Class IX Session 2025-26
Subject - Science
Sample Question Paper - 3

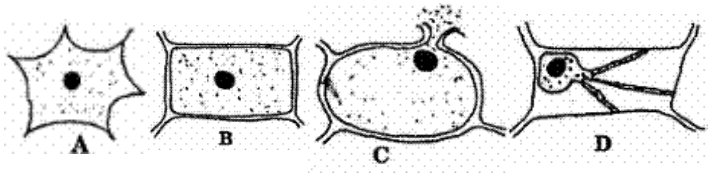
Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper consists of 39 questions in 3 sections. Section A is Biology, Section B is Chemistry and Section C is Physics.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

Section A

1. When an onion peel cell is placed in a hypertonic solution, it will look like? **[1]**



a) C b) D

c) B d) A

2. Amoeba acquires its food through a process, termed **[1]**

a) exocytosis b) endocytosis

c) both exocytosis and endocytosis d) plasmolysis

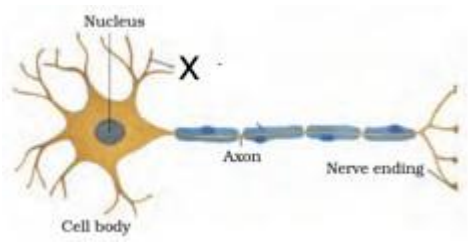
3. Match the following with the correct response**:** **[1]**

(a) Energy currency of the cell	(i) ATP
(b) Organelle which releases oxygen	(ii) RBC
(c) Human cells lacking a nucleus	(iii) Chloroplast
(d) Synthesis of protein	(iv) Ribosomes

a) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii) b) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)

c) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii) d) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

4. In the figure of neuron, X can be identified as: **[1]**



a) cell body
b) dendron
c) dendrite
d) axon

5. Induced breeding is used to increase the production of **[1]**

a) fish
b) poultry birds
c) draught animals
d) cows

6. **Assertion (A):** Blood is a fluid connective tissue. **[1]**
Reason (R): It is composed of plasma, platelets, red blood cells, and white blood cells.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

7. **Assertion (A):** The process of supplying water to crop plants by means of canals, wells, reservoirs, tube-wells, etc. is known as irrigation. **[1]**
Reason (R): Most agriculture in India is rain-fed.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

8. What is the role of the epidermis in the plants? **[2]**

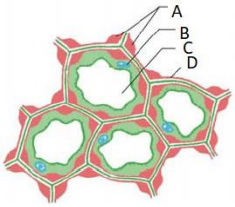
9. What are the important precautions that should be taken in poultry farming? **[2]**

OR

What are pathogens? Name any two plant diseases caused by pathogens?

10. Name two infectious diseases each of cows, poultry and fishes. **[2]**

11. Study the following figure and answer the following questions: **[3]**



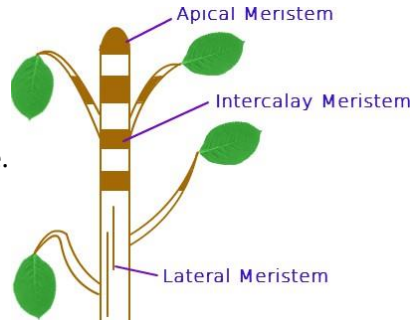
i. Identify the type of tissue shown in the given figure. Write the labellings - A, B, C, D.
ii. Is the given type of tissue in the figure is flexible or not? Give a reason for your answer.
iii. What are the functions of the tissue shown in the given figure?

12. Differentiate between hypertonic and hypotonic solution. **[3]**

13. **Read the following text carefully and answer the questions that follow:** **[4]**

The tissue is a group of cells having similar origin, structure& function. Study of tissues is called Histology. In unicellular organism (Amoeba) single cell performs all basic functions, whereas in multi-cellular organisms (Plants and Animals) shows division of labour as Plant tissue & Animal tissues. Plant tissues are two types:

Meristematic & Permanent tissue.



Meristematic tissue: The meristems are the tissues having the power of cell division. It is found on that region of the plant which grows.

Following are the types of Meristems:

The Apical meristems- It is present at the growing tip of the stem and roots and increases the length.

The lateral meristems- It present at the lateral side of stem and root (cambium) and increases the girth.

