Class IX Session 2024-25
Subject - Science
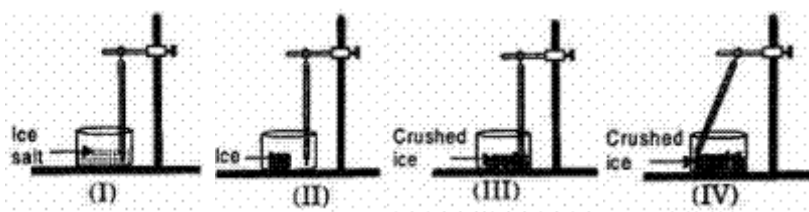## Sample Question Paper - 8

Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

1. This question paper consists of 39 questions in 5 sections.

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.

3. Section A consists of 20 objective type questions carrying 1 mark each.

4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.

5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words.

6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.

7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Section A

1. Which one of the following is the correct set up to determine the melting point of ice? **[1]**

   a) I

   b) III

   c) IV

   d) II

2. The most abundant material on the plant cell wall is: **[1]**

   a) proteins

   b) lipids

   c) wax

   d) cellulose

3. A car travels 10 m in 5 seconds, 20 m in the next 10 seconds, and 30 m in the last 10 seconds. The average speed of the motion is: **[1]**

   a) 30 ms^{-1}

   b) 2.2 ms^{-1}

   c) 2.4 ms^{-1}

   d) 2.0 ms^{-1}

4. Who is known as the 'Father of white revolution' in India? **[1]**

a) Mrs. Indira Gandhi

b) Shri Jai Prakash Narain

c) Dr.V. Kurein

d) Prof M.S. Swaminathan

5. Specimens of plants and animals are preserved in: **[1]**

a) acetone

b) methylated spirit

c) ethanol

d) formalin

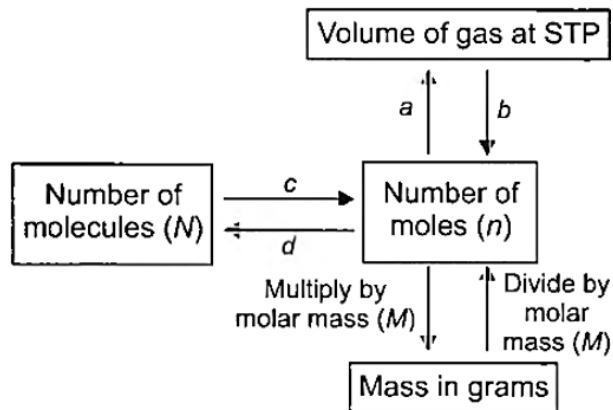6. Ribosomes are made up of _____. **[1]**

a) Both RNA and Proteins

b) RNA

c) Lipoprotein

d) Proteins

7. What are c and d? **[1]**

a) c = multiply by N_A, d = multiply by N_A

b) c = multiply by N_A, d = divide by N_A

c) c = divide by N_A, d = divide by N_A

d) c = divide by N_A, d = multiply by N_A

8. Glands in our body are formed by **[1]**

a) connective tissue

b) epithelial tissue

c) smooth muscles

d) adipose tissue

9. For performing an experiment to verify Archimedes principle, a student used a spring balance with a zero error of 4 g wt. He used to measure the weight of a solid metallic block as shown in the figure below. The solid metallic block was then lowered in water contained in an overflowing jar and the water displaced by this block was collected in graduated or measuring cylinder as shown in figure. **[1]**
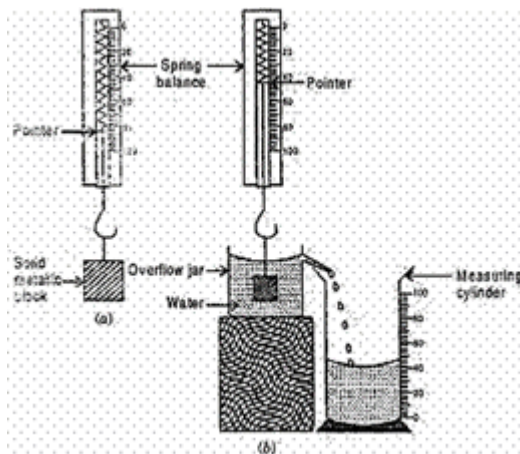
The apparent loss in weight of the solid metallic block is :

