Class IX Session 2023-24
Subject - Science
Sample Question Paper - 9

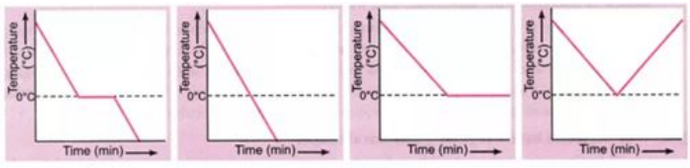
Time Allowed: 3 hours **Maximum Marks: 80**

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. 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) IV b) III

c) I d) II

2. Select the incorrect statement. **[1]**

i. Osmosis is a slow process, occurs down the concentration gradient and does not expend energy.

ii. Electron microscope uses very high voltage electricity. It uses electromagnets instead of glass lenses and beam of electrons instead of light.

iii. A semipermeable membrane does not allow both solvent and solute molecules to pass through it.

iv. Active transport of materials is rapid and usually occurs against the concentration gradient involving carrier proteins and energy in the form of ATP.

a) Statement (i) is correct.
b) Statement (iv) is correct.
c) Statement (ii) is correct.
d) Statement (iii) is correct.

3. **Statement 1:** Reducing the initial velocity to half the initial value, the stopping distance of moving object decreases by a factor of 2 (for the same deceleration). **[1]**

Statement 2: Stopping distance is proportional to the square of the initial velocity.

a) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
b) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
c) Statement 1 is true but statement 2 is false.
d) Statement 1 is false but statement 2 is true.

4. Bee pasturage refers to **[1]**

a) the flowers available for nectar collection by the bees
b) the trees where bees make the hives
c) the hives where honeybees live and deposit honey
d) the worker bees in a hive, who collect honey

5. The mechanical strength and rigidity of the cell wall is due to **[1]**

a) suberin
b) lignin
c) cellulose
d) cutin

6. The functional units of the Golgi apparatus are: **[1]**

a) cisternae
b) vacuoles
c) vesicles
d) cytoplasm

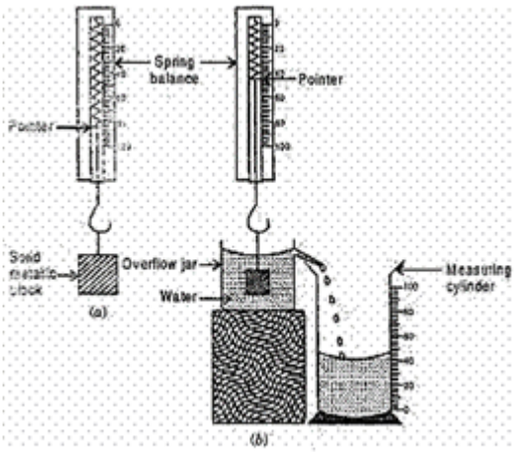
7. The chemical symbol for sodium is **[1]**

a) Sd
b) K
c) So
d) Na

8. The muscular tissue which function throughout the life continuously without fatigue is **[1]**

a) smooth muscle
b) cardiac muscle
c) voluntary muscle
d) skeletal muscle

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. The area below v-t graph is a measure of: **[1]**

a) Angular speed

b) Displacement

c) Angular acceleration

d) Acceleration

11. ${}^{226}_{88}A, {}^{228}_{87}B, {}^{228}_{88}C, {}^{228}_{90}D$ **[1]**

Which of the following nuclei are isotopes?

a) ${}^{226}_{88}A, {}^{228}_{88}C$

b) ${}^{228}_{87}B, {}^{228}_{88}C$

c) Both ${}^{228}_{87}B, {}^{228}_{88}C$ and ${}^{228}_{88}C, {}^{228}_{90}D$

d) ${}^{228}_{88}C, {}^{228}_{90}D$

12. Cork cells are made impervious to water and gases by the presence of **[1]**

a) cellulose

b) lignin

c) lipids

d) suberin

13. Chromosomes are made up of **[1]**

a) RNA

b) DNA

c) DNA and protein

d) Protein

14. Which type of solution is formed when sand and water are mixed thoroughly and then kept undisturbed for some time? **[1]**

a) True solution

b) Mixture

c) Colloidal

d) Suspension

15. A student added only two drops of iodine to a rice extract in test tube 'A'. Another student added a little rice extract to iodine solution in test tube 'B'. They would then observe: **[1]**

a) no change of colour in any test tube

b) a change of colour to blue-black in both tubes 'A' and 'B'

c) a change of colour to blue-black in test tube 'B' but not in test tube 'A'

d) a change of colour to blue-black in test tube 'A' but not in test tube 'B'

