# <u>Sample Paper</u>
<u>Class 9 CBSE 2020-21</u>

General Instructions

(i) The question paper comprises four sections A, B, C, and D. There are 36 questions in the question paper. All questions are compulsory.

(ii) (Section–A - question no. 1 to 20 - all questions and parts thereof are of one mark each. These questions contain multiple-choice questions (MCQs), very short answer questions, and assertion - reason type questions. Answers to these should be given in one word or one sentence.

(iii) Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should be in the range of 30 to 50 words.

(iv) Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should be in the range of 50 to 80 words.

(v) Section–D – question no. - 34 to 36 are long answer type questions carrying 5 marks each. Answers to these questions should be in the range of 80 to 120 words.

(vi) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

(vii) Wherever necessary, neat, and properly labelled diagrams should be drawn.

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1. What is Avogadro constant? Write its value.

2. Identify solute and solvent in 80% solution of ethyl alcohol with water.

3. The element having atomicity 'four' is most likely to be _____.

   A. argon

   B. fluorine

   C. phosphorus

   D. francium

4. What conclusion can you draw about the velocity of a body from the displacement-time graph shown below:
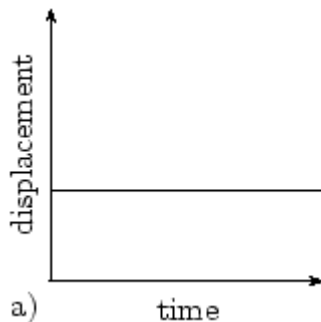
5. Under which condition is the magnitude of average velocity equal to average speed?

6. To take the boat away from the bank of a river, the boatman pushes the bank with an oar. Why?

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

   Why does a gunman get a jerk on firing a bullet?

7. What happens to the gravitational force between two objects when the distance between them is doubled?

   A. It becomes four times

   B. It becomes one-fourth

   C. It becomes half

   D. It becomes double

8. Name the devices or machines which convert:

   (a) Mechanical energy into electrical energy.

   (b) Chemical energy into electrical energy.

9. How much work is done when a body of mass m is raised to a height h above the ground?

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

What is the work done against gravity when a body is moved horizontally along a frictionless surface?

10. Which of the following does not have cartilage?

    a. Nose

    b. Kidney

    c. Larynx

    d. Ear

11. What will happen if kidneys are not filtering urine?

12. What do you understand by potable water and brackish water?

13. Which cell organelle gives rise to lysosomes?

14. DIRECTION: In the following questions, a statement of assertion (A) is followed by a statement of the reason (R).

Assertion (A): Evaporation is a surface phenomenon.

Reason (R): It takes place at room temperature.

    A. Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of the assertion

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

    C. Assertion (A) is true but reason (R) is false.

    D. Assertion (A) is false but reason (R) is true.

15. Assertion(A): Absorption of water by plant roots is an example of osmosis.
Reason(R): Cells tend to gain water through osmosis.

    A. Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of the assertion

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

    C. Assertion (A) is true but reason (R) is false.

    D. Assertion (A) is false but reason (R) is true.

16. Assertion (A): The velocity of a particle may vary even when its speed is constant.

Reason (R): The particle is moving in a circular path.

A. Both (A) and (R) are true and (R) is correct explanation to (A)

B. Both (A) and (R) are true and (R) is not correct explanation to (A)

C. (A) is true, but (R) is false.

D. (A) is false, but (R) is true.

17. Answer question numbers (a) to (d) based on your understanding of the following paragraph and related studied concepts:

Jar 1   Jar 2
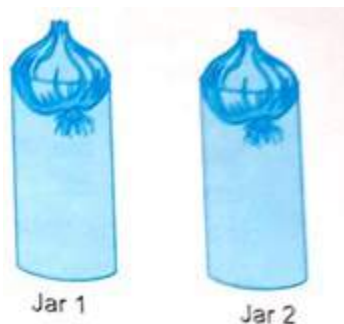
Take two glass jars and fill them with water. Now, take two onion bulbs and place one on each jar, as shown in figure. Observe the growth of roots in both the bulbs for a few days. Measure the length of roots on day 1, 2 and 3.

On day 4, cut the root tips of the onion bulb in jar 2 by about 1 cm. After this, observe the growth of roots in both the jars and measure their lengths each day for five more days, and record.