The intercalary meristems- It present at internodes or base of the leaves and increases the length between the nodes.

i. Which tissue help in the secondary growth of the plant? (1)

ii. In what region of the plant does intercalary meristematic growth occur? (1)

iii. Where does meristematic tissue mostly found in a plant? (2)

OR

Why cambium is called lateral meristem? (2)

14. Differentiate between **[5]**

i. Cell wall and cell membrane.

ii. Nuclear region of a bacterial cell and nuclear region of an animal cell.

iii. Prokaryotic cell & eukaryotic cell.

OR

The transportation system of plants is composed of complex permanent tissue. They have their transportation system within themselves. Justify in detail with appropriate diagrams.

Section B

15. Choose the correct statement of the following: **[1]**

a) Conversion of solid into vapours without passing through the liquid state is called sublimation.

b) Conversion of vapours into solid without passing through the liquid state is called freezing.

c) Conversion of solid into liquid is called sublimation.

d) Conversion of vapours into solid without passing through the liquid state is called vaporization.

16. Two substances, A and B were made to react to form a third substance, A_2B according to the following reaction **[1]**

$2A + B \rightarrow A_2B$. Which of the following statements concerning this reaction are incorrect?

i. The product A_2B shows the properties of substances A and B

ii. The product will always have a fixed composition

iii. The product so formed cannot be classified as a compound

iv. The product so formed is an element

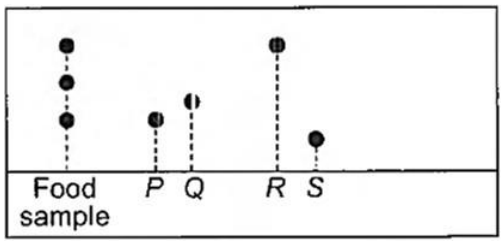
a) (iii) and (iv)

b) (ii), (iii) and (iv)

c) (i), (iii) and (iv)

d) (i), (ii) and (iii),

17. A food sample was tested for the presence of components P, G, R and S and the following chromatogram was obtained. **[1]**



The components not present in food sample are

a) Q and R

b) P and Q

c) P and R

d) Q and S

18. Match the following with the correct response**:** **[1]**

(a) Valency	(i) Combining the capacity of an atom.
(b) Metals	(ii) Gain electron(s) to become stable.
(c) Non-metals	(iii) Lose electron(s) to become stable.
(d) Noble gases	(iv) They have a stable configuration.

a) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)

b) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

c) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

d) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

19. Symbol of Iron is:- **[1]**

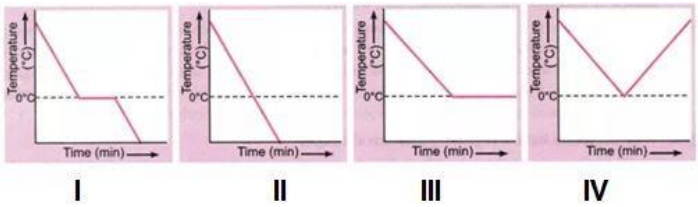
a) Ir

b) I

c) Mg

d) Fe

20. A glass tumbler containing hot water is kept in the freezer compartment of a refrigerator. If you could measure the temperature of the content of the tumbler, which of the following graph would correctly represent the change in its temperature as a function of time? **[1]**



a) II

b) I

c) IV

d) III

21. Which of the following are physical 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 (iv)

b) (iii) and (iv)

c) (i) and (ii)

d) (ii) and (iii)

22. **Assertion (A):** 1amu equals to 1.6×10^{-24} g. **[1]**

Reason (R): 1.6×10^{-24} g. equals to $\frac{1}{12}$th of mass of a C-12 atom.

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

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

23. What is meant by the term chemical formula? **[2]**

24. Give reasons **[3]**

(a) A gas fills completely the vessel in which it is kept.

(b) A gas exerts pressure on the walls of the container.

(c) A wooden table should be called a solid.

(d) We can easily move our hand in air but to do the same through a solid block of wood we need a karate expert.

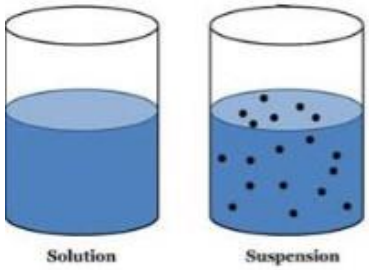
OR

Distinguish between : Liquid state and gaseous state.