16. Kharif season extends from **[1]**

a) April to June

b) January to March

c) June to October

d) October to January

17. **Assertion (A):** The bus travels 250 km from Delhi to Jaipur towards the West and then comes back to the starting point. Total displacement is zero. **[1]**

Reason (R): The average velocity of the bus for the whole journey (both ways) is 0 kilometers per hour.

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):** An iron almirah is a solid at room temperature. **[1]**

Reason (R): Water can flow and it assumes the shape of the containing vessel.

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):** A nail is inserted in the trunk of a tree at a height of 1 metre from the ground level. After 3 years, the nail is still present there. **[1]**

Reason (R): The girth of the stem or root increases due to apical meristem (cambium).

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.

20. **Assertion (A):** Isotopes are electrically neutral. **[1]**

Reason (R): Isotopes are species with same mass number but different atomic numbers.

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.

Section B

21. 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

The volume of 50 g substance is 20 cm^3. If the density of water is 1 g cm^{-3}, will the substance float or sink?

22. Why is it not proper to regard the gaseous state of ammonia as vapours? **[2]**

23. A person is listening to a tone of 500 Hz sitting at a distance of 450 m from the source of the sound. What is the time interval between successive compressions from the source? **[2]**

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

25. Why do the driver and the person seated in front seat need a seat belt? **[2]**

OR

A truck of mass M is moved under a force F. If the truck is then loaded with an object equal to the mass of the truck and the driving force is halved, then how does the acceleration change?

26. The element boron occurs in nature as two isotopes having atomic masses 10u and 11u. What are the percentage abundances of these isotopes in a sample of boron having average atomic mass of 10.8u? **[2]**

Section C

27. Explain the working and application of a sonar. **[3]**

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. An iron ball of density 7800 k gm^{-3} and volume 200 cm^{-3} is totally immersed in water. **[3]**

i. Calculate the weight of the iron ball in the air.

ii. Calculate the upthrust.

iii. Its apparent weight in water.

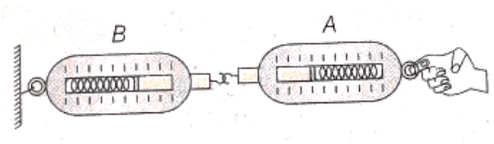
iv. Its apparent density in water.

OR

A train travels the first 15 km at a uniform speed of 30 kmh^{-1}, the next 75 km at a uniform speed of 50 kmh^{-1}, and the last 10 km at a uniform speed of 20 kmh^{-1}. Calculate the average speed for the entire train journey.

30. An automobile engine propels a 1,000 kg car A along a levelled road at a speed of 36 km h^{-1}. Find the power if the opposing frictional force is 100 N. Now, suppose after travelling a distance of 200 m, this car collides with another stationary car B of same mass and comes to rest. Let its engine also stop at the same time. Now, car B starts moving on the same level road without getting its engine started. Find the speed of the car B just after the collision. **[3]**

31. Look at the diagram below and answer the following questions: **[3]**



i. When a force is applied through the free end of the spring balance A, then the reading on the spring balance A is 15 g-wt. What will be the measure of the reading shown by spring balance B?

ii. Write the reasons for your answer.

iii. Name the force that balance A exerts on balance B and the force of balance B on balance A.

32. What is nucleoid? How it is different from the nucleus of eukaryotic cell? **[3]**

OR

How does fungi and bacteria can withstand much greater changes in the surrounding medium than animal cells?

33. Differentiate between bone and cartilage with respect to structure, function and location. **[3]**

Section D

34. Define acceleration due to gravity. Derive an expression for acceleration due to gravity in terms of mass of the **[5]**

earth (M) and universal gravitational constant (G).

