CBSE Class 09

Science

Sample Paper 6 (2019-20)

Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

i. The question paper comprises three sections - A, B and C. Attempt all the sections.
ii. All questions are compulsory. Internal choice is given in each section.
iii. All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
iv. All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50 - 60 words each.
v. All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80 – 90 words each.
vi. This question paper consists of a total of 30 questions.

Section A

1. State Mendeleev's periodic law.

2. Give an example of a triatomic molecule of an element.

3. **Crop Production Improvement**
   It involves different practices carried out by the farmer to achieve higher standards of crop production. Main practices involved in crop production management are Nutrient Management, Irrigation, and Cropping Patterns.
   Nutrient Management
   Like other organisms, plants also require some elements for their growth. These elements are called Nutrients. There are sixteen nutrients which are essential for plants. These nutrients are divided into the following two categories:

   These nutrients are supplied to plants by air, water and soil.

Sources	Nutrients
Air	Carbon, Oxygen
Water	Hydrogen, Oxygen
Soil	**Macronutrients:** Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur.
	Micronutrients: Iron, Manganese, Boron, Zinc, Copper, Molybdenum, Chlorine.

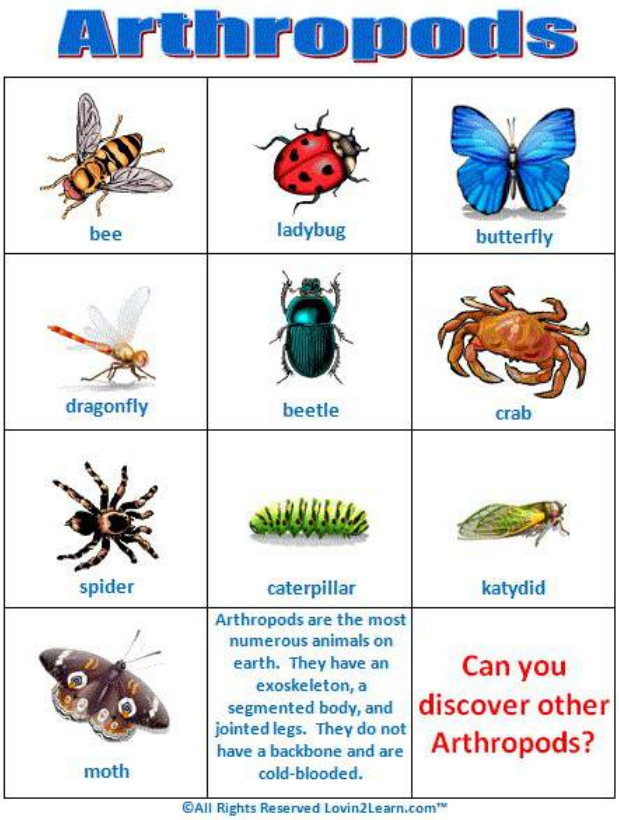
Answer the following questions:

- **Macronutrients:** The essential elements, which are utilized by plants relatively in large quantities, are called macronutrients.
- **Micronutrients:** The essential elements, which are used by plants in small quantities, are called micronutrients.

i. Differentiate between macronutrients and micronutrients.
ii. List all macronutrients.
iii. List all micronutrients.
iv. _____ is the main source of Carbon and Oxygen.

4. Arthropod, any member of the phylum Arthropoda, the largest phylum in the animal kingdom, which includes such familiar forms as lobsters, crabs, spiders, mites, insects, centipedes, and millipedes. About 84% of all known species of animals are members of this phylum. Arthropods are represented in every habitat on Earth and show a great variety of adaptations. Several types live in the aquatic environment, and others reside in terrestrial ones; some groups are even adapted for flight.

   The distinguishing feature of arthropods is the presence of a jointed skeletal covering composed of chitin (a complex sugar) bound to protein. Arthropods lack locomotory cilia, even in the larval stages, probably because of the presence of the exoskeleton. The body is usually segmented, and the segments bear paired, jointed appendages, from which the name arthropod (“jointed feet”) is derived. About one million arthropod species have been described, of which most are insects.



Answer the following questions:

i. What is the meaning of the word Arthropod?
ii. Give any five examples of phylum Arthropoda.
iii. Which is the largest phylum in the animal kingdom?
iv. Mention the habitat of arthropods.

