Substance 1	yes	very good
Substance 2	no	very poor
Substance 3	yes	medium
Substance 4	no	poor

(a) Which of the substances is likely to be a metal?
(b) Which of the substances is likely to he a metalloid?
(c) Which of the substances is/are likely to he a nonmetal? Why?
OR
Can substance 2 or substance 4 he used to prepare electric circuit wires? Why? [4]
Answer:
(a) Substance 1, as it is shiny and conducts electricity very well.
(b) Substance 3 1
(c) Substance 2/suhstance 4, as not shiny and poor conductor ol electricity.
OR

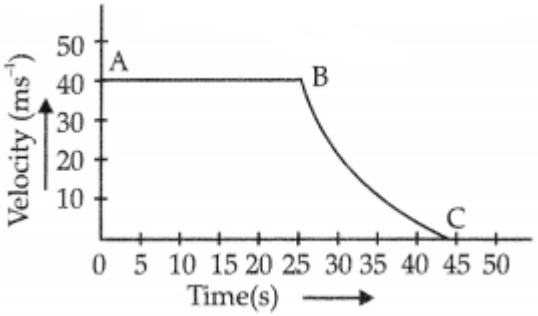
No, substance 2 or substance 4 cannot be used to prepare electric circuit wires as they are bad conductors of electricity.

Question 38.
Study the given diagram and answer the following questions.



(a) Name the tissue shown in the diagram.
(b) Which fissues together make vascular bundles?
(c) Identify the parts A, B, C, and D. [4]
OR
What will happen if phLoem at the base of the branch is removed?
Answer:
(a) Phloem I
(b) Vascular Bundles are composed of xylem and phloem together.
(c) A – Sieve plate, B – Sieve tube, C – Phloem parenchyma D- Companion cycle 2
OR
If the phlœm at the hase of branch is removed, then lower area of the branch will not receive food from the leaves. But the plant will not die, as it will continue to receive food from other branches as food can move in phloem in both
directions.

Question 39.
Study the following graph and choose the correct options to answer the following questions given below:
The velocity-time graph of an object is shown in the following figure.



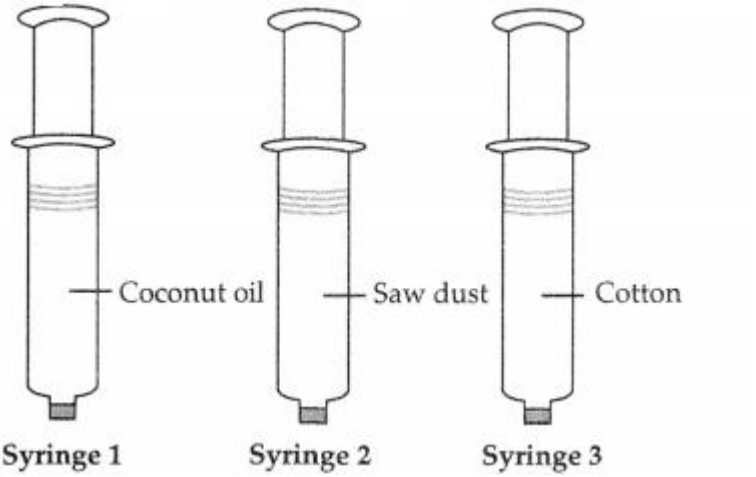
(a) State the Kind or motion that objects has, from A to B and from B to C.
(b) What does the area enclosed by the velocity-time graph represent?
(c) Identify the part of graph where the object has zero acceleration. Give reasons for your answer. [4]
OR
Identify the part of graph where the object has negative acceleration. Give reasons for your answer.
Answer:
(a) Uniform motion from A to B and non-uniform motion from B to C.
(b) Displacement
(c) AB because velocity remains constant from A to B.

OR
BC because velocity decreases from B to C.