OR

i. Write the formula to find the magnitude of the gravitational force between the earth and an object on the earth's surface.

ii. Derive how does the value of gravitational force F between two objects change when

a. distance between them is reduced to half and

b. mass of an object is increased four times.

35. Draw a neat labelled diagram of an animal cell. **[5]**

OR

Grass looks green, papaya appears yellow. Which cell organelle is responsible for this?

36. i. Distinguish among the true solution, suspension and colloid in a tabular form under the following heads: **[5]**

a. Stability

b. Filterability

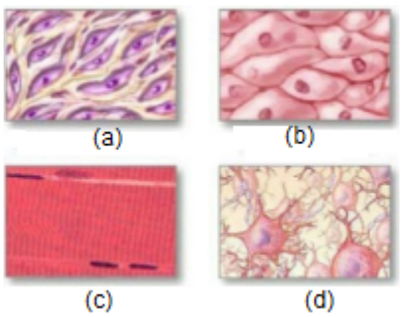
c. Type of mixture

ii. Give the expression for the concentration of a solution. How will you prepare a 10% solution of glucose by mass in the water?

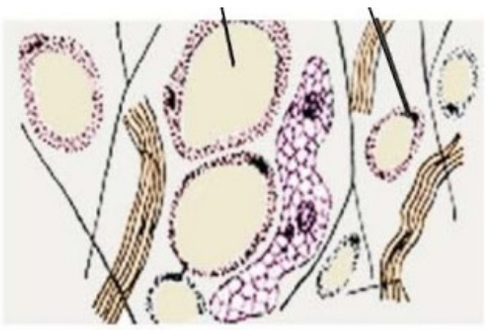
Section E

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

Animal tissues are of many types such as epithelial tissue, connective tissue, muscular tissue and nervous tissue. Blood is a type of connective tissue, and muscle forms muscular tissue. The nature of the matrix differs in concordance with the function of the particular connective tissue. Blood has a fluid (liquid) matrix called plasma, in which red blood corpuscles, white blood corpuscles and platelets are suspended. Blood flows and transports gases, digested food, hormones and waste materials to different parts of the body. Bone is another example of connective tissue. It forms the framework that supports the body. It also anchors the muscles and supports the main organs of the body. Another type of connective tissue, cartilage, has widely spaced cells.



(i) Identify the following tissue.



(ii) Are the cells of connective tissues loosely spaced?

OR

What are the components of the matrix of bone?

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

Poultry is the fastest growing segment of animal husbandry in India despite the fact that the majority of Indians are vegetarians. Poultry yields eggs from layers that are female birds. It yields meat from two sources, young birds or broilers, and non-productive layers. The indigenous breeds include Busra, Chhattisgarh, Kadaknath, and Aseel. They are slow growing. The yield of eggs is small. The exotic breeds are White Leghorn, Rhode Island Red, Plymouth Rock, and Australorp. The exotic breeds are fast growing and yield a large number of eggs (180-280 per year). Many of the exotic breeds have been acclimatised in our country. A number of high-yielding hybrids have been developed, e.g., ILS-82, B-77, HH-260.

(i) What is Broilers?

(ii) When are broilers dressed?

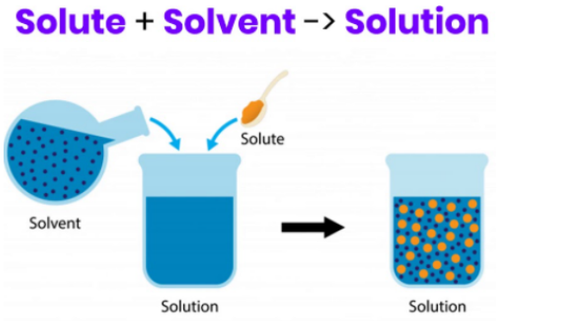
(iii) Which Indian poultry bird is used in cock fighting?

OR

Mention one poultry bird that yields the maximum number of eggs per annum.

39. **Read the text carefully and answer the questions:** **[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.



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

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

(iii) What is pure substance?

OR

What do you mean by Alloy?

Solution

Section A

1. **(c)** 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.

2. **(d)** Statement (iii) is correct.
Explanation: A semipermeable membrane allows only solvent molecules to pass through it.