5. Bags at the top of school van are tied using a string to avoid the effect of

OR

What is the S.I. unit of Momentum?

a. inertia

b. acceleration

c. force

d. momentum

e. ms/Kg

f. Kg ms

g. Kg ms^{-1}

h. Kg/ms

6. A cylinder and a cone having radius r_1 and r_2 respectively ($r_1 > r_2$) are having the same mass. Then pressure exerted by the cylinder is

   a. greater than cone

   b. equal to cuboid

   c. equal to cone

   d. less than cone

7. Match the following with correct response.

Column A	Column B
(1) Velocity effects	(A) Energy
(2) Maximum work done	(B) 90°
(3) Work done is zero	(C) O°
(4) Work done, when force act obliquely	(D) $F \times S \times \cos\theta$

   a. 1-D, 2-A, 3-C, 4-B
   b. 1-A, 2-C, 3-B, 4-D
   c. 1-B, 2-D, 3-A, 4-C
   d. 1-C, 2-B, 3-D, 4-A

8. Match the following with correct response.

(1) Speed of sound in Aluminium.	(A) 326 ms^{-1}
(2) Speed of sound in water.	(B) 1484 ms^{-1}

(3) Speed of sound in air.	(C) 6420 ms^{-1}
(4) Speed of sound in oxygen gas.	(D) 343 ms^{-1}

OR

The earth is acted upon by gravitation of the sun, even though it does not fall into it. Why?

a. 1-D, 2-A, 3-C, 4-B
b. 1-C, 2-B, 3-D, 4-A
c. 1-A, 2-C, 3-B, 4-D
d. 1-B, 2-D, 3-A, 4-C

9. Which of the following is not a branch of animal husbandry
A. Apiculture
B. Pisciculture
C. Agriculture
D. Horticulture

a. B and D

b. A and C

c. A, C and D

d. All of these

10. 22 carrot gold is
a. Heterogeneous mixture
b. Pure element
c. Homogenous mixture
d. Pure compound

11. AIDS can be transmitted by:
(a) Sexual contact
(b) Handshake
(c) Hugs

(d) Breast feeding

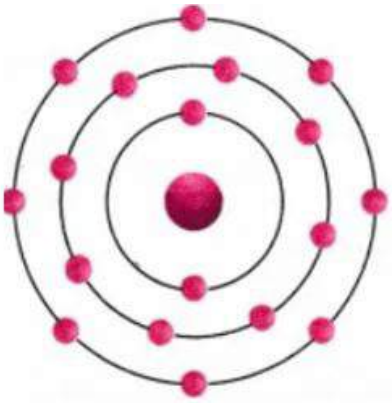
a. (a) and (d) are correct

b. (a), (b) and (c) are correct

c. All of these are correct.

d. (b) and (c) are correct

12. What is the valency of the given figure?



OR

Match the following with the correct response:-

(1) Solid element	(A) Salt solution
(2) Compound	(B) Gold
(3) Mixture	(C) Mercury
(4) Liquid element	(D) Sugar

a. 3

b. 2

c. 0

d. 1

e. 1-D, 2-A, 3-C, 4-B

f. 1-B, 2-D, 3-A, 4-C

g. 1-A, 2-C, 3-B, 4-D

h. 1-C, 2-B, 3-D, 4-A

13. **Assertion:** Naphthalene balls disappear with time without leaving any solid.

    Reason: Solid converted to liquid is called sublimation.

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

    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.

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

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

    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. i. What is manure?
    ii. State two advantages of using manure.
    iii. How does green manure differ from ordinary manure?

16. A 0.24 g sample of compound of oxygen and boron was found by analysis to contain 0.096 g of boron and 0.144 g of oxygen. Calculate the percentage composition of the

compound by weight.

OR

What are the limitations of J.J.Thomson's model of the atom?

17. A body of mass 5 Kg is lifted vertically at a height of 12m. Calculate

    i. The force applied
    ii. Work Done in lifting the body
    iii. What happens to the work performed?

18. **OR**

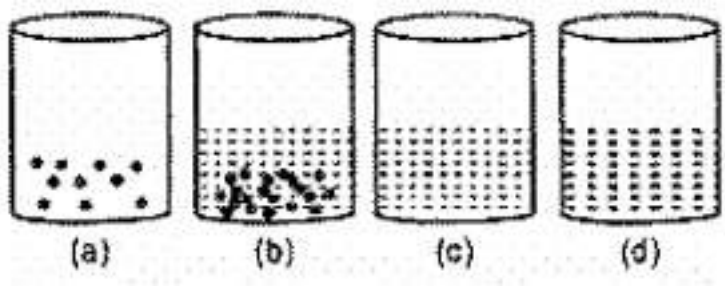
    i. Name the stage in the life cycle of aquatic animals, which is affected by change in temperature.
    ii. Name any one method by which water helps in soil formation.
    iii. Different types of soil have different constituents. Name the main constituent in following soil
        a. Black soil
        b. Red soil
    iv. List two main ways in which oxygen is consumed and carbon dioxide is produced.
    v. What is the role of respiration in the oxygen cycle?
    vi. Name the organisms for whom oxygen is harmful.