(a) Which of the two onions has longer roots? Why?

(b) Do the roots continue growing ever after we have removed their tips?

(c) Why would the tips stop growing in jar 2 after we cut them?

(d) Why are onions kept dipped in water in the two jars?

18. Read the following and answer any **four** questions from 18 (a) to 18 (e)

(a) Name the negatively charged particle present in the atoms of all the elements.

(b) Name the positively charged particle present in the atoms of all the elements.

(c) Name the particles which actually determine the mass of an atom.

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(d) What is the maximum number of electrons that can go into the N shell of an atom?

(e) Which part of an atom was discovered by Rutherford's alpha-particle scattering experiment?

19. Read the following and answer any **four** questions from 19 (a) to 19 (e)

Classify each of the following as a physical or a chemical change. Give reasons.

(a) Drying a shirt in the sun.

(b) Rising of hot air over a radiator.

(c) Burning of kerosene in a lantern.

(d) Change in the colour of black tea by adding lemon juice to it.

(e) Churning of milk cream to get butter.

20. Read the following paragraph and answer the questions 20(a) to 20(e)

If a particle moves along a straight line, its displacement may be obtained from Its Initial position, x_1, and its final position, x_2. The displacement is given by $s - x_1$. This gives two quantities—the straight-line distance between the initial and final positions as well as the direction of the final position as seen from the initial position. Let us understand this through an example. Consider the situation shown.
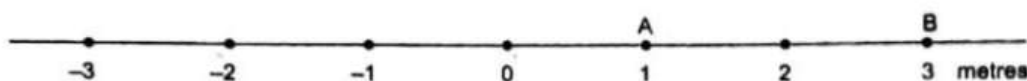
20. (a) Is displacement a scalar quantity?

(b) Which of the following statement/s are true for displacement?

I. It can never be zero

II. Its magnitude can be greater than the distance travelled by the object

III. It is the shortest path between the initial position and the final position.

IV. It is a vector quantity

A. I and II are correct

B. III and IV are correct

C. Only III is correct

D. All of these

(c) What is the displacement of the particle if it moves from A to B?

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(d) What is the displacement of the particle if the particle moves from B to A?

(e) Suppose the particle travels 5 m from point B in the direction B to A and then travels back to A. What will be the distance travelled by the body?

Section-B

21. What is a connective tissue? State its two basic components.

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

What causes encephalitis? How does it enter the body? Which organ does it infect and list the symptoms?

22. a. Name the major nutrient elements which form 95% mass of the living organisms.

    b. What is the percentage of nitrogen, oxygen, and carbon dioxide in the air?

    c. What is nitrogen fixation

23. Differentiate between an element and a compound. Categorize the following substances into elements and compounds.

    Sodium chloride, iodine, water, 24-carat gold, oxygen gas, carbon.

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

Name the compound $Al_2(SO_4)$, and mention the ions present in it.

24. One electron is present in the outermost shell of the atom of an element 'Z'.

    (a) What will be the nature of this element?

    (b) What will be the value of the charge of the ion formed, if this electron is removed from the outermost shell?

25. Calculate the force of gravitation between two objects of masses 50 kg and 120 kg respectively kept at a distance of 10 m from one another. (Gravitational constant, $G = 6.7 \times 10^{-11}$ Nm^2 Kg^{-2})

26. If 'g' is the acceleration due to gravity on earth, what is the acceleration due to gravity on another planet having mass and radius twice that of earth?

Section-C

27. Name the three major functional regions of the cells. Briefly mention the components of each and explain the function of each.

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

Name any two diseases caused by protozoans and also mention their causative organisms.

28. Briefly discuss the structure of the tissue that smoothes bone surfaces at joints. Supplement the answer with a labelled diagram.

29. Give reasons for the following:
    a. Cells of sclerenchyma tissue have a narrow lumen
    b. It is difficult to pull out the husk of the coconut.
    c. Muscles are able to contract and relax to bring about movements.

30. (a) A champagne cork with a mass of 10 grams accelerates off the top of the champagne bottle at $4ms^{-2}$ for 2 seconds. What is the final kinetic energy of the cork after 2 seconds?

    (b) Find the work done by a force of 5 N in displacing a book through 20 cm along the direction of the push.

31. Explain the terms dilute solution, concentrated solution and saturated solution. How would you determine the solubility of a solution? What is the effect of change of temperature on the solubility?