Section – A

(Select and write the most appropriate option Out of the four options given for each of the questions 1-20. There is no negative mark for incorrect response:)

Question 1.
Tina found three syringes of the same size closed with rubber cork. She took the piston out of each syringe and filled them with coconut oil, sawdust, and cotton. Tina closed the end of each syringe with a piston. She then tried to press the piston of each syringe as much as possible. [1]

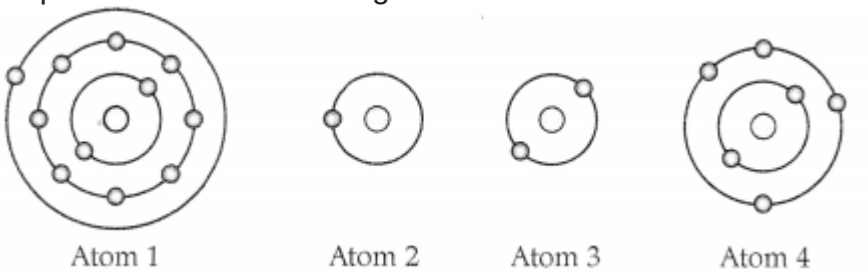


Arrange the syringes in increasing order of difficulty of pressing the piston.
Key: less difficult → more difficult
(A) Syringe 1 → Syringe 2 → Syringe 3
(B) Syringe 3 → Syringe 2 → Syringe 1
(C) Syringe 1 → Syringe 3 → Syringe 2
(D) Syringe 2 → Syringe 3 → Syringe 1
Answer:
Option (C) is correct.
Explanation: Increasing order of difficulty to press the piston:
Syringe 1 → Syringe 3 → Syringe 2,
as syringe 1 contains a liquid, syringe 2 contains a solid, and syringe 3 contains a solid with a lot of air spaces.

Question 2.
Which of the following statements are true for pure substances? [1]
(i) Pure substances contain only one kind of particles.
(ii) Pure substances may be compounds or mixtures.
(iii) Pure substances have the same composition throughout.
(iv) Pure substances can be exemplified by all elements other than nickel.
(A) (i) and (ii)
(B) (i) and (iii)
(C) (iii) and (iv)
(D) (ii) and (iii)
Answer:
Option (B) is correct.
Explanation: A pure substance is one which is made up of only one kind of atoms or molecules. They have the same composition throughout.

Question 3.
In a laboratory, while doing an experiment, carbon dioxide was taken in an enclosed cylinder and compressed by applying pressure and keeping a low temperature. Which state of matter we will obtain after completion of the above-given process? [1]
(A) Solid
(B) Liquid
(C) Gas
(D) Both (A) and (B)
Answer:
Option (B) is correct.
Explanation: Liquid state of matter will be obtained and the process is known as liquefication. Liquefication is the change of state from gas to the liquid by increasing pressure or decreasing temperature.

Question 4.
The pictures show the arrangement of electrons in tle shells of different atoms.



Which atom has the highest atomic number?
(A) Atom 1
(B) Atom 2
(C) Atom 3
(D) Atom 4
Answer:
Option (A) is correct.
Explanation: Atom 1 has 11 electrons means 11 protons. So its atomic number is 11, which is highest among the given atoms.

Question 5.
Rutherford's a-particle scattering experiment showed that:
(i) Electrons have a negative charge.
(ii) The mass and positive charge of the atom is concentrated in the nucleus.
(iii) Neutron exists outside the nucleus.
(iv) Most of the space in the atom is empty.
Which of the above statements are correct?
(A) (i) and (iii)
(B) (ii) and (iv)
(C) (i) and (iv)
(D) (iii) and (iv)
Answer:
Option (B) is correct.
Explanation: Points (ii) and (iv) are correct. An atom consists of a positively charged, dense and very small nucleus which has all the protons and neutrons. Positive charge is due to protons, as neutrons have no charge. Most of the space is empty because most of the alpha particles pass straight through the gold foil without any deflection. Electrons have negative charge.

Question 6.
Seema visited a Natural Gas Compressing Unit and found that the gas can be liquefied under specific temperature and pressure conditions. While sharing her experience with friends she got confused. Help her to

identify the correct set of conditions. [1]
(A) Low temperature, low pressure
(B) High temperature, low pressure
(C) low temperature, high pressure
(D) High temperature, high pressure.
Answer:
Option (C) is correct
Explanation: There is a lot of space between the particles of a gas. On applying high pressure, the particles of gas move so close that they start attracting each other sufficiently forming a liquid. Keeping the temperature low keeps the energy of gas particles low, making it easier to liquefy.