19. Why is osmoregulation is necessary in aquatic organisms?

20. Name the following:-

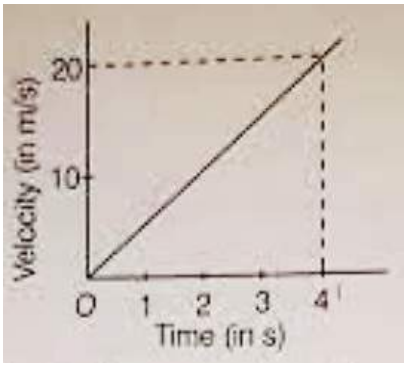
    a. Tissue that stores fats in our body
    b. Tissue present in the brain
    c. Connective tissue with fluid matrix
    d. Tissue that connects muscles to bones in humans

21. Which of the following is a true solution?



22. i. Why does a bucket of water feel heavier when taken out of water?
    ii. Lead has greater density than iron and both are denser than water. Is the buoyant force on a lead object greater than, less than or equal to the buoyant force on an iron object of the same volume?

23. The velocity-time graph of a ball moving on the surface of the floor is as shown in the figure. Calculate the force acting on the ball, if mass of the ball is 100 g.



24. **OR**

The following data represents the distribution of electrons, protons and neutrons in atoms of four elements A, B, C, D.

Element	Protons	Neutrons	Electrons
A	10	10	10
B	11	12	11
C	12	12	12
D	13	14	13

Solve the following questions.

i. The potential energy of a freely falling object decreases progressively. What

happens to its

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?
iii. Write the electronic distribution of atoms of elements A and D.
iv. Element A is an inert gas. Why?
v. What is the valency of element C?

25. Fractional distillation is suitable for the separation of miscible liquids with a boiling point difference of about 25 K or less. What part of fractional distillation apparatus makes it efficient and possesses an advantage over a simple distillation process? Explain using a diagram.

OR

i. Write the steps involved in the process of obtaining pure copper sulphate from an impure sample.
ii. Give any one application of this method.
iii. Why is this technique better than simple evaporation to purify solids?

26. Distance travelled by train and the time taken by it is shown in the following table?

Time	Distance (in km)
10 : 00 AM	0
10 : 30 AM	25
10 : 40 AM	28
11 : 00 AM	40
11 : 15 AM	42
11 : 30 AM	50

i. Plot distance-time graph.
ii. What is the average speed of the train?

iii. When is the train travelling at the highest speed?
iv. At what distance does the train slow down?
v. Calculate the speed of the train between 10:40 AM to 11:00 AM.

27. Give reasons:

a. Meristematic cells have a prominent nucleus and dense cytoplasm but they lack vacuole.

b. Intercellular spaces are absent in sclerenchymatous tissues.

c. We get a crunchy and granular feeling when we chew pear fruit.

d. Branches of a tree move and bend freely in high wind velocity.

e. It is difficult to pull out the husk of a coconut tree.

28. Explain by giving reasons:

OR

Draw a flowchart to show different divisions of kingdom-Plantae and answer the following questions.

i. A balanced diet is necessary for maintaining a healthy body.
ii. The health of an organism depends upon the surrounding environmental conditions.
iii. Our surroundings should be free from stagnant water.
iv. Social harmony and good economic conditions are necessary for good health.
v. Which division has the simplest plants?
vi. To which divisions Pinus and Cycas belong?
vii. What is the other name given to flowering plants? Classify them on the basis of a number of cotyledons present in their seed.

29. i. Define relative density. Give its mathematical form.
ii. The mass of an iron cube having an edge length 1.5 cm is 50 g. Find its density.
iii. The volume of a 250 g sealed tin is 400 cubic cm. Find the density of the tin in g $(cc)^{-1}$. State, if the object would sink or float in water.

30. Complete the following table.

Atomic Number	Mass Number	Number of Neutrons	Number of Protons	Number of Electrons	Name of the atomic Species
9	-	10	-	-	-
16	32	-	-	-	Sulphur
-	24	-	12	-	-
-	2	-	1	-	-
-	1	0	1	0	-

OR

Fill in the missing data in the following table.