25. The atomic number of Al and Cl are 13 and 17 respectively. What will be number of electrons in Al^{3+} and Cl^-? **[3]**

26. **Read the following text carefully and answer the questions that follow:** **[4]**

A suspension is a heterogeneous mixture in which the solute particles do not dissolve but remain suspended throughout the bulk of the medium. Particles of a suspension are visible to the naked eye. The particles of a suspension scatter a beam of light passing through it and make its path visible. Due to the relatively smaller size of particles, as compared to that of a suspension, the mixture appears to be homogeneous. The scattering of a beam of light is called the Tyndall effect. The components of a colloidal solution are the dispersed phase and the dispersion medium. The solute-like component or the dispersed particles in a colloid form the dispersed phase, and the component in which the dispersed phase is suspended is known as the dispersing medium.



i. Differentiate between Dispersed phase and Dispersion medium? (1)

ii. Differentiate between Homogeneous and Heterogeneous mixture? (1)

iii. What is emulsion? (2)

OR

Give an example of solid sol? (2)

27. What are the postulates of Bohr's model of an atom? **[5]**

OR

What were the drawbacks of Rutherford's model of an atom?

Section C

28. In the given below image, the goalkeeper held his palm in the path of the moving ball to show that **[1]**

a) A force can change the shape of the object

b) A force can stop a moving body

c) A force can change the speed of a moving body

d) A force can move a stationary body

29. Statement A: Speed of a gas molecule decreases with increase in temperature. **[1]**

Statement B: P. E of the body decreases as it falls towards the surface of the Earth.

Which of the two statements is true?

a) statement A

b) statement A and B are false

c) both statement A and B

d) statement B

30. Match the following with the correct response**:** **[1]**

(a) Rate of change of velocity	(i) Uniform circular motion
(b) Rate of change of displacement	(ii) Velocity
(c) Rate of change of distance	(iii) Acceleration
(d) Rate of change of speed in a circular path	(iv) Speed

a) (a) - (i), (b) - (iii),(c) - (ii), (d) - (iv)

b) (a) - (ii), (b) - (iv),(c) - (i), (d) - (iii)

c) (a) - (iv), (b) - (i),(c) - (iii), (d) - (ii)

d) (a) - (iii), (b) - (ii),(c) - (iv), (d) - (i)

31. Acceleration due to gravity is **[1]**

a) All of these

b) Dependent on mass of the planet for points outside the planet.

c) Inversely proportional to square of radius for all points on the surface of the planet.

d) Dependent directly on the radius of the planets under comparison are made of same material.

32. **Assertion (A):** Sound is produced when an object vibrates or moves back and forth rapidly. **[1]**

Reason (R): The energy required to make an object vibrate is provided by some outside source.

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

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

33. Which would require a greater force,accelerating a 2 kg mass at 5 ms^{-2} or a 4 kg mass at 2 ms^{-2}?. **[2]**

34. A rocket of 3×10^6 kg mass takes off from a launching pad and acquires a vertical velocity of 1 kms^{-1} at an altitude of 25 km. **[2]**

Calculate

a. Potential energy

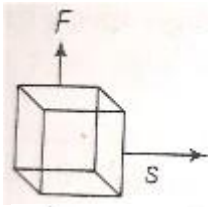
b. Kinetic energy. (Take the value of g = 10 ms^{-2})

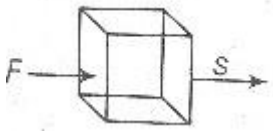
OR

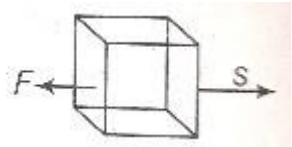
Calculate the work required to be done to stop a car of 1500 kg moving at a velocity of 60 km/h?

35. Why is it difficult to hold a school bag having a strap made of a thin and strong string? **[3]**

36. In each of the following, a force F is acting on an object of mass m. The direction of displacement is from West to east shown by the longer arrow. Observe the figure carefully and state whether the work done by the force is negative, positive or zero. **[3]**

i. 

ii. 

iii. 