3. **(d)** Statement 1 is false but statement 2 is true.
Explanation: Let the distance travelled by the vehicle before it stops be d_s, then substituting v = 0, x = d_s (stopping distance) in $v^2 = u^2 - 2ax$, we get $d_s = \frac{u^2}{2a}$.
Thus, the stopping distance is proportional to the square of the initial velocity.
So, if the initial velocity is reduced to half of its value, the stopping distance decreases by a factor of four.

4. **(a)** the flowers available for nectar collection by the bees
Explanation: Pasturage is the availability of flowers to the bees for nectar and pollen collection. Pasturage is related to honey production because it determines the taste of honey and the quantity of honey.

5. **(b)** lignin
Explanation: The cell walls of sclerenchyma are greatly thickened due to the presence of lignin. Lignin is a complex polymer with high tensile strength e., it does not break easily on stretching and high compressional strength, it does not buckle easily.

6. **(a)** cisternae
Explanation: Golgi apparatus is a membrane-bound organelle of eukaryotic cells (cells with clearly defined nuclei) that is made up of a series of flattened, stacked pouches called cisternae. The Golgi apparatus is responsible for transporting, modifying, and packaging proteins and lipids into vesicles for delivery to targeted destinations.

7. **(d)** Na
Explanation: Sodium is a chemical element with the symbol **Na** (from Latin *natrium*) and the atomic number is 11.

8. **(b)** cardiac muscle
Explanation: Cardiac muscles show characteristics of both smooth and striated muscles. These muscles are striated, cylindrical, branched and involuntary in nature. In addition to the light and dark bands, these muscles show densely stained cross bands called intercalated dises. These act as impulse boosters. Cardiac muscles contract and relax rapidly, rhythmically and tirelessly throughout a lifetime, from early embryonic stage until death.

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)** Displacement
Explanation: The area under the velocity-time graph gives the distance (magnitude of displacement) which has the unit is metre (m).

11. **(a)** $^{226}_{88}A, ^{228}_{88}C$
Explanation: Isotopes are the elements with the same atomic number but different mass numbers. The elements A and C are having the same atomic number 88 but different mass number 226 and 228 respectively.

12.

(d) suberin

Explanation: The walls of cork cells are heavily thickened with an organic substance, suberin. Suberin makes these cells impervious to water and gases.

13.

(c) DNA and protein

Explanation: Each chromosome is made up of DNA tightly coiled many times around proteins called histones that support its structure.

14.

(d) Suspension

Explanation: Sand will form a suspension in water. If you shake a container of sand and water, the sand spreads through the water, forming a cloudy liquid. The sand will then settle to the bottom of the container as sediment. Suspensions often need to be shaken or stirred before use to spread the sediment through the liquid.

15.

(b) a change of colour to blue-black in both tubes 'A' and 'B'

Explanation: Iodine + Starch Solution $\rightarrow$ Blue-black colour

Starch act as an indicator of the presence of iodine.

16.

(c) June to October

Explanation: Kharif crops are the crops grown in rainy season extending from June to October hence are also called as monsoon crops. These crops are totally rain dependent crops. Kharif crops include paddy, soybean, sugarcane.

17.

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

Explanation: In this case, the bus travels 250 km from Delhi to Jaipur towards the West and then comes back to starting point Delhi in the reverse direction. So, the total displacement.

18.

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

Explanation: Almirah is rigid and has fixed shape. So, it is a solid at room temperature.

19.

(c) A is true but R is false.

Explanation: The nail will remain at the same position even after 3 years. This is because a plant or tree grows from its tip (stem or root) not from the point at which it joins the ground. So, the tree will grow but the nail will remain at the same place on the tree trunk.

20.

(c) A is true but R is false.

Explanation: Isotopes are species with same atomic number but different mass numbers.

Section B

21. 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

Mass of substance m = 50 g

Volume of substance V = 20 cm^3

Therefore density of substance is

$D = \frac{M}{V} = \frac{50}{20}$ = 2.5 g cm^{-3}

The substance will sink in water, because its density is more than that of water.