Species property	H_2O	CO_2	Na atom	$MgCl_2$
Number of moles	2	-	-	0.5
Number of particles	-	3.011×10^{23}	-	-
Mass	36 g	-	115 g	-

CBSE Class 09

Science

Sample Paper 6 (2019-20)

Solution

Section A

1. According to **Mendeleev's periodic law**, the physical and chemical properties of elements are a periodic function of their atomic weight (atomic mass).

2. Ozone (O_3)

3. i. **Macronutrients:** The essential elements, which are utilized by plants relatively in large quantities, are called macronutrients.
   Micronutrients: The essential elements, which are used by plants in small quantities, are called micronutrients.
   ii. **Macronutrients:** Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur along with Carbon, Hydrogen and Oxygen.
   iii. **Micronutrients:** Iron, Manganese, Boron, Zinc, Copper, Molybdenum, Chlorine.
   iv. Air.
4. i. The meaning of the word Arthropod is Jointed foot.
   ii. Examples are a butterfly, beetles, crab, dragon-fly, spider.
   iii. Phylum Arthropoda is the largest phylum in the animal world.
   iv. Arthropods are found in water, land and air as well.
5. (a) inertia
   Explanation: Inertia is the resistance of any physical object to any change in its state of motion. This includes changes to the object's speed, direction, or state of rest. Inertia will result in falling of the bag from the top of the van.

OR

(c) Kg ms^{-1}

Explanation: The units of momentum are the product of the units of mass and velocity.

Linear Momentum = Mass × Velocity

S.I Unit of Momentum = S.I Unit of mass × S.I Unit of velocity

S.I Unit of Momentum = kg × $m.s^{-1}$

S.I Unit of Momentum = $kg.m.s^{-1}$

6. (d) less than cone
   Explanation: $P \propto \frac{1}{A}$

   Pressure is inversely proportional to area and $A_{Cylinder} > A_{Cone}$

7. (b) 1-A, 2-C, 3-B, 4-D **Explanation:**

   (1) As the velocity of object increases it's Kinetic energy also increases.

   (2) W= F x S cos θ ($\cos 0^0 = 1$) So, w = F x S means maximum work is done.

   (3) W= F x S cos θ ($\cos 90^0 = 0$) So, w = 0 means zero work is done.

   (4) W= F x S cos θ where F = force, d = displacement

8. (b) 1-C, 2-B, 3-D, 4-A **Explanation:**

   The speed of sound is not always the same. Speed of sound in different for different mediums.

   (1) Speed of sound in Aluminium is 6420ms^{-1}.

   (2) Speed of sound in water is 1484ms^{-1}.

   (3) Speed of sound in air is 343ms^{-1}.

   (4) Speed of sound in oxygen gas 326ms^{-1}.

   OR

   The earth does not fall into the sun because the earth remains in its circular orbit due to the gravitational force acting on it.

9. (c) A, C and D
   Explanation: B. Pisciculture - only animal husbandry

   Animal husbandry is the *branch* of agriculture concerned with *animals* that are raised for meat, fibre, milk, eggs, or other products. It includes day-to-day care, selective *breeding*, and the raising of livestock. Fish farming or *pisciculture* is the

principal form of aquaculture, while other methods may fall under mariculture. Fish farming or *pisciculture* involves raising fish commercially in tanks or enclosures such as fish ponds, usually for food. It is the principal form of aquaculture, while other methods may fall under mariculture.

10. (c) Homogenous mixture **Explanation:** 22 carrot gold is homogeneous mixture of Gold or silver or Gold or Copper. Since, pure gold is very soft, it cannot be used to make jewellery and thus with 22 parts of gold 2 parts of silver or copper are mixed to make it hard.
11. (a) (a) and (d) are correct
    Explanation: AIDS can be transmitted from one partner to another through sexual contact. It can also be transmitted through blood to blood contact with infected people or from an infected mother to her baby during pregnancy or through breast-feeding. It is not transmitted through casual physical contacts like handshakes or hugs.
12. (c) 0
    Explanation: The outermost orbit of the given atom is completely filled. So, the valency of the given figure is zero.

OR

(b) 1-B, 2-D, 3-A, 4-C
Explanation: (1) Solid Element - Gold occurs in solid-state.