37. A ball starts from rest and rolls down 16 m down an inclined plane in 4 s. **[3]**

(a) What is the acceleration of the ball?

(b) What is the velocity of the ball at the bottom of the inclined plane?

38. **Read the following text carefully and answer the questions that follow:** **[4]**

An old man takes 10 minutes to do a particular work whereas a young man takes 5 minutes to do the same work. The rate of doing work of a young man is more than that of an old man. This rate of doing work is called power. Hence, power of young man is more than that of an old man. Thus, Power is defined as the rate of doing work.

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

$P = \frac{W}{t}$

When work is done an equal amount of energy is consumed. Power is a scalar quantity. The SI unit of power is watt which is denoted by symbol W.

1 watt is the power of an appliance which does work at the rate of 1 joule per second.

1 watt = 1 joule/1 second

1 watt = 1 joule per second.

The power of an electrical appliance tells us the rate at which electrical energy is consumed by it. Watt is a small unit of power. Sometimes, bigger units of power called kilowatt (kW) and megawatt (MW) are also used.

1 kilowatt = 1000 watts

1 kW = 1000 W

1 megawatt = 1000,000 watts

$1MW = 10^6$ W

i. What is power? (1)

ii. Define the SI unit of power. (1)

iii. What does the power of an electrical appliance tell? (2)

OR

How many watts are there in 1 kilowatt and 1 megawatt? (2)

39. Describe Newton's first law of motion in detail, giving examples. **[5]**

OR

i. State second law of motion.

ii. A bus starts from the stop and take 20 second to get the speed of 10m/s. If the mass of the bus along with passengers is 10000 kg, calculate the force applied by the engine of bus to push the bus at the speed of 10m/s.

Solution

Section A

1.

(b) D

Explanation:

Due to plasmolysis liquid moves out from the cell and the cell membrane shrinks.

2.

(b) endocytosis

Explanation:

Amoeba acquires its food through the process of Endocytosis. Actually it has cytoplasmic projections called psedupodia (false feet) that extend out of its body. It moves the pseudopodia towards the food and take it in its body through the process of endocytosis.

3.

(d) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

Explanation:

- The energy required for various chemical activities is released by mitochondria. They contain enzymes for cellular respiration. During cellular respiration, energy is released in the form of ATP (Adenosine triphosphate). The body uses energy stored in ATP. Hence, ATP is called the energy currency of the cell.
- Chloroplasts are found in leaves of plants. They make use of sunlight to perform a process called photosynthesis. Chloroplasts are involved in the process of photosynthesis during which oxygen is produced and the net amount is given off.
- Red Blood Cells in mammals anucleate when mature i.e. they do not contain a nucleus. This is so that the cell has maximum space for haemoglobin.
- Ribosomes are associated with the synthesis of proteins from amino acids. Proteins are required by a cell for functions such as repair or directing chemical processes.

4.

(c) dendrite

Explanation:

The dendrites receive impulses and the axon takes impulses away from the cell body.

5. **(a)** fish

Explanation:

Induced breeding is an optimal effort to produce fish fry without considering the season. This technique is used to produce fry of fish species that have or potentially have great economic significance for aquaculture, which do not reproduces spontaneously in captivity.

6.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Blood is a fluid connective tissue. It consists of two components - fluid and corpuscles. It is composed of plasma, platelets, red blood cells, and white blood cells.

7.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

The process of supplying water to crop plants by means of canals, wells, reservoirs, tube-wells, etc. is known as irrigation. Most agriculture in India is rain-fed, that is, the success of crops in most areas is dependent on timely monsoons, and sufficient rainfall spread through most of the growing season.

8. (i) Protection. (ii) Regulation of transpiration (iii) Formation of insulating stationary air layer with the help of hair. (iv) Exchange of gases.
9. In poultry farming the following precautions should be taken:
   a. Proper poultry feed.
   b. Proper vaccination of birds.
   c. Prevention and control of diseases and pests.
   d. Isolation of diseased birds.
   e. Maintenance of optimum temperature and hygienic conditions in housing.