a) 38 g wt

b) 35 g wt

c) 40 g wt   d) 30 g wt

10. Slope of a velocity-time graph gives   **[1]**

    a) the displacement   b) the acceleration

    c) the distance   d) the speed

11. The mass number of an isotope of an element is 295, if its nucleus has 196 neutrons. What is its atomic number? **[1]**

    a) 98.0   b) 199.0

    c) 491.0   d) 99.0

12. Lignified or thickened cell wall is a characteristic feature of   **[1]**

    a) phloem   b) xylem

    c) parenchyma   d) collenchyma

13. Kitchen of the cells   **[1]**

    a) Golgi apparatus   b) Endoplasmic reticulum

    c) Chloroplast   d) Mitochondria

14. Metanil yellow, an adulterant used in Arhar dal is basically: **[1]**

    a) a dye   b) an acid

    c) a detergent   d) a base

15. Which of the following solutions has the highest mass by mass percentage?   **[1]**

    a) 20 g of sodium carbonate in 90 g of water   b) 15 g of sugar in 160 g of water

    c) 10 g of sodium chloride in 200 g of water   d) 60 g of potassium permanganate in 200 g of water

16. Weeds affect the crop plants by   **[1]**

    a) dominating the plants to grow   b) killing of plants in field before thy grow

    c) all of these   d) competing for various resources of crops (plants) causing low availability of nutrients

17. **Assertion (A):** A bus moving due north takes a turn and starts moving towards the east with the same speed. **[1]**
There will be no change in the velocity of the bus.
Reason (R): Velocity is a vector quantity.

    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.

18. **Assertion (A):** The conversion of gas directly into solid is called condensation.   **[1]**
Reason (R): Naphthalene leaves residue when kept open for some time.

    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.

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

   c) A is true but R is false.   d) A is false but R is true.

20. **Assertion (A):** Rutherford's atomic model was that it could not explain the stability of atoms.   **[1]**

   Reason (R): Any charged particle during acceleration would radiate energy, and while revolving, it would lose its energy and eventually fall into the nucleus.

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

   c) A is true but R is false.   d) A is false but R is true.

Section B

21. A battery lights a bulb. Describe the energy changes involved in the process.   **[2]**

OR

A machine raises a load of 750 N through a height of 16 m in 5 seconds. Calculate the power at which the machine works.

22. Alka was making tea in a kettle. Suddenly she felt intense heat from the puff of steam gushing out of the spout   **[2]**
of the kettle. She wondered whether the temperature of the steam was higher than that of the water boiling in the kettle. Comment.

23. Explain how sound is produced by your school bell.   **[2]**

24. How much water should be mixed with 12 mL of alcohol so as to obtain a 12 % alcohol solution?   **[2]**

25. A man throws a ball of mass 0.4 kg vertically upwards with a velocity of 10 m/s. What will be its initial   **[2]**
momentum? What would be its momentum at the highest point of its reach?

OR

A stone of 1 kg is thrown with a velocity of 20 ms^{-1} across the frozen surface of a lake and comes to rest after travelling a distance of 50 m. What is the force of friction between the stone and the ice?

26. An electron is regarded as a universal particle. Explain.   **[2]**

Section C

27. Represent graphically by two separate diagrams in each case   **[3]**

   i. Two sound waves having the same amplitude but different frequencies?

   ii. Two sound waves having the same frequency but different amplitudes.

   iii. Two sound waves having different amplitudes and also different wavelengths.

28. On the basis of the number of protons, neutrons and electrons in the samples given below identify   **[3]**

   i. the cation.

   ii. the pair of isobars, and

   iii. the pair of isotopes.

Sample	Protons	Neutrons	Electrons
A	17	18	16
B	18	19	18
C	17	20	17

D	17	17	17

29. A train is travelling at a speed of 90 kmh^{-1}. Brakes are applied so as to produce a uniform retardation of 0.5 ms^{-2}. Find how far the train will go before it is brought to rest. **[3]**

<center>OR</center>

Two trains A and B of length 400 m each are moving on two parallel tracks with uniform speed of 72 kmh^{-1} in the same direction with A ahead of B. The driver of B decides to overtake A and accelerates by 1 ms^{-2}. If after 50s, the guard of B just passes the driver of A, what was the original distance between them?