(2) Compounds - Sugar (Cane sugar - $C_{12}H_{22}O_{11}$) is made of two or more elements (C, H and O) which are chemically combined in a fixed proportion by mass.
(3) Mixture - Salt solution consists of two or more compounds (Sodium chloride, and Water) which are not chemically combined.
(4) Liquid element - Mercury is an element which is a liquid at room temperature.

13. (c) Assertion (A) is true but reason (R) is false.
    Explanation: Naphthalene has the property of sublimation and hence naphthalene ball evaporates easily and disappears.
14. (d) Assertion (A) is false but reason (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.

15. i. Manure is an organic substance obtained through the decomposition of plant wastes like straw and animal wastes such as cow dung. The decomposition is brought about by microbes.
    ii. Advantages of using manure are:
        a. It enriches the soil with nutrients without any pollution.
        b. It improves soil texture.
        c. It increases the water-holding capacity of soil by adding organic matter to it.
    iii. Green manure is different as it is obtained by growing green plants, which are then mulched by ploughing them into the soil. Later on, it forms green manure.

16. Mass of the given sample compound = 0.24 g
    Mass of boron in the given sample compound = 0.096 g
    Mass of oxygen in the given sample compound = 0.144 g
    $\%$ composition of compound = $\%$ of boron and $\%$ of oxygen
    Therefore $\%$ of boron = mass of boron 100/mass of the sample compound
    $0.096 \times \frac{100}{0.24}$
    = 40 percent
    Therefore $\%$ of oxygen = mass of oxygen 100/mass of the sample compound
    $0.144 \times \frac{100}{0.24}$
    = 60 percent

OR

The main limitation of the atomic model proposed by J.J Thomson was that it didn't explain the arrangement of electrons inside an atom. The model failed to explain how protons and electrons were arranged inside an atom so close to each other when they carried opposite charges.

17. Mass = m = 5 Kg
    Height = h = 12 m.
    g = Acceleration due to gravity= 9.8 m/s^2

    i. P.E. = mgh

= $5 \times 12 \times 9.8$

= 588 J

ii. Force = ?

Work Done = P. E. energy of the Body

Force × Distance Moved = 588

F $\times$ 12 = 588

F = 49 N

iii. The work done in lifting the body gets stored as the potential energy.

18. i. Hatching (egg stage), larvae and young animals are affected by change in temperature of the water bodies.

ii. In physical weathering, water and high-temperature cause expansion and contraction of rocks, facilitating their breakdown. As a result, soil is formed.

iii. The main constituents are:

a. Black soil - Humaus, Ca, Fe, Mg, Al.

b. Red soil - Iron oxide.

OR

i. Respiration and combustion.

ii. Oxygen enters the living world through the process of respiration. It is used to oxidise the food material (glucose molecule) and produce energy and carbon dioxide.

iii. Some bacteria are poisoned by elemental oxygen. Oxygen is toxic to obligately anaerobic organisms.

19. Aquatic organisms have higher concentration of water outside their bodies, which causes endo–osmosis. Osmoregulation i.e., the maintenance of constant osmotic pressure in the fluids of an organism by the control of water and salt concentrations.

20.

(a)	Tissue that stores fats in our body	Adipose tissue
(b)	Tissue present in the brain	Nervous tissue
(c)	Connective tissue with fluid matrix	Blood

(d)	Tissue that connects muscles to bones in humans	Tendons

21. Alcohol is soluble in water. Therefore, it will form true solution. sand will form suspension. Milk and soap will form colloidal solution

22. i. A bucket of water feels heavier when taken out of water because when immersed in water, an upward force, i.e. buoyant force acts on it which is equal to the weight of water displaced by the bucket.
    ii. The buoyant force on a lead object is lesser than the buoyant force on the iron object because lead has greater density, so it displaces a lesser amount of water consequently lesser amount of buoyant force acts on it.

23. The velocity-time graph shows that the velocity of the ball at t = 0 is zero. So, the initial velocity of the ball, u = 0.
    Velocity of the ball at t = 4 s is 20 m/s
    i.e. final velocity, v = 20 m/s; time, t = 4 s
    ∴ Acceleration of the ball,
    $a = \frac{v-u}{t} = \frac{20m/s-0}{4s} = 5m/s^2$
    Also, mass of the ball
    $a = 100g \Rightarrow \frac{100}{1000}kg = \frac{1}{10}kg$
    ∴ Force acting on the ball,
    F = ma
    F= $\frac{1}{10}kg \times 5m/s^2$
    = 0.5 kg-m/s^2 = 0.5 N [∵ 1 kg-m/s^2 = 1 N]