   OR

   The disease causing microorganisms like bacteria, fungi and viruses are called pathogens.
   They reach the plants through water, air, soil as well as seeds.
   Two plant diseases caused by pathogens are rust in wheat and blast in paddy/stem rot in pigeon pea.
10. (a) Cows - Anthrax and Foot and mouth diseases
    (b) Poultry - Ranikhet and Salmonellosis diseases
    (c) Fishes- Viral Hemorrhagic Septicemia (VHS) and Infectious Pancreatic Necrosis (IPN)
11. i. The tissue shown is collenchyma tissue.
    The labelling of the collenchyma tissue is as follows:
    A. - Wall thickenings
    B. - Nucleus
    C. - Vacuole
    D. - Cell wall
    ii. Yes, the collenchyma tissue is flexible. This is so because collenchyma cells don't have lignin in their cell wall.
    iii. The function of collenchyma tissue are as follows:
    a. Collenchyma tissue provides flexibility to the plant.
    b. It also provides mechanical support to plants.
12. Hypertonic solution – If the medium surrounding the cell has higher solute concentration than the cell, then the solution in called hypertonic solution.
    Hypotonic solution – If the medium surrounding the cell has lower solute concentration than the cell, then the solution in called hypotonic solution.
13. i. Cambium tissue help in the secondary growth of the plant.
    ii. Between mature tissue segments, intercalary meristematic growth occurs.
    iii. Meristematic tissues are mostly found at the apices of root and shoot.

    OR

    The cambium is called the lateral meristem because it increases the girth of the axis.
14. i.

Cell wall	**Cell membrane**
It is present in bacteria, fungi, and plant cells. It is absent in animal cells and protozoans.	It is present in all cells.
There is no other name of the cell wall.	The cell membrane is also known as the plasma membrane or plasmalemma.
The cell wall is completely permeable.	The cell membrane is semi-permeable.
The cell wall is made up of cellulose.	The cell membrane is made up of lipids and proteins.

ii.

Nuclear region of bacterial cell	**Nuclear region of an animal cell**
Smaller in size.	Larger in size.
The nuclear membrane is absent, the nucleolus is absent. The nucleus is regarded as the nucleoid.	Nuclear membrane with nucleolus present.

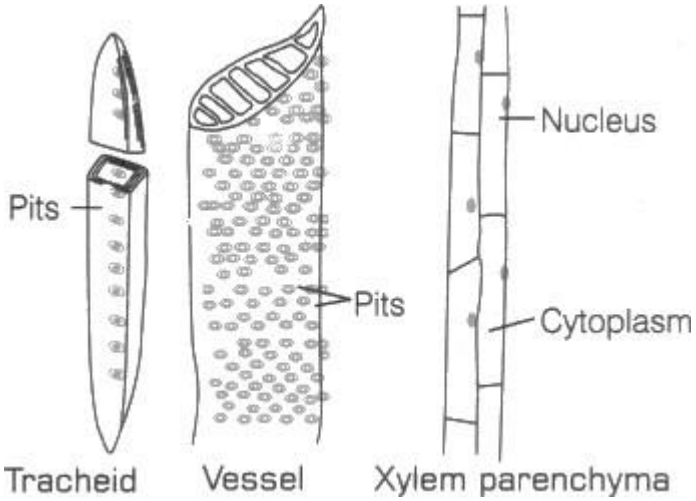
iii.

Prokaryotic cell	Eukaryotic cell
The size of a cell is generally small.	The size of a cell is generally large.
The true nucleus is absent.	The true nucleus is present.
It contains a single chromosome.	Contains more than one chromosome.
Membrane-bound cell organelles absent.	Membrane-bound cell organelles present.

OR

In plants, there are pipe-like vessels through which water and minerals can enter the plants. These vessels are made up of elongated cells and thick walls. A group of cells forms a tissue which performs a specialized function within the organisms. These are conducting tissues. These conducting tissues are divided into two types which are xylem and phloem.

i. **Xylem:** It is a vascular tissue that spreads from the top to bottom of the plant. It helps in the transportation of water and minerals from roots to other parts of the plant.