30.   i. The potential energy of a freely falling object decreases progressively. What happens to its **[3]**

     a. Kinetic energy,

     b. total mechanical energy?

      State the law on which your answer is based.

   ii. A household consumes 1 kWh of energy per day. How much energy is this in joules?

31. The velocity-time graph of a ball moving on the surface of a floor is shown in the figure. Find the force acting on the ball if the mass of the ball is 50 g. **[3]**
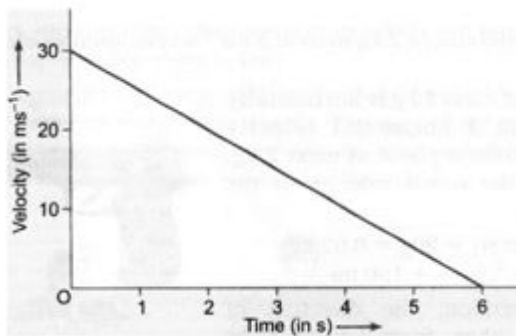
32. What are the differences between cell wall and cell membrane? **[3]**

<center>OR</center>

What is the role of ribosmes and golgi body?

33. Describe the types of connective tissues along with their functions. **[3]**

<center>**Section D**</center>

34. Define acceleration due to gravity. Derive an expression for acceleration due to gravity in terms of mass of the earth (M) and universal gravitational constant (G). **[5]**

<center>OR</center>

A block of wood is kept on a tabletop. The mass of the wooden block is 5 kg and its dimensions are 40 cm $\times$ 20 cm $\times$ 10 cm. Find the pressure exerted by the wooden block on the table top if it is made to lie on the table top with its sides of dimensions
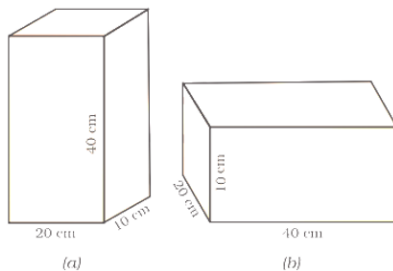
   i. 20 cm $\times$ 10 cm and

   ii. 40 cm $\times$ 20 cm.

35. Why are mitochondria called powerhouse of the cell? Give three similarities and one difference between **[5]**

mitochondria and plastid.

OR

i. Describe the role played by the lysosomes. Why are they termed as suicidal bags? How do they perform their function?

ii. What happens to the dry raisins, when placed in plain water for some time? State the reason for whatever is observed. What would happen if these raisins are then placed in concentrated salt solution?

36. Non-metals are usually poor conductors of heat and electricity. They are non-lustrous, non-sonorous, non-malleable and are coloured. **[5]**

   i. Name a lustrous non-metal.

   ii. Name a non-metal which exists as a liquid at room temperature.

   iii. The allotropic form of a non-metal is a good conductor of electricity. Name the allotrope.

   iv. Name a non-metal which is known to form the largest number of compounds.

   v. Name a non-metal other than carbon which shows allotropy.

   vi. Name a non-metal which is required for combustion.

Section E

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

The animal body are covered by epithelial tissue. The epithelial tissue cover most of the organ and cavity with in the body. It also form barrier to keep different body systems separate. The skin, the lining of the mouth, lining of the blood vessels, lung alveoli and kidney tubules are all made of epithelial tissue. The oesophagus and lining of mouth are covered with squamous epithelium. Skin help in protecting the body. The columnar cell have hair-like projection called cilia. Cuboidal epithelium form lining of the kidney tubules and duct of salivary gland.

   i. What type of cell are present where absorption and secretion occur? (1)

   ii. Skin helps in the protection of body explain? (1)

   iii. How cilia clear mucus? (2)

   OR

   What is glandular epithelium? (2)

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

A farmer has grown wheat on his field consecutively two times but when the third time he grows wheat on the same field the quality of the wheat was not up to the desired level. To improve the quality of his crops he uses chemical fertilizer but the condition of the crop became worse. One of his friends told him to grow a different variety of crops after wheat so as to grow two or three crops in a year with good harvests and use biological manure in place of chemical fertilizers which he prepares by animal excreta and plant waste to get the good quality of crops. He also told him about the good storage of his grains to protect them from the biotic and abiotic losses as in agriculture storage losses are very high.