24. 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 from one form to another.
    ii. 1 kWh = 3.6 $\times$ 10^6 J

OR

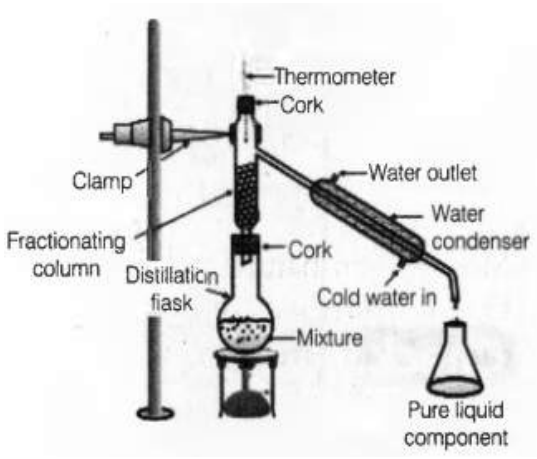
i. Electronic distribution of atoms of elements A and D.

	k	L	M
A =	2,	8	
D =	2,	8,	3

ii. The number of electrons in the outermost shell of element A is 8.
The outermost shell of this element is complete and the element does not need to gain or lose electrons to complete its outermost shell. Hence, A is an inert gas.

iii. Valency of element C (2, 8, 2) is 2.

25. Fractional distillation is a process to separate the volatile liquids. In the apparatus, a fractionating column is the most important part of the fractional distillation apparatus. This column has glass beads in it which provides a large surface area for the vapours to collide and lose energy so that they can be quickly condensed and distilled. Apart from the presence of bead, if the length of the column is increased, then it would also increase the efficiency. The vapours of high boiling liquid get condensed earlier (at a lower level).



Advantages:

i. This method can separate the liquids with a boiling point difference of about or less than 25 K.

ii. During the process, both evaporation and condensation take place simultaneously.

iii. A mixture (like petroleum) can also be separated by fractional distillation process which contains several components.

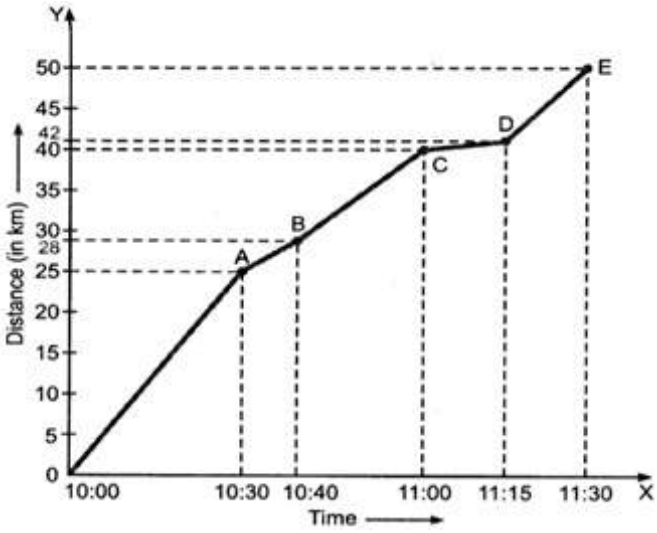
OR

i. The steps involved in the process of obtaining pure copper sulphate from an impure sample are as follows:
   - Dissolve copper sulphate in water.
   - Add a few drops of dil. H_2SO_4 to get a clear solution.
   - Heat the solution in China dish till crystallisation point is reached.
   - Cool this saturated solution.
   - Crystals of pure copper sulphate are formed. Impurities remain behind in the solution.
   - Separate these crystals from solution by filtration and dry them.

ii. The method is crystallisation. It is used for the purification of common salt from water.

iii. Soluble impurities can be removed by this technique which is not removed by evaporation.

26.



i. Average speed = $\frac{\text{Total distance travelled}}{\text{Total time taken}}$ In this problem, the total distance travelled = 50 km. Total time took 10:00 AM to 11: 30 AM

= 1 hour 30 minutes = $1\frac{1}{2}h$ = $\frac{3}{2}h$

Therefore, Now average speed = $\frac{50\,km}{\frac{3}{2}h}$

= $\frac{100}{3}km/h$

= 33.33 km h^{-1}

ii. We, know, speed = slope of the distance-time graph. The greater the slope the

greater is the speed.