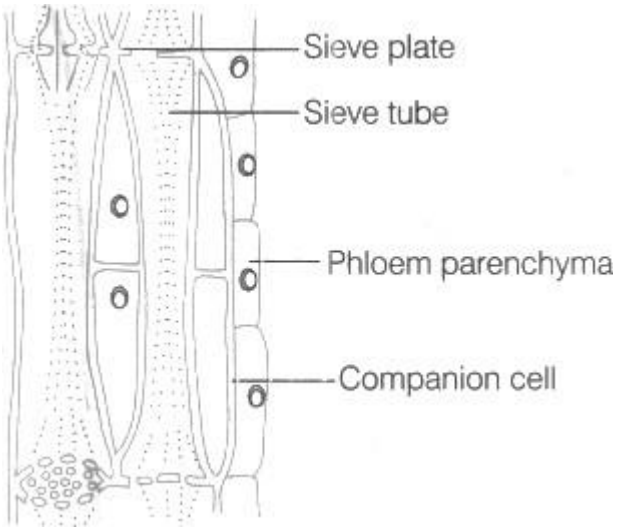
Elements of xylem:

a. **Tracheids and Vessels**: It is Tubular structure and transport water and minerals vertically.
b. **Parenchyma:** It stores food and helps in sideways conduction of water.
c. **Fibres**: It is supportive in function.

ii. **Phloem** It transports food from leaves to other parts of the plant. Food is prepared in leaves by the process of photosynthesis.

Elements of phloem:

a. **Sieve tubes**: It is tubular cells with perforated walls. These consist of living cells.
b. **Companion cells:** It is small elongated cells with dense cytoplasm.
c. **Phloem parenchyma** : It is Thin-walled cells. Mainly function in storage and transportation of food.
d. **Phloem fibres** It is Thick-walled cells. These are dead cells. Provide mechanical strength to tissue.



Both xylem and phloem maintain a transportation system within the plants. There is continuous transportation of food, water and minerals within the plant. This transportation is necessary for the proper growth and maintenance of the plant.

Section B

15. **(a)** Conversion of solid into vapours without passing through the liquid state is called sublimation.

Explanation:

Conversion of solid into vapours without passing through the liquid state is called sublimation.

16.

(c) (i), (iii) and (iv)

Explanation:

$2A + B \rightarrow A_2B$

In the reaction, A_2B is a compound made up of two elements A and B which are present in a fixed ratio. The properties of a compound (e.g. A_2B) are entirely different from those of its constituent elements (i.e., A and B). The product will always have a fixed composition.

17.

(d) Q and S

Explanation:

Chromatogram of food sample does not match with the chromatograms of components Q and S.

18.

(b) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

Explanation:

Valency is the combining capacity of an atom. Metals are electro-positive in nature. They lose an electron(s) to become stable. Non-metals are electro-negative in nature. They gain an electron(s) to become stable. Noble gases or inert gases have a stable configuration and zero valency.

19.

(d) Fe

Explanation:

Symbol "Fe" for Iron has been derived from the Latin word Ferrum.

20.

(b) I

Explanation:

The water will cool initially till it reaches 0°C, the freezing point. At this stage, the temperature will remain constant until all the water will freeze. After this, the temperature would fall again.

21.

(b) (iii) and (iv)

Explanation:

Option (i) Decaying of wood and (ii) 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. In (iii) Sawing of wood and (iv) Hammering of a nail into a piece of wood, the chemical composition of wood is not changed, therefore, (iii) and (iv) are physical changes.

22.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

$\frac{1}{12}$ th of mass of 1 atom of C-12 - is 1.66×10^{-24} - and atomic mass unit (1 amu) 1.66×10^{-24} g.

23. A chemical formula is the representation of elements present in a compound with the help of symbols and also the number of atoms of each element with those numbers only. for eg: A molecule of water (compound) contains 2 atoms of hydrogen and one

atom of oxygen hence its chemical formula is H_2O

24. (a) Since the attraction force between particles of a gas is negligible i.e. extremely less hence particles freely move/flow in all possible directions as a result gas fills completely the vessel in which it is kept.

(b) Freely moving particles of gas hit the walls of its container continuously and randomly therefore such random and erratic motion of gas particles exerts pressure on the walls of the container.

(c) A wooden table particles are quite rigid, have a fixed location and also possess a definite shape and volume. Due to all these properties we should call a wooden table a solid substance.

(d) Air is a mixture of gases and since particles of gas are far apart and gases can be compressed easily so we can move our hand in air. But a solid block of wood is hard and rigid that resists any change in location of its particles hence we need a karate expert in case of a solid block of wood.