Question 7.
Tincture of iodine has antiseptic properties. This solution is made by dissolving: [1]
(A) iodine in potassium iodide
(B) iodine in vaseline
(C) iodine in water
(D) iodine in alcohol
Answer:
Option (D) is correct.
Explanation. A tincture of iodine is made by dissolving iodine in alcohol.

Question 8.
The only cell organelle seen in prokaryotic cell is: [1]
(A) Mitochondria
(B) Rihosome
(C) Plastids
(D) lysosomes
Answer:
Option (B) is correct.
Explanation: A prokaryotic cell Lacks membrane-bound organelles like plastids, mitochondria and endoplasmic reticulum but smaller and randomly scattered ribosomes are seen.

Question 9.
Which of the following does not lose their nucleus at maturity?
(A) Companion cells
(B) Red blood cells
(C) Vessel
(D) Sieve tube cells
Answer:
Option (A) is correct.
Explanation: Companion cells do not lose nucleus at maturity. RBC, vessels, and sieve tube cells lose their nucleus at maturity.

Question 10.
Fats are stored in the human body as; [1]
(A) Cuhoidal epithelium
(B) Adipose tissue
(C) Bones
(D) Cartilage
Answer:
Option (B) is correct.
Explanation: Adipose tissue stores tat and acts as an insulator.

Question 11.
Contractile proteins are found in: [1]
(A) Bones
(B) Blood
(C) Muscles
(D) Cartilage
Answer:
Option (C) is correct
Explanation: Contractile proteins are found in muscles, as they are associated with the movement of body or limbs.

Question 12.
Organelle other than the nucleus, containing DNA is [1]
(A) Endoplasmic reticulum
(B) Golgi apparatus
(C) Mitochondria
(D) Lysosome
Answer:
Option (C) is correct.
Explanation: Mitochondria contains DNA and are able to synthesize their own proteins. They are also known as semi-autonomous organelles.

Question 13.
Suppose a boy is enjoying a ride on a merry-go-round which is moving with a constant speed of 10 ms^{-1}. It implies that the boy is: [1]
(A) At rest
(B) Moving with no acceleration
(C) In accelerated motion
(D) Moving with uniform velocity
Answer:
Option (C) is correct.
Explanation: in merry-go-round, the speed is constant but velocity is not constant, because its direction goes on changing i.e., there is acceleration in the circular motion. So, we can say that the boy is in accelerated motion.

Question 14.
Expression for the power of an object is equal to: [1]
(A) Power = Work done x Time
(B) Power = $\frac{\text{Time}}{\text{Work done}}$
(C) Power = $\frac{\text{Work done}}{\text{Time}}$
(D) Power = Force × Displacement
Answer:
Option (C) is correct.
Explanation: Power is rate at which work is done.
Question 15.
Find out the wrong statement from the following. [1]
(A) White Revolution is meant for increase in milk production.
(B) Blue Revolution is meant for increase in fish production.
(C) Increasing food production without compromising environmental quality is called sustainable agriculture.
(D) None of the above [1]
Answer:
Option (D) is correct.
Explanation: All the statements are correct. White revolution is meant for increase in milk production, blue

revolution is meant for increase in fish production and green revolution is for high production of food grains. Sustainable agriculture is the increasing food production without compromising with environmental quality.

Question 16.
Animal husbandry is the scientific management of: [1]
(i) Animal breeding
(ii) culture of animais
(iii) animal livestock
(iv) rearing of animals
(a) (i), (ii), and (iii)
(b) (ii), (iii), and (iv)
(c) (i), (ii), and (iv)
(d) (i), (iii), and (iv)
Answer:
Option (D) is correct.
Explanation: Animal husbandry is scientific management of animal breeding, animal's livestock, and rearing of animals.

Assertion-Reason Based Questions

Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(A) Both (A) and (R) are true, and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true, and (R) is not the correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.