32. (a) 110 g of a solute is present in 550 g of solution. Calculate the concentration of the solution.

    (b) Give any three points of difference between true solution, colloidal solution and suspension.

33. (a) Which pulls harder gravitationally, the Earth on the Moon, or the Moon on the Earth? Which accelerates more?

    (b) How much mass of a man if he has to do 2500 joules of work is climbing a tree 5 m tall? ($g = 10$ m s^2)

Section-D

34. Calcium carbonate is decomposed on heating in the following reaction

    $CaCO_3 \rightarrow CaO + CO_2$

    i. How many moles of Calcium carbonate are involved in this reaction?

    ii. Calculate the gram molecular mass of calcium carbonate involved in this reaction.

    iii. How many moles of CO2 are there in this equation?

   OR

    (a) The teacher instructed three students A', 'B', and 'C' respectively to prepare a 50% (mass by volume) solution of sodium hydroxide (NaOH). 'A' dissolved 50 g of NaOH in 100 mL of water, 'B' dissolved 50 g of NaOH in 100 g of water while 'C' dissolved 50 g of NaOH in

water to make 100 mL of solution. Which one of them has made the desired solution and why?

(b) Explain why filter paper cannot be used to separate colloids.

35. **a.** Name a vaccine which saves the life of babies from three diseases.

b. How is the principle of immunisation implemented for eliminating polio?

c. Name two diseases which are caused in due course of time and last life long or they can be kept in control but cannot be cured permanently.

d. Why do female anopheles mosquitoes feed on human blood?

e. Give the causative organism of Malaria.

36. (a) An elevator is moving up. The variation in the velocity of the elevator is documented in the v–t graph as shown in the figure. What is the height to which the elevator takes the passengers before making the first stop?
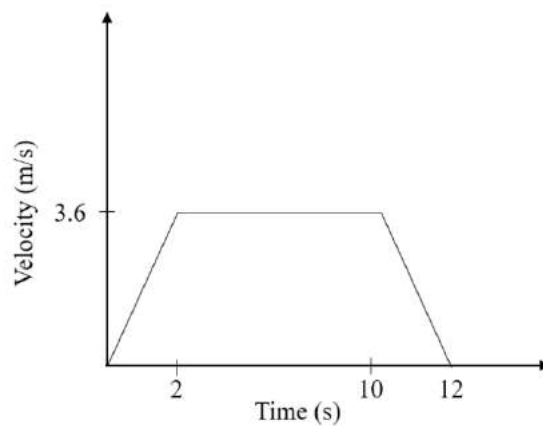
(b) An object with a mass 10 kg moves at a constant velocity of 10 m/sec. A constant force then acts for 4 seconds on the object. It then moves with a speed of 2 m/s in the opposite direction. What is the acceleration produced?

(c) A bowler runs a long distance before bowling from the bowling line. Why?

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Hints & Solutions

1. Solution: The Avogadro constant is defined as the number of atoms in exactly 12 g of carbon-12.

   Avogadro constant or Avogadro number = 6.022×10^{23}

2. Solution: Water present in a smaller amount is solute. Ethyl alcohol present in excess is solvent.

3. Solution: C

   The atomicity of phosphorus is 4.

4. Solution: It shows the graph for an object stationary over a period. The gradient is zero, so the object has zero velocity

5. Solution: The magnitude of average velocity is equal to average speed when the body moves along a straight-line path.

6. Solution: Pushing the river bank is an action, the river thus pushes back the boat in the forward direction as a reaction in accordance with Newton's third law of motion which states that every action has an equal and opposite reaction.

   OR

   This is because when the bullet is fired from the gun, it moves forwards and exerts a force on the gun; an equal amount of force is exerted on the bullet by the gun. This is because according to the third law of motion when a force is applied to a body, the body exerts an equal and opposite force on another body.

7. Answer: B

   Solution: : We know that the gravitational force between two bodies is given as

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

   From the above equation we can conclude that

   If we double the distance between two bodies, the gravitational force becomes one-fourth.

8. Solution:

   (a) Electric generator: A device for converting mechanical energy to electrical energy.

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(b) Battery: A battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights.