OR

Sr. No.	Liquid State	Gaseous State
1.	The particles cannot get away from each other but have sufficient freedom of movement.	The particles are nearly independent of each other and can move far away till they collide.
2.	Only one free surface	No free surface.
3.	Kinetic energy is higher than solids.	Kinetic energy is much higher than the solids as well as liquids.

25. Number of electrons in Al = Number of protons in Al = Atomic number (Z) of Al = 13

Number of electrons in Al^{3+} = 13 - 3 = **10**

Number of electrons in Cl = Number of protons in Cl = Atomic number (Z) of chlorine = 17

Number of electrons in Cl^- = 17 + 1 = **18**

26. i. Dispersion medium is a continuous medium in which the dispersed phase is distributed throughout. Dispersed phase is the phase that is composed of particles that are distributed through another phase.

ii. Homogenous mixtures generally have a uniform composition throughout the mixture whereas Heterogeneous mixtures have composition which may vary from point to point. In Homogenous mixtures, the whole mixture is in the same phase whereas in Heterogeneous mixture, substances can be of two phases and layers may separate.

iii. An emulsion is a mixture of two or more liquids that are usually immiscible but under specific transforming processes will adopt a macroscopic homogeneous aspect and a microscopic heterogeneous one.

OR

Coloured gemstone.

27. The postulates put forth by Neils Bohr's about the model of an atom are as follows:-

i. Only certain special orbits known as discrete orbits, are allowed inside the atom. These discrete orbits are called energy levels. Energy levels in an atom are shown by concentric circles. These orbits are represented by the letters K, L, M, N, … or the numbers, n = 1, 2, 3, 4, ….

ii. While revolving in the discrete orbits, the electrons do not radiate any energy.

OR

Rutherford had proposed a model in which the electrons revolve around the nucleus in well-defined orbits. However, the orbital revolution of the electron was not expected to be stable. Any particle in a circular orbit would undergo acceleration and the charged particles would radiate energy. Thus, the revolving electrons would lose energy and finally fall into the nucleus. Revolution of electrons around the atom would make the atom highly unstable and the matter would not exist. But this is contrary to our common observations.

Section C

28.

(b) A force can stop a moving body

Explanation:

A moving ball comes to a stop when the goalkeeper held his palm in the path of moving the ball. As his palm applies a force to the moving ball. The stopping of a moving football by a goalkeeper demonstrates that a force can stop a moving object.

29.

(d) statement B

Explanation:

The average kinetic energy of a gas particle is directly proportional to the temperature. An increase in temperature increases the speed at which the gas molecules move. So statement A is a false statement.

As the body falls from height h, its potential energy decreases while the kinetic energy begins to increase; the total mechanical energy at any point being the same i.e. m g h. So, statement B is a true statement.

30.

(d) (a) - (iii), (b) - (ii),(c) - (iv), (d) - (i)

Explanation:

The general definition of Uniform circular motion, Velocity, Acceleration, and Speed is given.

Acceleration of a body is defined as the rate of change of its velocity with time.

The velocity of a body is defined as the rate of change of its displacement with time.

The speed of a body is the distance travelled by it per unit time.

When a body moves along a circular path, then its direction of motion keeps changing continuously. Therefore, the motion along a circular path is said to be accelerated.

31.

(b) Dependent on mass of the planet for points outside the planet.

Explanation:

The gravitational force exerted by any planet is based on the effective mass of the planet, which is in turn dependent on if you are on the surface of the planet, above the surface or below the surface of the planet.

$F = \frac{Gm_1m_2}{r^2}$

32.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

When a vibrating object moves forward, it pushes and compresses the air in front of it creating a region of high pressure. As the object moves back and forth rapidly, a series of compressions and rarefactions are created in the air. These make the sound wave that propagates through the medium.

The energy required to make an object vibrate is provided by some outside source like our hand, wind, etc.

33. Here, $m_1 = 2$ kg , $a_1 = 5$ ms^{-2}, $m_2 = 4$ kg, $a_2 = 2$ ms^{-2}

$F_1 = m_1a_1 = 2 \times 5 = 10$N

$F_2 = m_2a_2 = 4 \times 2 = 8$ N

$F_1 > F_2$

Thus, accelerating a 2 kg mass at 5 ms^{-2} acceleration would require a greater force than accelerating a mass of 4kg at 2 ms^{-2} .