Question 17.
Assertion (A): ElemcnLs and compounds are pure substances. [1]
Reason (R): The properties of compounds are different from those of its constituent elements.
Answer:
Option (B) is correct
Explanation: A pure substance may either contain constituent particles of only one kind or of different kinds. A pure substance has a fixed composition. Thus, elements and compounds are example of pure substances. Properties of compounds are different from those of its constituent elements.

Question 18.
Assertion (A): Chloroplast performs photosynthesis. [1]
Reason (R): Chloroplast comprises photosynthetic pigments.
Answer:
Option (A) is correct.
Explanation: Chioroplast is involved in the process of photosynthesis. It comprises a photosynthetic pigment called chlorophyll, which haps energy from the Sun.

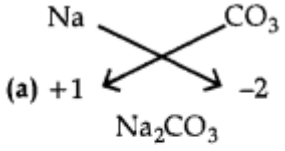
Question 19.
Assertion (A): Motion of satellites around their planets is considered an accelerated motion. [1]
Reason (R): During their motion, the speed remains constant, while the direction of motion changes continuously,
Answer:
Option (A) is correct
Explanation: Satellites revolve around their planets in almost circular orbits with constant speed. Thus, during their motion, the speed remains constant, while the direction of motion changes continuously. As a result,

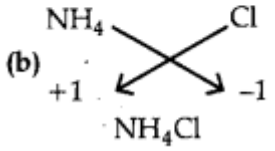
there is a change in their velocity. Therefore, the motion of satellites around their planets is considered as accelerated motion.

Question 20.
Assertion (A): Fisheries are important place in the Indian economy. [1]
Reason (R): It provides income and employment to millions of farmers and fishermen, particularly in coastal states.
Answer:
Option (A) is correct.
Explanation: Fisheries are an important place in the Indian economy as it provides income and employment to millions of farmers and fishermen, particularly in coastal states.

Section – B
(Questions No. 21 to 26 arc very short answer questions)

Question 21.
Write the chemical formula of: [2]
(a) Sodium carbonate
(b) Ammonium chloride
Answer:





Question 22.
Give any two functions of plastids. [2]
Answer:

- Chloroplast is the site of photosynthesis and helps in preparing the food (in case of plants).
- Leucoplasts are the site of storage of food.
- Chrornoplast provide colour to various flowers and fruits. (Any two)

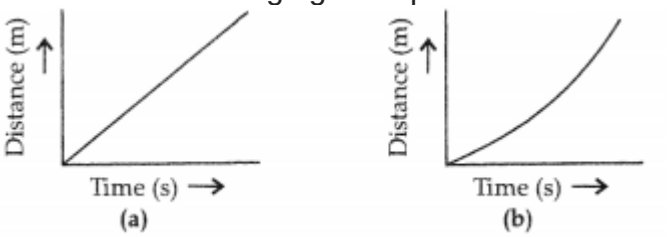
Question 23.
list two points of differences between parenchyma and sclerenchyma. [2]
OR
Mention one region in the human body where adipose tissue is present and state one function of the tissue.
Answer:
Parenchyma tissue: In this, cells are found with thin cell walls and are usually loosely packed so that large intercellular spaces are found.
Scierenchyma: Cells are dead and cell wall is thickened due to lignin. It provides strength to plants.
OR
It is found below the skin. It acts as an insulator.

Question 24.
To establish the relation between the loss in weight of a solid when immersed in water with the weight of water displaced by it, four students A and B, performed an experiment. They noted following readings.

Student	Wt. of the object in air	Weight lost by the object	Buoyant force	Weight of the water displaced
A	100 N	30 N	70 N	30 N
B	100 N	30 N	30 N	70 N

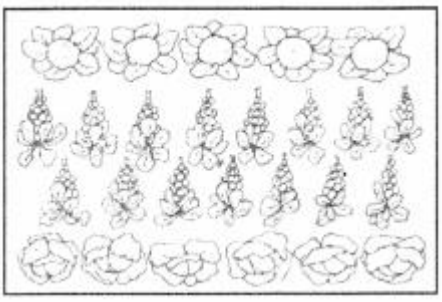
Readings of which students are correct and why? [2]
Answer:
The reading of student A is correct. This is because,
Buoyant force = weight of the object in the air – weight lost by the object. = 100-30 = 70 N.
Weight of water displaced = 100 – 70 = 30 N.