9. Solution:

We know that

$$W = F \times d$$

In this case,

$$F = mg$$

And

$$d = h$$

Therefore,

$$W = mgh$$

OR

Force of gravity acts vertically downward, while the body is moved horizontally. Thus, the force of gravity is not causing the motion. So, the work done by the force of gravity is zero.

10. Solution: (b) Kidneys are soft organs and have no cartilage

11. Solution: If kidneys are not filtering urine, poisonous substances will accumulate in the blood resulting in damage to other organs.

12. Solution: Potable water means water safe to drink and brackish water means slightly salty water.

13. Solution: Golgi bodies pinch off vesicles on the sides as well as maturing or trans face of the apparatus. These vesicles contain hydrolytic enzymes and are referred to as lysosomes.

14. Solution: A

15. Solution: (b) Water enters into the plant roots due to osmosis as the soil would have a higher concentration of water than the cell

16. Answer: A

Solution: In circular motion, the speed of the particle is constant, even when its velocity changes due to change in direction.

17. Solution:

(a) The onion in jar 1 will have longer roots because it will continue to grow due to presence of meristematic tissue.

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(b) The roots will not grow once their tips have been removed, as in jar 2 because the apical meristem is located at the shoot tip and root tip.

(c) In jar 2, the apical meristem is lost as the roots are cut 1 cm behind the tip. Thereby losing its meristem, hence they stop growing

(d) By keeping the roots dipped in water the cell of the root gets hydrated and active. This leads to their growth and cell division

18. (a) Solution: The negatively charged particle present in the atoms of all the elements is the electron.

(b) Solution: The positively charged particle present in the atoms of all the elements is the proton.

(c) Solution: The particles which actually determine the mass of an atom are nucleons.

(d) Solution: The maximum number of electrons that can go into the N shell of an atom is 32.

(e) Solution: The part of an atom discovered by Rutherford's alpha-particle scattering experiment was the nucleus.

19. (a) Solution: (a) It is a physical change because water is converted from its liquid state to a gaseous state because of the sun's heat.

(b) Solution: (b) It is a physical change because the water in the radiator is converted from a liquid state to a gaseous state

(c) Solution: (c) It is a chemical change because the combustion of kerosene occurs and new products are formed.

(d) Solution: (d) It is a chemical change because there is a reaction between the citric acid in the lemon and the compounds of tea resulting in the formation of new products.

(e) Solution: (e) It is a physical change because the cream suspended in the milk is separated by churning

20. Solution: No, Displacement is a vector quantity because it has magnitude as well as direction.

(b) Answer: C

Solution: The displacement is the shortest path between the initial and final position of the object. It is a vector quantity.

The magnitude of the displacement can be either equal to or greater than the distance travelled by the object but it can never be greater than it. The magnitude of displacement can be zero in some cases

(c) Solution: The displacement between A and B is 3-1 = 2 metres

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(d) Solution: The displacement of the particle from B to A is 1-3 = -2 m

(e) Solution: After travelling 5 m, the particle would be 3 m away from A, then the distance travelled would be = 5 + 3 = 8 m.

21. Solution: Connective tissue is the most abundant animal tissue that helps in connecting, binding, packaging and supporting different structures of the animal's body. It comprises scattered living cells embedded in an abundant matrix. Matrices can be jelly-like, fluid or solid in nature. So, the two basic components of connective tissue are cells and matrices. Different types of connective tissue have different types of living cells.

OR

Solution: Encephalitis is caused by a virus. It enters the human body through a mosquito bite. Brain is infected with this disease. It results in headache, fits, vomiting and unconsciousness.

22. Solution:

   a.   Carbon, hydrogen, oxygen, and nitrogen

   b.   Nitrogen = 78%, Oxygen = 21% and CO_2 = 0.032%

   c.   Conversion of atmospheric nitrogen into useful compounds is called nitrogen fixation.

23. Solution: For the distinction between element and compound,

   Elements: Iodine, 24-carat gold, carbon.

   Compounds: Sodium chloride, water, oxygen gas.

OR

   Solution: The compound is called aluminium sulphate; cation: Al^{3+}; anion : $(SO_4)^{2-}$

24. Solution:

   (a)   Element 'Z' will be metal because it has only one electron in the outermost shell, so it is electropositive.

   (b)   After the loss of one electron, 'Z' will acquire one positive charge.