   i. What are the bases on which the next crop is decided to grow in the same field also name the process? (1)

   ii. What is the advantage of using biological manure over chemical fertilizers? (1)

   iii. Is it possible for the farmer to grow two crops at the same time if yes what is the requirement? (2)

   OR

   Enlist the biotic and abiotic losses? (2)

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

Mixtures are constituted by more than one kind of pure form of matter. Sodium chloride is itself a pure substance matter. The solution is a homogeneous mixture of two or more substances. Lemonade, soda water etc.

are all examples of solutions. Alloys are mixtures of two or more metals or a metal and a non-metal and cannot be separated into their components by physical methods. A solution has a solvent and a solute as its components. The component of the solution that dissolves the other component in it (usually the component present in a larger amount) is called the solvent. The component of the solution that is dissolved in the solvent (usually present in lesser quantity) is called the solute.

Solute + **Solvent** –> **Solution**

  i. In a water-sugar solution: Identify solute and solvent? (1)

 ii. What is the size of the particles of a solution? (1)

iii. What is pure substance? (2)

OR

What do you mean by Alloy? (2)

Solution

Section A

1.

(b) III

Explanation: The bulb of the thermometer should be dipped in crushed ice to determine the melting point of ice.

2.

(d) cellulose

Explanation: Cellulose is an important structural component of the primary cell wall of green plants, many forms of algae, and the oomycetes. Some species of bacteria secrete it to form biofilms. Thus, cellulose is the most abundant organic polymer on Earth.

3.

(c) 2.4 ms^{-1}

Explanation: The average distance covered in unit time by a moving object is called average speed. The average speed is the ratio of total distance covered and total time taken.

Average speed = $\frac{Total\ distance\ covered}{Total\ time\ taken}$ = $\frac{10+20+30}{5\ +\ 10\ +10}$ = $\frac{60}{25}$ = 2.4 ms^{-1}

4.

(c) Dr.V. Kurein

Explanation: Dr.V. Kurein is called as the 'Father of white revolution' in India because of his initiatives and immense contribution to the dairy sector.

5.

(d) formalin

Explanation: Specimen preservation means "longterm preservation of organisms either plant or animal in the best possible condition. So that it can be accessed in the future as a reference collection for scientific purposes". Formalin is the best preservative for plants and animals.

6. **(a)** Both RNA and Proteins

Explanation: Ribosomes consist of two major components: the small ribosomal subunit, which reads the RNA, and the large subunit, which joins amino acids to form a polypeptide chain. Each subunit is composed of one or more ribosomal RNA (rRNA) molecules and a variety of ribosomal proteins (r-protein).

7.

(d) c = divide by N_A, d = multiply by N_A

Explanation: No. of moles = No. of molecules $\div \underbrace{\text{Avogadro's number}}_{c}$

Number of molecules = Number of moles $\times \underbrace{\text{Avogadro's number}}_{d}$

8.

(b) epithelial tissue

Explanation: A gland is a group of cells. Epithelial tissues are thin tissues that cover all the exposed surfaces of the body. They form the external skin, the inner lining of the mouth, digestive tract, secretory glands, the lining of hollow parts of every organ such as the heart, lungs, eyes, ears, the urogenital tract, as well as the ventricular system of the brain and central canals of the spinal cord.

9.

(c) 40 g wt

Explanation: Loss in weight = Difference in reading, i.e. 84 − 44 = 40 units. [Scale is not graduated with respective units]

10.

(b) the acceleration

Explanation: The area under a velocity-time graph represents the distance covered and the gradient of a velocity-time graph represents the acceleration.

11.

(d) 99.0
Explanation: Atomic number is the number of protons present in the given element and can be calculated by subtracting neutrons from mass number.

12.

(b) xylem
Explanation: The xylem is one of the conductive tissues in plants. It is a complex tissue composed of many types of cells. The main function of xylem is to conduct water and minerals from roots to leaves. The secondary xylem also provides mechanical support due to the presence of a thick lignified cell wall.

13.

(c) Chloroplast
Explanation: Chloroplasts are special structures present only in plant cells. With the help of this chlorophyll, the plants prepare their food in the presence of water, sunlight and oxygen. Hence, chloroplasts are called the kitchen of a plant cell.

14. **(a)** a dye
Explanation: Metanil yellow is a yellow colour dye, generally used colouring food material, for e.g. starch when dyed with metanil yellow looks like turmeric. Poor quality dal when dyed with metanil yellow looks superior quality dal.