Question 25.
Which of the following figure represents the uniform motion of a moving object correctly? Why? [2]



Why is it easier to stop a tennis ball in comparison to a cricket ball moving with the same speed?
Answer:
Figure (a) represents uniform motion correctly. This is because, for uniform motion, the distance-time graph is a straight line, as in uniform motion object covers an equal distance in equal interval of time.
OR
Tennis ball is lighter (less mass) than a cricket ball. Tennis ball moving with the same speed has less momentum (mass × velocity) than a cricket ball. It is easier to stop tennis ball having less momentum than a cricket ball.

Question 26.



(a) What type of cropping pattern is shown in a diagram shown?
(b) How are the crops selected for this type of cropping pattern? [2]
Answer:
(a) The cropping pattern shown in the diagram is intercropping.
(b) Crops for this pattern are selected in such a way that their nutrient requirements are different. Due to it there is maximum utilisation of the nutrients supplied.

Section – C
(Question No. 27 to 33 are short answer questions)

Question 27.
Give an example for each of the following:
(a) Solid – Liquid homogeneous mixture
(b) Gas – Gas homogeneous mixture
(c) liquid – Liquid heterogeneous mixture [3]
Answer:
(a) Sugar in water
(b) Air
(c) Oil in water.

Question 28.
What are the three different states of matter? Which one of these has a aennite snape. distinct boundaries and fixed volume? Compare the three on the basis of compressibility. [3]
OR
You are provided with a fine white coloured powder which is either sugar or salt. How would you identify it without tasting?
Answer:
Three states of matter are solid, liquid, and gas. Solid has a definite shape distinct boundary and fixed volume. Solids are not compressible, liquids are less compressible while gases are highly compressible.
OR
On heating the powder. it will char if it is a sugar. Alternatively, the powder may be dissolved in water and checked for its conduction of electricity. If it conducts, it is a salt.

Question 29.
Write one function each of ribosomes, Vacuole, Plasma membrane. [3]
Answer:
Ribosomes: It helps in protein synthesis.
Vacuole: Vacuoles are full of cell sap and provide turgidity and rigidity to the cell in plants.
Plasma membrane: It allows or permits the entry and exit of some materials in and out of the cell. It prevents the movement of some other materials not required or are harmful for cells.

Question 30.
List the characteristics of cork. How are they formed? Mention their role. [3]
Answer:

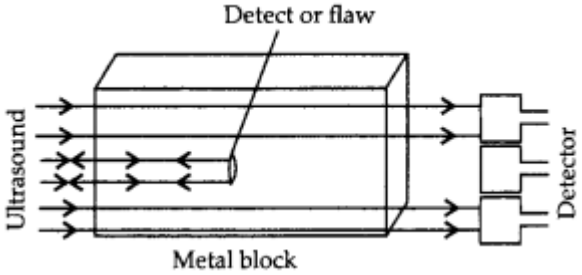
- Non-living
- Compactly arranged
- No intercellular spaces
- Multilayered
- Contains suberin

A strip of secondary meristem replaces the epidermis. Cells on the outside are cut forming cork. Protection makes the plant impervious to gases, prevents loss of water, and prevents mechanical injury or infection.

Question 31.
In which direction do the following forces act when an object is in motion? Explain with the help of an example.
(a) Frictional force
(b) Gravitational force [3]

Answer:
(a) Frictional force: Backwards
Example: If a book slides across the surface of a desk, then the desk exerts a frictional force in the opposite (i.e., backwards) direction of its motion.
(b) Gravitational force: Downwards Example: When we throw a ball in the air, it returns to the ground.