From the graph, it is clear that slope of the distance-time graph is maximum between 10:00 AM to 10:30 AM, so the train was travelling at the highest speed during this interval of time.

iii. The part CD of the graph has a minimum slope, so the train had a minimum speed between 11:00 AM and 11:15 AM. Thus, the train had slowed down between 40 km and 42 km.

iv. Speed between 10:40 AM to 11:00 AM = $\frac{\text{Distance}}{\text{Time}}$

= $\frac{(40-28)km}{20\,\text{min}}$ = $\frac{12}{\frac{20}{60}}$ = 36 km/h

27. (a) Meristematic cells are active and continuously dividing cells so they have a prominent nucleus and dense cytoplasm. But since meristematic cells do not store food material or waste materials, they lack vacuole.

(b) Sclerenchyma cells have lignified cell walls. Lignin makes the cell walls thick, the cell compact and leaves no intercellular spaces.

(c) We get a crunchy and granular feeling while eating a pear due to the presence of sclereids. Sclereids are a reduced form of sclerenchyma cells with highly thickened, lignified cellular walls. The presence of numerous sclereids forms the gritty texture of pears.

(d) The branches of a tree have collenchyma cells which give tensile strength to plant parts. Hence, plants move and bend freely in high wind velocity. Collenchyma provides flexibility to the parts of a plant and allows easy bending of leaves and stem without breaking.

(e) The husk of a coconut tree is made up of sclerenchymatous cells which have lignified cell walls. Hence, it is difficult to pull out the husk of a coconut tree.

28. i. A balanced diet is the first and foremost condition necessary for good health. A balanced diet provides all the nutrients, e.g. proteins, carbohydrates, fats, vitamins and minerals required by the body in correct proportions. When our diet lacks one or more of these nutrients, we get deficiency diseases or nutritional disorders, e.g. if our diet lacks the mineral iron, we may get a disease called anaemia. Excessive or inadequate intake of food and nutrients leads to conditions such as obesity, kwashiorkor and rickets, e.g. vitamin-A causes hypervitaminosis-A and

calcium causes rickets. A balanced diet prevents deficiency diseases. It also increases our ability to fight against infections in general.

ii. Our health depends on the cleanliness of our surroundings. Flies and mosquitoes carry germs that cause diseases. Flies breed in rotting garbage and mosquitoes breed in pools of stagnant water. So, people fall ill quite often if the area in which they live or work has garbage, stagnant water or open drains.
Clean air is also a part of our surroundings and a basic requirement for good health.

iii. This is so because many waterborne diseases causing insect vectors flourish in stagnant water, which cause diseases such as malaria, dengue, etc., in human beings.

iv. Social harmony and good economic conditions are necessary for good health. Social harmony involves each other's participation in joys and sorrows, helping others, etc. If we mistreat each other, we cannot be happy or healthy. Proper earning is necessary to provide adequate and nutritious food and a clean environment for living. Thus, good economic condition is also a necessary factor for good health.

OR

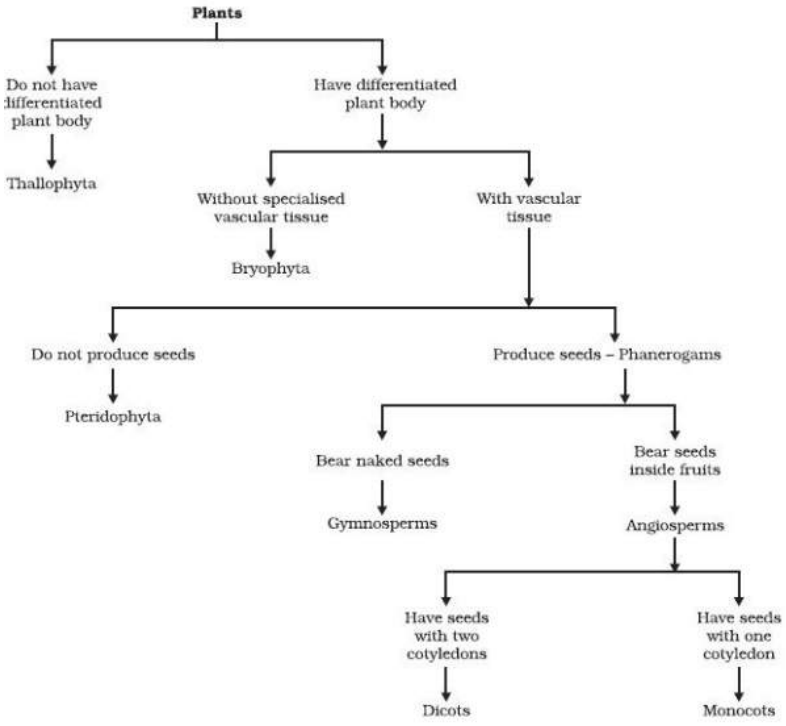


Figure: Classification of Plants

i. Thallophyta includes plants with simple body design.

ii. Pinus and Cycas belong to gymnosperms.

iii. Flowering plants are also called angiosperms. The angiosperms are divided into two groups on the basis of the number of cotyledons present in the seed. These are as follows:

Monocotyledonous- Plants with seeds having a single cotyledon, e.g. maize.