   $Z \rightarrow Z^+ + 1\ e^-$

25. Solution: Given,

   Mass of first object, m = 50 kg

   Mass of second object, M = 120 kg

   Distance, d = 10m

Gravitation constant, G = 6.7 × 10⁻¹¹ Nm²kg⁻²

We know,

$$F = G\frac{Mm}{d^2}$$
$$F = 6.67 \times 10^{-11}\frac{50 \times 120}{10^2}$$
$$F = 4.02 \times 10^{-9}N$$

26. Solution: Acceleration due to gravity on earth is described using the expression,

$$g = \frac{GM_e}{R_e^2}$$

The mass and radius is double of earth

$$g = \frac{G(2M_e)}{(2R_e)^2} = \frac{GM_e}{2R_e} = \frac{g}{2}$$

Section-C

27. Solution: The three major functional regions of the cells are:

    1. Nucleus
    2. Mitochondria
    3. Golgi body

    Nucleus: It is located near the center of the cell. It's chief components are chromatin material and nucleolus. Chromatin when condenses form rod-like structures called chromosomes. Chromosomes contain hereditary units genes which in turn are made up of DNA.

    Mitochondria: It is a double membranous structure. Its outer membrane is smooth and inner membranes have folds known as cristae. Mitochondria is known as the powerhouse of as respiration occurs in this organelle and energy is released.

    Golgi body: It consists of a set of smooth flat sac like structures called cisternae. Main functions of the golgi body are secretion storage and packaging. It also forms lysosomes and peroxisomes

    OR

    Solution: Amoebiasis and kala-azar are two diseases caused by protozoans.

    Amoebiasis is caused by *Entamoeba histolytica*. Kala-azar is caused by *Leishmania*.

28. Solution: The tissue that smoothes bone surfaces at joints is referred to as **cartilage**. It forms the soft endoskeleton of the body. Cartilage is a

firm but flexible connective tissue in which a solid matrix has fluid filled lacunae having 1-4 living cells called chondrocytes. Chondrocytes secrets a protein called chondrin of which matrix is made up of. It occurs in nasal septum, pinna, epiglottis, larynx, trachea, bronchi and so on.

Cartilage
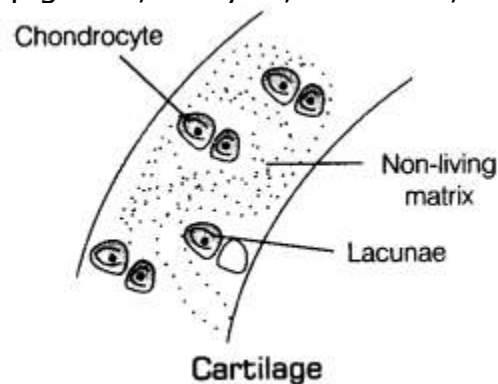
29. Solution:

a. Sclerenchyma tissue has cells which have thick lignified walls due to which the inside space narrows down.

b. It is difficult to pull down the husk of coconut as it is composed of sclerenchymatous fibres which are closely packed.

c. Muscles are able to contract and relax due to the presence of special proteins called contractile proteins. These proteins cause or enable movement.

30. Solution:

(a) We can find the final velocity by multiplying the acceleration by the time. We then plug this into the formula for kinetic energy and solve.

$$v = u + at$$
$$v = 0 + 4 \times 2 = 8 \, m/s$$
$$K = \frac{1}{2}mv^2 = \frac{1}{2} \times 0.01 \times 8^2 = 0.32 \, J$$

(b) Work is given by the product of force and displacement. Since both the force and displacement are in the same direction in this problem, work is simply the product of the two:

$$W = Fd = 5 \times 0.2 = 1 \, J$$

31. Solution:

For dilute and concentrated solutions: We have read that a binary solution has two components or constituents. These are solute and solvent. The relative amounts of the solute and solvent in the solution

either by mass or by volume, represent the concentration solution. Expressing the Concentration of a Solution.

The concentration of a solution is expressed as the amount of the solute present in a given amount of the solvent or solution. It is normally expressed as mass by a mass percent or as a volume by volume percent.

For saturated solutions: A solution becomes saturated if the solute starts separating at the bottom of the container in which the solution is being prepared at a given temperature. A saturated solution generally becomes unsaturated on heating.

For the determination of the solubility of a Solution: The solubility of a solute in a solution is always expressed with respect to the saturated solution. It may be defined as The maximum amount of the solute which can be dissolved in 100 g (0-1 kg) of the solvent to form a saturated solution at a given temperature.