Question 32.
A body can have zero average velocity but not zero average speed. justify giving an example. [3]
Answer:
Average velocity = Net displacement Total time taken
Average speed = Net distance Total time taken
Net displacement can be zero but total distance cannot he zero. Hence, average velocity can be zero but not the average speed. e.g., body thrown vertically comes down to the ground has zero displacement. but distance travelled is 2h where h is height reached by the body.
Question 33.
How defects in a metal block can be detected by using ultrasound? Explain. [3]
Answer:
Ultrasound can be used to detect cracks and flaws in metals blocks. The cracks or holes inside the metal blocks, which are invisible from outside reduces the strength of structure. Ultrasonic waves are allowed to pass through the blocks and detectors are used to detect the transmitted waves. If there is a small defect, the ultrasound gets reflected back.



Section – D
(Question No. 34 to 36 are long answer questions)

Question 34.
(a) Name the international organisation who approves names of elements.
(b) Give an example with explanation to show that the law of conservation of mass applies to physical changes also. [5]
OR
Describe Rutherford's a-particle scattering experiment and mention the important observations and conclusions drawn from this experiment.
Answer:
(a) International Union of Pure and Applied Chemistry (IUPAC),
(b) when ice melts into water it is a physical change. Take a piece of ice in a small flask, cork it and weigh it and denote it as ice (s). Heat the flask gently and ice (solid) slowly melts into water (liquid). Then, weigh the flask again as Water.
It is found that there is no change in the weight i.e.,
$W_{ice} = W_{water}$

$$\text{Ice} \xrightarrow{\text{Heat } (\Delta)} \text{Water}$$

This shows the law of conservation of mass holds true for physical changes.
OR
in this experiment, fast-moving a-particles were made to fall on a thin gold foil.

The following observations were made:

- Most of the fast-moving a-particles passed straight through the gold foil.
- Some of the a-particles were deflected by the foil by small angles.
- One out of every 12000 particles appeared to rebound.

Conclusions:

- Most of the space inside the atom is empty because most of the a-particles passed through the gold foil without getting deflected.
- Very few particles were deflected from their path. indicating that the atom's positive charge occupies very little space.
- A very small fraction of a-particles was deflected by 180°, indicating that all the positive charge and mass of the gold atom were concentrated in a very small volume within the atom.

Question 35.
Analyse the reason behind the following statements:
(a) Epidermis is thicker in desert plants though it is usually single-layered.
(b) Presence of a waxy layer (secreted by epidermis) on the outer surface of plants.
(c) Discuss the cell arrangement which supports the fact that epidermis is a protective tissue. [5]
OR
Name the following tissues:
(a) That forms the inner lining of our mouth.
(b) Present in the brain.
(c) Found in the iris of the eye.
(d) That connects two bones.
(e) Epithelial tissue present on the tongue
Answer:
(a) In desert habitats, protection against water loss is essential so, the epidermis is thicker in desert plants.
(b) The waxy covering aids in protecting the plant against loss of water, mechanical injury and invasion by parasitic fungi.
(c) Epidermis is the outermost covering of cells in plants. It is usually made up of a single layer of cells. On aerial parts of a plant epidemial cells often create a waxy, water-resistant layer on their outer surface to prevent loss o water from plant.

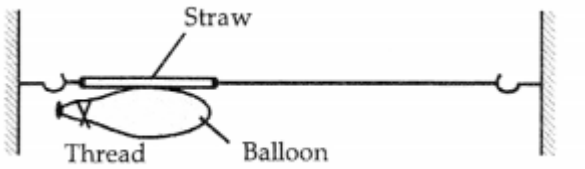
The cells of epidermis are present in a continuous layer without intercellular spaces. Small pores are present on the epidermis of the leaf. These pores are called as stomata, which help in gaseous exchange and transpiration.

As the plant grows older, a strip of secondary meristem replaces the epidermis nl the stem and forms a thick cork
OR

- Epithelial tissue-squamous epithelium
- Nervous tissue
- Involuntary muscular tissue.
- Ligament
- Stratified squamous epithelium

Question 36.
(a) State the law of conservation of momentum.
(b) Observe the following diagram and answer the questions, Stiaw given below:
(i) Which direction does the balloon move when the thread tied to its neck is removed and why?
(ii) State the conclusion drawn from this activity. [5]
OR

(a) Prove that if the Earth attracts two bodies placed at the same distance from the center of Earth, with equal force; then their masses will be the same.
(b) Mathematically express the acce1eraon due to gravity that is expressed by a free-falling object.
(c) Why is 'G' called a universal constant?