15.

(d) 60 g of potassium permanganate in 200 g of water
Explanation: Mass by mass percentage = $\frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$
Concentration of solution I = $\frac{10}{10+200} \times 100 = 4.76\%$
Concentration of solution II = $\frac{15}{160+15} \times 100 = 8.57\%$
Concentration of solution III = $\frac{60}{200+60} \times 100 = 23.07\%$
Concentration of solution IV = $\frac{20}{90+20} \times 100 = 18.18\%$

16.

(d) competing for various resources of crops (plants) causing low availability of nutrients
Explanation: Unwanted plants which grow in the field are called weeds, e.g. Xanthium (gokhroo), Parthenium (gajar ghas), Cyperinus rotundus (motha). They compete with crops for various resources; like sunlight, water and nutrients. Thus, weeds hamper the growth of crops.

17.

(d) A is false but R is true.
Explanation: As velocity is a vector quantity, its value changes with change in direction. Therefore when a bus takes a turn from north to east its velocity will also change.

18.

(d) A is false but R is true.
Explanation: The conversion of gas directly into a solid is called desublimation. Naphthalene does not leave any residue when kept open for some time.

19.

(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.

20. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation: Rutherford's atomic model could not explain how moving electrons could remain in their orbits. Any charged particle during acceleration would radiate energy, and while revolving, it would lose its energy and eventually fall into the nucleus. This means that the atom would be highly unstable. But, the matter is composed of stable atoms. Thus, the major drawback of Rutherford's atomic model was that it could not explain the stability of atoms.

Section B

21. A battery has stored chemical energy. The chemical energy is converted into electrical energy during lighting of bulb. So, a battery converts chemical energy into electrical energy. The filament in the bulb becomes white hot and gives out light. Electrical energy

is converted into heat and light energy.

Thus, the energy changes involved in this process can be written as follows:

Chemical energy → Electrical energy → Heat energy + Light energy.

<div align="center">OR</div>

Given force, F = 750 N, displacement = height,

h = 16 m and time, t = 5

Work done by machine,

W = Force x Displacement = F x h

= 750 N x 16 joule

Power of machine, P $\frac{W}{t}$

$\frac{750\ N \times 15 J}{5 s}$

= 2400 watt.

22. The temperature of both boiling water and steam is 100°C, but steam has more energy because of latent heat of vaporisation. Latent heat of vapourisation makes it much more hotter than hot boiling water.

23. When the peon strikes the school bell with a hammer, the particles of bell metal start vibrating and those vibrations produce sound.

24. Volume of alcohol (solute) =12 mL

Let the volume of water (Solvent) = x mL

∴ Volume of solution = (12 + x) mL

Concentration of solution = $\frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100 = \frac{\text{Volume of alcohol}}{\text{Volume of solution}} \times 100$

$12 = \frac{12}{12+x} \times 100$

12 + x = 100

x = 100 - 12 = 88 mL

So, 88 mL of water should be mixed with 12 mL of alcohol to obtain 12% alcohol solution. .

25. Here, m = 0.4 kg, u = 10 m/s

Initial momentum of the ball = mu = 0.4 × 10 = 4 kg m/s

At the highest point, velocity of ball is zero,

Therefore,the momentum of the ball at the highest point of flight = 0 × 4 = 0.

<div align="center">OR</div>

Here,

Mass,m = 1 kg

Initial velocity,u = 20 ms^{-1}

Final velocity,v = 0 ms^{-1}

Distance travelled,S = 50 m

Force of friction, F =?

From the third equation of motion, we have, $v^2 = u^2 + 2as$

$\Rightarrow\ a = \frac{v^2 - u^2}{2s} = \frac{0 - (20\ ms^{-1})^2}{2 \times 50\ m}$

$= \frac{-400 m^2 s^{-2}}{100\ m} = -4\ ms^{-2}$

From Newton's second law of motion, we have

F = ma = 1kg $\times \left(-4 ms^{-2}\right) = -4 kgms^{-2}$ = -4 N

Negative sign indicates the force is acting opposite to the direction of motion.