22. The gaseous state of a substance can be regarded as vapours only in case it is a liquid at room temperature. Since ammonia is a gas at room temperature, its gaseous state cannot be regarded as vapours.
23. The time interval between successive compressions from the source
    $T = 1/v$ = 1/500 = 0.002 second.
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. In a car accident, a fast running car stops suddenly. Due to this the car's large momentum is reduced to zero in a very short time. The stretchable seat belts tightened by the passengers of the car increases the time taken by the passengers to fall forward. Due to long time, the rate change of momentum of passengers is reduced and hence less stopping force acts on them. So, the passengers may either not get injured at all or may get less injuries. It is obvious that seat belts reduce the passengers' momentum more gently and hence prevent injuries.

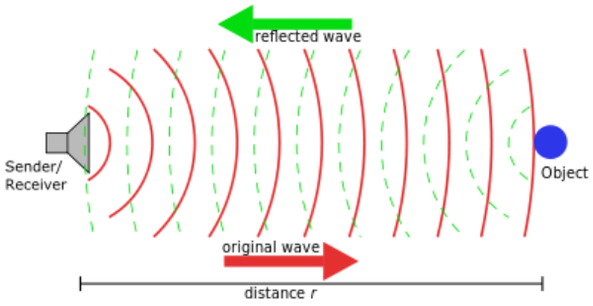
    OR

    Acceleration can be given as follow:
    F = ma or a = $\frac{f}{m}$ or $a_1 = \frac{F}{M}$
    When mass is doubled and force is halved;
    $a_2 = \frac{F}{4M}$ *or* $\frac{a_2}{a_1} = \frac{F}{4M} \div \frac{F}{M} = \frac{1}{4}$
    So, acceleration becomes one-fourth.
26. Let the percentage of B – 10 isotope = *x*
    ∴ the percentage of B – 11 isotope = 100 – *x*
    From the information, the average atomic mass of boron = $\frac{10 \times x}{100} + \frac{11 \times (100 - x)}{100}$
    But the given average atomic mass of boron = 10.8 u
    ∴ $\frac{10 \times x}{100} + \frac{11 \times (100 - x)}{100} = 10.8u$
    10*x* + 1100 – 11*x* = 10.8 × 100
    – *x* + 1100 = 1080
    – *x* = 1080 – 1100
    – *x* = –20
    x = 20
    ∴ Percentage abundance of B – 10 isotope = 20%
    Percentage abundance of B – 11 isotope = 100 – 20 = 80%

Section C

27. Sonar is a device that uses ultrasonic waves to measure the distance, direction, and speed of underwater objects.
    Sonar consists of a transmitter and a detector and is installed in a boat or a ship. The transmitter produces and transmits ultrasonic waves. These waves travel through water and after striking the object on the seabed, get reflected back and are sensed by the detector. The detector converts the ultrasonic waves into electrical signals which are appropriately interpreted. The distance of the object that reflected the sound wave can be calculated by knowing the speed of sound in water and the time interval between transmission and reception of the ultrasound. Let the time interval between transmission and reception of ultrasound signal be *t* and the speed of sound through seawater be *v*. The total distance, 2*d* travelled by the ultrasound is then, $2d = v \times t$.
    The above method is called echo-ranging. The sonar technique is used to determine the depth of the sea and to locate underwater

hills, valleys, submarine, icebergs, sunken ship etc.



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. i. Volume in iron ball = 200 cm^3

    $\therefore$ Mass of iron ball = $200 \times 10^{-6} \times 7800 = 1.56$ kg

    Weight of iron ball in air = $m \times g = 1.56 \times 10$

    Weight of iron ball in air = 15.6 N

    ii. Upthrust = Volume of water displaced (V) $\times$ density of water (d) $\times$ g

    $= Vdg = 2 \times 10^{-4} \times 1000 \times 10$

    Upthrust = 2N

    iii. Apparent weight = True weight - Upthrust = (15.6 - 2)

    Apparent weight = 13.6 N

    iv. Apparent density = density of solid - density of liquid = 7800 - 1000

    Apparent density = 6800 kgm^{-3}

OR

Given total distance travelled = 15 + 75 + 10 = 100 km

Time taken in the first part of motion $t_1 = \frac{S}{V_1} = \frac{15}{30}$

Time taken in the second part of motion $t_2 = \frac{S}{V_2} = \frac{75}{50}$

Time taken in the third part of motion $t_3 = \frac{S}{V_3} = \frac{10}{20}$

Total time taken $t = t_1 + t_2 + t_3 = \frac{15}{30} + \frac{75}{50} + \frac{10}{20} = 2.5h$