For the effect of change in temperature on the solubility: The temperature at which the process of dissolution is carried is always mentioned. This means that the solubilities of salts in solvents (generally water) are influenced by the change in temperature. Actually, the effect of temperature depends upon the heat energy changes which accompany the process.

32. Solution:

(a)

$$\text{Mass of solute} = 110 \text{ g}$$
$$\text{Mass of solution} = 550 \text{ g}$$

$$\text{Concentration of solution} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100 = \frac{(110\text{g})}{(550\text{g})} \times 100 = 20\%$$

(b)

	Property	Suspension	Colloidal solution	Solution
1.	Particle size	> 100 nm	1 to 100 nm	< 1 nm
2.	Filterability	cannot pass through filter paper or membrane	can pass through filter paper but not through animal membrane	can pass through filter paper and animal membrane
3.	Settling of particles	Settle of their own	Settle only on centrifugation	Do not settle
4.	Appearance	Opaque	Generally transparent	Transparent
5.	Tyndall effect	Shows	Shows	Does not show
6.	Diffusion of particles	Donot diffuse	Diffuse slowly	Diffuse rapidly
7.	Brownian movement	May show	Shows	May or may not show
8.	Nature	Heterogeneous	Heterogeneous	Homogeneous

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33. Solution:

(a) Newton's 3rd law states that for every force there is an equal and opposite force. In other words, the force with which the moon pulls on the Earth is the same force that the Earth pulls on the moon.

Newton's 2nd law states that the acceleration of an object is directly related to the force applied and inversely related to the mass of the object. Since both the earth and the moon have the same force acting on it, it is their masses that will determine who will accelerate more. Since there is an inverse relationship between the mass and acceleration, the object with the smaller mass will accelerate more. Therefore, the moon will accelerate more.

(b) Work done in climbing, w = 2500 J

Acceleration due to gravity (g) = 10m/s^2

Height above the ground = 5m

We know,

W = mgh

2500 = m × 10 × 5

m = 2500/50

m = 50Kg

Hence, Mass of the man = 50 kg

Section-D

34. Solution:

(i) No of moles of $CaCO_3$ involved in this reaction = 1

(ii) Molar mass of calcium = 40

Molar mass of carbon = 12

Molar mass of oxygen = 16

Gram molecular mass of $CaCO_3$ = Molar mass of calcium + Molar mass of carbon + Molar mass of oxygen x 3

= 40 + 12 + (16 x 3)

= 100 g

(iii) No of moles of CO_2 in the reaction = 1

OR

Solution:

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(a) 'C' has made the desired solution because 50% (mass by volume) solution means 50g of solute dissolved in 100 mL of solution.

Mass by volume percent = Mass of solute/ Volume of solution ×100

= 50/100×100 = 50% mass by volume.

(b) The size of colloidal particles is less than 1 nm, while the size of pores present in an ordinary filter paper is larger than l nm. Hence, a colloidal solution cannot be separated by filtration.

35. Solution**:**

a. DPT is a triple vaccine which saves the life of babies from diphtheria, whooping cough (pertussis) and tetanus.

b. Polio drops are heat killed or chemically weakened pathogens which are given periodically as booster doses to children under five years of age. The preparations stimulate the body to produce antibodies against these antigens. Thus, the body becomes immune to polio disease.

c. High Blood pressure and diabetes are two diseases which are caused in due courses of time and last life long. They can be kept in control but cannot be cured permanently.

d. Female anopheles mosquito feeds on human blood as it requires large amount of proteins to lay their eggs

e. Malaria is caused by *Plasmodium*, also known as malarial parasite.

36. Solution:

(a) The area underneath the graph gives the total displacement covered by the elevator before stopping for the first time at 12 s.

The area under the graph: -

$$A = \frac{1}{2} \times 2 \times 3.6 + 8 \times 3.6 + \frac{1}{2} \times 2 \times 3.6$$
$$A = 36\, m$$

(b) The change in momentum of the body is given as

$$= m(v - u)$$

Considering the final direction of the object as positive

$$= m(2 - (-10)) = m(12) = 120\, kg\, m/s$$

Now, from second law of motion, force is the rate of change of momentum, therefore

$$F = \frac{120}{4} = 30\, N$$

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