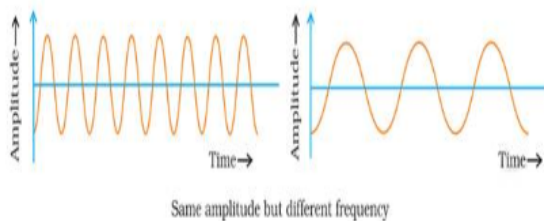Thus,the force of friction between the stone and ice is -4 N

26. The values of charge (e) and mass (m) of the electron always remain the same whatever may be the source of their emission. In the discharge tube, the electrons may be emitted either from the cathode or from the gas enclosed in the discharge tube. Whatever may be the metal which forms cathode or the gas present in the discharge tube, these values remain the same. Therefore, electron is regarded as a universal particle.
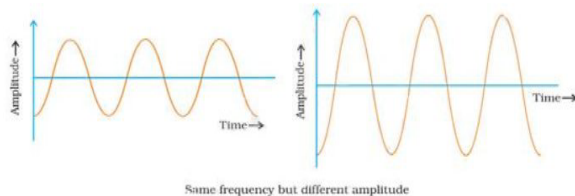
Or

The electron is an elementary particle. It cannot be further divided into more divisions. Also other particles are through to have condensed from combinations of these. Thus electron is called a universal particle.
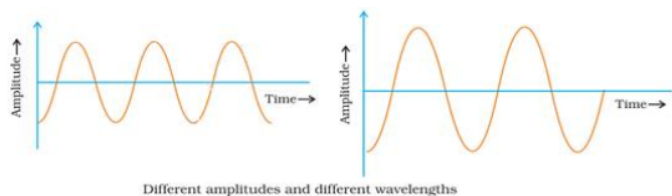
<div align="center">**Section C**</div>

27. i.

Same amplitude but different frequency

    ii.

Same frequency but different amplitude

   iii.

Different amplitudes and different wavelengths

28. i. Sample A has more protons than electrons. Hence, it is a cation.

    ii. Sample B and C have same mass number (Mass number = Number of protons + number of neutrons = 37) but different atomic numbers (i.e. 18 and 17respectively). Hence, they are a pair of isobars.

   iii. Samples C and D have same atomic number but different mass numbers. Hence, they are a pair of isotopes.

29. Here, initial velocity, u = 90 kmh^{-1}

$= \frac{90 km}{1 h}$

$= \frac{90 \times 1000 m}{60 \times 60 s}$

= 25 ms^{-1}

Acceleration, a = -0.5 ms^{-2}

Final velocity v = 0

From the equation of motion, 2as $= v^2 - u^2$

s $= \frac{v^2 - u^2}{2a}$

$= \frac{0 - (25 ms^{-1})^2}{2 \times (-0.5 ms^{-2})}$

$= \frac{-625 m^2 s^{-2}}{-1.0 ms^{-2}}$

= 625 m

The train will go 625 m further, after applying the brakes.

<div align="center">OR</div>

Initial speed of each train u = 72 kmh^{-1} = 20 ms^{-1}

Distance travelled by train A in 50 s = 20 × 50 = 1000 m

Distance travelled by train B in 50 s with an acceleration of 1 ms^{-2} is

20 × 50 + $\frac{1}{2}$ (1) × (50)^2 = 2250m using S = ut + $\frac{1}{2}$ at^2

Therefore the original distance between the trains is 2250 - 1000 = 1250 m

30. i. a. As potential energy decreases with decreasing height, the speed of the object will increase and hence its kinetic energy will increase.

      b. Total mechanical energy will remain constant.

      It is based on the law of conservation of energy which states that energy can neither be created nor be destroyed/. It can only be transformed into one form to another.

   ii. 1 kWh = 3.6 $\times$ 10^6 J

31. The velocity-time graph shows that velocity of the ball at t = 0 is 30 ms^{-1}

Initial velocity of the ball, u = 30 ms^{-1}

The velocity of the ball at t = 6 s is zero.

Final velocity of the ball, $v = 0$

Time, t = 6s

∴ Acceleration of the ball,

$a = \frac{v-u}{t} = \frac{0-30\, ms^{-1}}{6\, s}$

= -5 ms^{-2}

Negative sign shows that the ball is retarded or decelerated.

Also, mass of ball, $M = 50\, g = \frac{50}{1000} = \frac{1}{20}\, kg$

Therefore, Force acting on the ball, F = ma

$= \left(\frac{1}{20} kg\right)\left(-5\, ms^{-2}\right)$

= - 0.25 kg ms^{-2}

= 0.25 N [1 kg ms^{-2}= 1 N]

Here -ve sign indicates that the force is retarding or stopping force.