Therefore, $V_{av} = \frac{Total\ distance\ travelled}{Total\ time\ taken} = \frac{100}{2.5} = 40\ kmh^{-1}$

30. $m_A = m_B = 1000$ kg. v = 36 km/h= 10 m/s

Frictional force = 100 N

Since, the car A moves with a uniform speed, it means that the engine of car applies a force equal to the frictional force.

Power = $\frac{\text{Force} \times \text{distance}}{\text{time}}$

= F.v

= 100 N $\times$ 10 m/s = 1000 W

after collision,

$m_A u_A + m_B u_E = m_A \upsilon_A + m_B$

$1000 \times 10 + 1000 \times 0 = 1000 \times 0 + 1000 \times \upsilon_B$

$v_B = 10\ ms^{-1}$.

31. i. 15 g-wt.
    ii. From Newton's third law, the force exerted by B on A and force exerted by A on B are equal.
    iii. Force of reaction balance A exerts on balance B and force of action balance B exerts on balance A.

32. In prokaryotic cell, genetic material in not surrounded by membrane. This undefined region where genetic material is present, is known as nucleoid.

In eukaryotic cell, genetic material is surrounded by nuclear membrane.

OR

The cell wall present in fungi and bacteria permits these cells to withstand very dilute external medium without bursting.
The cells take up water by osmosis, swells, and builds the pressure againts the cell wall. The wall exerts an equal pressure againts the swollen cell. It is because of the cell wall, such cells can withstand much greater changes in the surrounding medium than animal cells.

33. Differences between bone and cartilage are as follows:

Point of Difference	**Bone**	**Cartilage**
Structure	It is strong and non-flexible tissue, whose cells are embedded in a hard matrix, which is composed of calcium and phosphorus compounds.	It is soft and flexible tissue, whose solid matrix is composed of proteins and sugars. Also, it has widely spaced cells.
Function	It forms the framework that supports the body and anchors the muscles that support the main organs of the body.	It smoothens bone surfaces at the joints.
Location	It is present in the skeletal system of vertebrates.	It is present in nose, ear, trachea, and larynx.

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

i. Formula to find the magnitude of gravitational force:

$F = \frac{GMm}{R^2}$.

where, M = mass of the earth

m = mass of the object

R = distance between centres of the earth and an object.

and universal gravitational constant, $G = 6.67 \times 10^{-11}$ $N\text{-}m^2/kg^2$

ii. a. Let gravitational force be F when the distance between them is R,

$F = \frac{GMm}{R^2}$ ....(i)

Now, when the distance reduces to half,

$F' = \frac{GMm}{\left(\frac{R}{2}\right)^2} = \frac{4GMm}{R^2} = 4F$

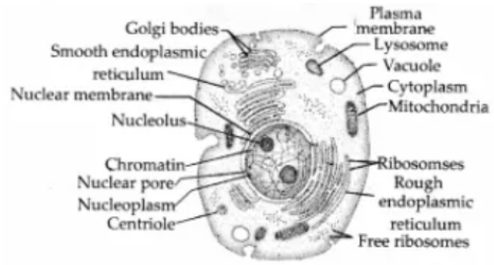
i.e. the force of gravitation becomes 4 times the original value.

b. When the mass becomes 4 times,

$F' = \frac{GM(4m)}{R^2} = 4F$

i.e. the force of gravitation becomes 4 times the original value.

35. **Diagram of an animal cell is given below:**



OR

Plastids are responsible. These are found in plant cells only. Plastids are the major cell organelles in plants. On the basis of pigments present in plastids, they are divided into two types;

i. the colourless leucoplasts and

ii. the pigmented chromoplasts.

The colourless leucoplasts store starch, oil and protein granules whereas the pigmented chromoplasts have different colours and can be of several types. The most important ones are those containing the pigment chlorophyll, known as chloroplasts, which is responsible for the preparation of food by photosynthesis. Other chromoplasts contain non-green pigments, which are responsible for the characteristic colours of fruits and flowers.