Answer:
(a) When two or more bodies act upon one another their total momentum remains constant, provided no external forces are acting.

(b)

- Air from inside the balloon escapes from the mouth of the balloon.
  The balloon moves in the opposite direction that is from left to right.
- Forces of action and reaction are equal and opposite.

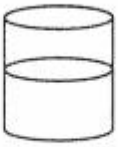
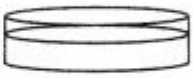
OR

(a) Let mass of the first body be m_1
Let mass of second body be m_2
Force on 1st body = Forcc on 2 body
$GMm_1R_2 = GMm_2R_2$
This implies, $m_1 = m_2$, Hence proved.
$g=GM/R^2$
(c) Its value is constant anywhere in the universe.

Section – E

(Question No. 37 to 39 are case-based! data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.)

Question 37.
Madhu poured 100 ml. of water to each of four different glass vessels. She kept all the four vessels under the Sun.
Madhu noted the time taken for the water in each vessel to evaporate completely Observe the table and answer the questions below:

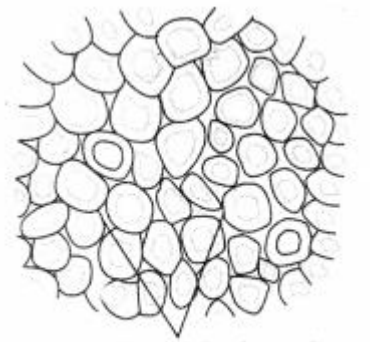
	Vessel 1	Vessel 2	Vessel 3	Vessel 4
				
Time taken for the water to evaporate	4 hours	6 hours	2 hours	8 hours

(a) Water in which vessel has taken the least time to evaporate?
(b) Water in which vessel has taken maximum time to evaporate?
(c) Does the rate of evaporation of a liquid depend on the open surface area? Explain your answer. [4]
OR
Why did Madhu pour an equal amount of water in each vessel?
Answer:
(a) Vessel 3

(b) Vessel 4
(c) Yes, the rate of evaporation depends on the surface area, as in vessel 3 surface area is more, so the water has taken the least time to evaporate as compared to vessel 4 where the surface area is less.

OR
To reliably compare the evaporation time for the vessels.

Question 38.
Study the given diagram and answer the following questions.
(a) Identify the tissue:
(b) Where do we find collenchyma tissues?
(c) Why do these cells have irregularly thickened cell walls? [4]
OR



What type of tissues are collenchyma tous tissues? How do collenchyma tous cells appear in cross-section?
Answer:
(a) Collenchyma.
(b) Leaf stalks. Collenchyn-ia tissues form long flexible but strong strands in leaf stalk.
(c) The irregular thickening is due to the deposition of pectin.
OR

- Collenchymatous tissues are simple permanent tissues.
- Collenchyma cells appear polygonal in cross-section.

Question 39.
Study the given figure' and answer the following questions.

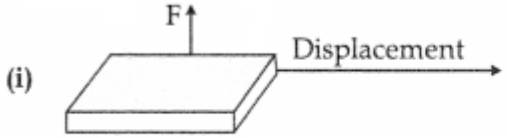


Fig (i)

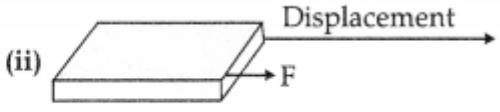


Fig (ii)

(a) What will be the work done in Fig (ii)?
(b) Write an expression for work in terms of force and displacement.
(C) What is the angle between force and displacement when the work done is negative? [4]
OR
Why will be the work done in Fig (i) called zero?
Answer:
(a) In fig (ii), work done is positive. I
(b) W = F × d (Work = Force × Displacement)
(c) In case of negative work, the angle between the force and displacement is 180°.
OR
In figure (i), the direction of force, (F) and displacement are perpendicular to each other. There is no displacement in the direction of force so the work done is zero.