32.

S.No	Cell Wall	Cell Membrane
1	Cell wall is found in plant cell	Cell membrane is found in animal cells
2	Cell wall is completely permeable	Cell membrane is semi-permeable.
3	The function of the cell membrane is the same as that of the skin.	The function of the cell wall is to provide strength and rigidity to the cell.
4	It is non – living	It is living
5	It is made up of cellulose	It is made up of lipids and proteins

OR

Ribosomes synthesize proteins. Golgi body helps in storage, packaging and dispatch of various substance inside and outside the cell.

33. There are five types of connective tissues:-

(i) **Areolar connective tissue:** It is a loose and cellular connective tissue. It joins skin to muscles, fills spaces inside organs, and is found around muscles, blood vessels, nerve and in the bone marrow.

Functions:

(a) It acts as a supporting and packing tissue between organs lying in the body cavity.

(b) It helps in repair of tissues after an injury.

(c) It also helps in combating foreign toxins.

(d) It fixes skin to underlying muscles.

(ii) **Dense regular connective tissue:** It is a fibrous connective tissue. It is characterised by ordered and densely packed collection of fibres and cells. Dense regular connective tissue is the principal component of tendons and ligaments.

Functions:

(a) Tendons: Tendons are cord-like, strong, inelastic structures that join skeletal muscles to bones.

(b) Ligament: They are an elastic structure which connects bones to bones.

(iii) **Adipose tissue:** Adipose tissue is an aggregation of fat globules. The cells that primarily compose adipose tissue are called adipocytes or lipocytes or fat cells. The adipose tissue is abundant below the skin, between the internal organs and in the yellow bone marrow.

Functions:

(a) It serves as a reservoir of fat.

(b) It provides shape to the limbs and the body.

(c) It keeps visceral organs in position. It forms shock-absorbing cushions around kidneys and eyeballs.

(d) It acts as an insulator and reduces heat loss from body, i.e. it regulates body temperature.

(iv) **Skeletal tissue:** The skeletal or supporting tissue includes bone and cartilage which form the endoskeleton of vertebrate body.

(a) Cartilage: The cartilage is a specialised connective tissue which is compact and less vascular. Cartilage can be found in ear, nose tip, epiglottis, inter-vertebral discs, end of long bones, lower ends of ribs and rings of trachea. There are three varieties of

cartilage - hyaline, elastic, and fibro-cartilage. The most abundant type is hyaline, found as supportive tissues in the nose, ears, trachea, larynx, and smaller respiratory tubes.

(b) Bone: Bone is very strong and non-flexible tissue. Bone cells are embedded in a hard matrix. Like cartilage, bone is a specialised connective tissue.

Functions:

(a) Cartilage provides support and flexibility to body parts such as ears and nose. It smoothens bone surfaces at the joints.

(b) Bone provides shape and skeletal support to body.

(c) Bone supports and protects vital body organs such as brain, lungs, etc.

(d) Bone anchors the muscles.

(v) **Fluid connective tissue:** Fluid connective tissue links the different parts of the body and maintains continuity in the body. It includes blood and lymph.

(a) Blood: In this tissue, cells move in a fluid or liquid matrix or medium called plasma. Blood flows in blood vessels called arteries, veins, and capillaries which are connected together to form the circulatory system. Blood contains red blood cells (RBCs), white blood cells (WBCs) and platelets suspended in the plasma.

(b) Lymph: Lymph is a colourless fluid that has filtered out of the blood capillaries.

Functions:

(a) Blood flows and transports gases, nutrients, hormones and vitamins to the tissues, and transports waste products from the tissues to the liver and the kidney.

(b) Lymph transports the nutrients (oxygen, glucose) that may have filtered out of the blood capillaries back into the heart to be re-circulated in the body.

(c) Lymph brings CO_2 and nitrogenous wastes from tissues to the blood.

Section D

34. **Acceleration due to gravity:** The acceleration produced in the motion of a body falling under the force of gravity is called acceleration due to gravity. It is denoted by 'g'. It is expressed in units, ms^{-2}.