34. Given : Mass of the rocket (m) = 3×10^6 kg. Height (h) = 25 km = 25×10^3 m

Acceleration due to gravity (g) = 10 ms^{-2}

P.E. of the rocket = mgh

$= 3 \times 10^6 \times 10 \times 25 \times 10^3 = 7.5 \times 10^{11}$J

Now K.E. of the rocket

$= \frac{1}{2}mv^2 = \frac{1}{2} \times 3 \times 10^6 \times 10^6 = 1.5 \times 10^{12}$J

OR

Initial velocity of the car (u) = 60 km/h $= (60 \times 1000)/60 \times 60 = 50/3 ms^{-1}$

Final velocity (v) = 0 (object has to be stopped)

Initial kinetic energy $= \frac{1}{2} \times m \times v^2$

$= \frac{1}{2} \times 1500 \times (50/3)^2 = 208333.30$ J

Final kinetic energy $= \frac{1}{2} \times 1500 \times 0 = 0$

Therefore, work done = change in kinetic energy = 208333.30 - 0 = 208333.30 J

35. It is difficult to hold a school bag having a thin strap because the pressure on the shoulders is quite large. This is because the pressure is inversely proportional to the surface area on which the force acts. The smaller is the surface area the larger wold be the pressure on the surface. In the case of a thin strap, the contact surface area is very small. Hence pressure exerted on the shoulder is very large.

36. In Fig. (i), the angle between F and S is $90°$, so work done is zero.
In Fig. (ii), the angle between F and S is $0°$, so work done is positive.
In Fig. (iii), the angle between F and S is $180°$, so work done is negative.

37. u= initial velocity =0 (body starts from rest)
S= distance = 16m
T= time = 4s
(i) From, $s= ut+at^2$
$16 = 0 \times t + \frac{1}{2} \times a \times (4)^2$
$16 = \frac{1}{2} \times a \times 16$
$\frac{16 \times 2}{16}$
$a = 2m/s^2$
(ii) From, v = u +at
$v = 0 + 2 \times 4$
v= 8m/s

38. i. Power is defined as the rate of doing work.
Power = $\frac{\text{Work done}}{\text{Time taken}}$
P = $\frac{W}{t}$
ii. The SI unit of power is watt which is denoted by symbol W.
1 watt is the power of an appliance which does work at the rate of 1 joule per second.
iii. The power of an electrical appliance tells us the rate at which electrical energy is consumed by it.
OR
1 kilowatt = 1000 watts
1 kW = 1000 W
1 megawatt = 1000,000 watts
1MW = 10^6 W

39. According to Newton's first law of motion, a body at rest or in uniform motion will remain at rest or in uniform motion unless an unbalanced force acts upon it. Newton's first law defines inertia and is rightly called the law of inertia. This law consists of three parts:
(i) The first part says that a body at rest continues in its state of rest. For instance, a boy standing in a train falls backward when the train suddenly starts moving forward. This is because when the bus moves, the lower part of his body begins to move along with the train while the upper part of his body continues to remain at rest due to inertia.
(ii) The second part says that a body in uniform motion continues to move in straight line path with a uniform speed, e.g., when a moving train stops suddenly a person sitting in it falls forward. This is because as the train stops, the lower part of the person's body comes to rest along with the bus while upper part of his body continues to remain in motion due to inertia of motion and thus he falls forward.
(iii) Third part says that a body moving with a uniform speed in a straight line cannot change its direction of motion by itself. For example, when a bus takes a sharp turn, a person sitting in the bus gets force acting away from the centre of the curved path due to his tendency to move in the original direction.

OR

Newton's Second Law of Motion: The rate of change of momentum is directly proportional to the force applied in the direction of force.
According to the question:
Initial velocity (u) = 0, final velocity (v) = 10m/s, time (t) = 20 second, Mass (m) = 10000 kg,
Therefore, force (F) = ?
We know that force (F) = $m\frac{(v-u)}{t}$

$F = (10000)^{\frac{(10-0)}{20}}$

$= \frac{100000}{20}$

$= 5000$ N

Thus the required force is 5000 N.