36. i. Distinctions between true solution, suspension and colloid are:

Property	Solution	Suspension	Colloid
Stability	It is stable. Constituting particles do not settle down on keeping undisturbed.	It is unstable. Constituting particles settle down on keeping undisturbed.	It is quite stable. Constituting particles do not settle down on keeping undisturbed.
Filterability	Particles cannot be separated by filtration. Means passes through filter paper.	Particles are large, so they can be easily separated by ordinary filtration. Means do not pass through filter paper.	It cannot be separated by ordinary filter paper but can be separated by ultrafiltration. Means passes through filter paper.
Type of mixture	Homogeneous	Heterogeneous	Heterogeneous but appears to be homogeneous.

ii. Concentration is defined as the number of moles (amount of substance) per unit volume (often liters/ dm^3)

The methods by which the concentration of a solution can be expressed are:

a) Mass by mass% of solution = $\frac{Mass\ of\ solute}{Mass\ of\ solution} \times 100$

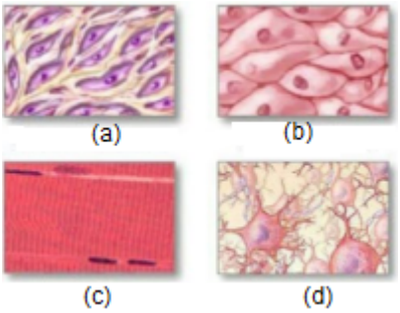
b) Mass by volume % of solution = $\frac{Mass\ of\ solute}{Mass\ of\ solution} \times 100$

Thus, a 10 percent solution of glucose can be prepared by dissolving 10 g of glucose in 90 g of water.

Section E

37. **Read the text carefully and answer the questions:**

Animal tissues are of many types such as epithelial tissue, connective tissue, muscular tissue and nervous tissue. Blood is a type of connective tissue, and muscle forms muscular tissue. The nature of the matrix differs in concordance with the function of the particular connective tissue. Blood has a fluid (liquid) matrix called plasma, in which red blood corpuscles, white blood corpuscles and platelets are suspended. Blood flows and transports gases, digested food, hormones and waste materials to different parts of the body. Bone is another example of connective tissue. It forms the framework that supports the body. It also anchors the muscles and supports the main organs of the body. Another type of connective tissue, cartilage, has widely spaced cells.



(i) Adipose tissue.

(ii) The cells of the connective tissue are loosely spaced and invaded in and intracellular matrix.

OR

Calcium and phosphorus compounds.

38. **Read the text carefully and answer the questions:**

Poultry is the fastest growing segment of animal husbandry in India despite the fact that the majority of Indians are vegetarians. Poultry yields eggs from layers that are female birds. It yields meat from two sources, young birds or broilers, and non-productive layers. The indigenous breeds include Busra, Chhattisgarh, Kadaknath, and Aseel. They are slow growing. The yield of eggs is small. The exotic breeds are White Leghorn, Rhode Island Red, Plymouth Rock, and Australorp. The exotic breeds are fast growing and yield a large number of eggs (180-280 per year). Many of the exotic breeds have been acclimatised in our country. A number of high-yielding hybrids have been developed, e.g., ILS-82, B-77, HH-260.

(i) Broilers is Young male birds.

(ii) When they are 7-8 weeks old with a weight of 1.0-1.5 kg.

(iii) Aseel Indian poultry bird is used in cock fighting.

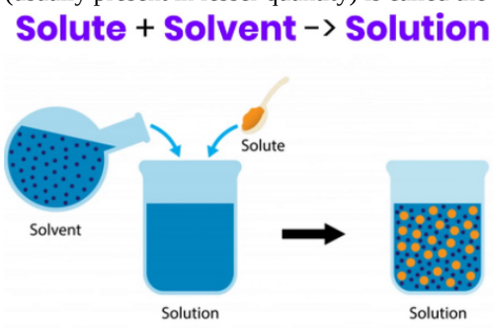
OR

Plymouch Rock poultry bird yields the maximum number of eggs per annum.

39. **Read the text carefully and answer the questions:**

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.



(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.