Expression for acceleration due to gravity: The force (F) of gravitational attraction on a body of mass m due to earth of mass M and radius R is given by, $F = G\frac{mM}{R^2}$ .....(1)

Where, 'G' is universal gravitational constant.

According to Newton's second law of motion: Force is the product of mass and acceleration.

$\therefore$ F = ma

But the acceleration due to gravity is represented by the symbol g.

Therefore, we can write; F = mg .....(2)

From equation (1) and (2), we get

$mg = G\frac{mM}{R^2}$ or $g = \frac{GM}{R^2}$ ...(3)

When the body is at a distance 'R' from centre of the earth then $g = \frac{GM}{R^2}$.

It may be noted that, value of 'g' is independent of mass of object.

OR

We have given that,

The mass of the wooden block = 5 kg

The dimensions = 40 cm $\times$ 20 cm $\times$ 10 cm

Here, the weight of the wooden block applies a thrust on the table top.

i.e,

Now we know that,

Thrust = F = m$\times$g

= 5 kg $\times$ 9.8 ms^{-2}

= 49 N

Area of a side = length $\times$ breadth

= 20 cm $\times$ 10 cm

= 200 cm^2 = 0.02 m^2

From equation Pressure = $\frac{thrust}{area}$ .....(i)

Pressure = $\frac{49\text{N}}{0.02\text{m}^2}$

= 2450 Nm^{-2}.

When the block lies on its side of dimensions 40 cm × 20 cm, it exerts the same thrust.

Area length × breadth

= 40 cm × 20 cm

= 800 cm^2 = 0.08 m^2

From equation (i)

Pressure = $\frac{49N}{0.08m^2}$

The pressure exerted by the side 20 cm × 10 cm is 2450 Nm^{-2} and by the side 40 cm × 20 cm is 612.5 Nm^{-2}.

35. Mitochondria are often associated with cellular respiration and energy generation of the cell. The energy required for various chemical activities is released by the mitochondria in the form of ATP molecules. For this reason, mitochondria are known as the powerhouse of the cell.

    Three similarities between mitochondria and plastids are as follows:

    i. Both have their own DNA and ribosomes.

    ii. External structures of mitochondria and plastids are similar.

    iii. Both have more than one membrane layer.

    One major difference between mitochondria and plastids is that mitochondria are present in both plant and animal cells, whereas plastids are present only in plant cells.

    OR

    i.
    - Lysosomes are membrane-bound sacs filled with digestive enzymes. These enzymes are made by the rough endoplasmic reticulum.
    - Lysosomes are a kind of waste disposal system of the cell. During the disturbance in cellular metabolism, e.g. when a cell gets damaged, lysosomes present in the cell may burst and the enzymes digest the damaged cell. Hence, lysosomes are called as 'suicidal bags' of a cell.
    - Lysosomes break up the foreign materials entering into the cell, such as bacteria or food into small pieces.

    ii. The dry raisins, when placed in plain water for some time will swell up due to endosmosis. If these raisins are again placed in a concentrated salt solution, they will shrink, due to exosmosis.

36.   i. Iodine

      ii. Bromine

      iii. Graphite

      iv. Carbon

      v. Sulphur, phosphorus

      vi. Oxygen

Section E

37.   i. Tall epithelial cell.

      ii. Skin epithelial cell are arranged in many layer to prevent wear and tear.

      iii. Cilia can move and their movement pushes the mucus forward to clear it.

      OR

      The multicellular gland formed due to the inward folding of a portion of epithelial tissue is called the glandular epithelium.

38.   i. The availability moisture and irrigation facilities decide the chose the crop to be cultivated after one harvest and the process knows as crop rotation.

      ii. Biological manure help in improving soil structure, enriching the soil with nutrient also reduce the risk of water pollution which is a major problem with chemical fertilizers.

      iii. Yes, it is possible to grow two crops simultaneously at the same but the two crops are chosen to grow should have a different nutrient requirement.

      OR

      Biotic losses caused by - insects, rodents, fungi, mites, and bacteria and abiotic losses are inappropriate moisture and temperature in place of quality.

39.   i. Water is solvent and sugar is solute.

      ii. 1 nm in diameter

      iii. Pure substances are substances that are made up of only one kind of particle and have a fixed or constant structure.

      OR

      The meaning of the term 'alloy' is a substance formed from the combination of two or more metals. Alloys can also be formed from combinations of metals and other elements. ex- steel.