Dicotyledonous- Plants with seeds having two cotyledons, e.g. pea.

29. i. The relative density of a substance is the ratio of its density to that of water.

Relative density of a substance = $\frac{\text{Density of the substance}}{\text{Density of water}}$

In other words,

Relative density of a substance

= $\frac{\text{Mass of the substance}}{\text{Volume of the substance}} \times \frac{\text{Volume of water}}{\text{Mass of water}}$ [$\because$ density = $\frac{mass}{volume}$]

ii. Given that, mass of the cube = 50 g

Side of cube = 1.5 cm

$\therefore$ Volume of cube = $(1.5)^3$ = 3.375 cm^3

$\therefore$ Density = $\frac{Mass}{Volume}$ = $\frac{50}{3.375}$ = 14.81 g cm^{-3}

iii. Given that, mass, m = 250 g

Volume, V = 400 cc

$\therefore$ Density of tin = $\frac{Mass}{Volume}$ = $\frac{250}{400}$ = 0.625 g $(cc)^{-1}$

As we know that, density of water = 1 g $(cc)^{-1}$.

So, the density of tin is less than that of water and hence tin will float.

30.

Atomic Number	Mass Number	Number of Neutrons	Number of Protons	Number of Electrons	Name of the atomic Species
9	19	10	9	9	Fluorine
16	32	16	16	16	Sulphur
12	24	12	12	12	Magnesium
1	2	1	1	1	Deuterium
1	1	0	1	0	Hydrogen ion

Explanation:

i. Fluorine ($^{19}_{9}\mathrm{F}$) Given, atomic number = 9 and number of neutrons = 10
Mass number = Atomic number + number of neutrons = 9 + 10 = 19
Number of protons = Atomic number = Number of electrons = 9

ii. Sulphur ($^{32}_{16}\mathrm{S}$) Given, atomic number = 16
Number of protons = Number of electrons = 16
Number of neutrons
= Mass number - atomic number = 3 2 - 16= 16.

iii. Magnesium ($^{24}_{12}\mathrm{Mg}$) Number of protons = 12
Atomic number = Number of protons = 12
Number of electrons = Number of protons = 12
Number of neutrons = Mass number - atomic number = 24 — 12 = 12

iv. Deuterium ($^{2}_{1}\mathrm{D}$) Number of protons = 1 and Number of electrons = 1
∴Atomic number = 1, mass number = 2
Number of neutrons =2-1=1

v. Hydrogen ion (1H+) Mass number = 1
Number of protons = 1
Number of neutrons = 0
Number of electrons = 0
Atomic number = Number of protons = 1
Atomic number = Number of protons = 1
Because number of electrons is zero, i.e. not equal to that of protons, so the species is hydrogen ion, not hydrogen atom.

OR

For H_2O

Given, number of moles = 2 and mass = 36 g

∴ Number of particles = number of moles $\times$ 6.022 $\times$ 10^{23}

= 2 $\times$ 6.022 $\times$ 10^{23} = 1.2044 $\times$ 10^{24}

$$\left[\because \text{ Number of moles } = \frac{\text{Number of particles}}{\text{Avogadro's number}}\right]$$

For CO_2

Given, number of particles = 3.011×10^{23}

$\therefore$ Number of moles of CO_2

= $\frac{\text{Number of particles}}{6.022 \times 10^{23}} = \frac{3.011 \times 10^{23}}{6.022 \times 10^{23}}$ = 0.5 mol

mass of CO_2 = moles $\times$ molar mass

= $0.5 \times 44 = 22g$

($\because$ Molar mass of $CO_2 = 12 + 2 \times 16 = 44$)

For Na atom

Given, mass = 115 g

Number of moles = $\frac{\text{Mass}}{\text{Molar mass}} = \frac{115}{23}$ = 5 mol

$\therefore$ Number of particles = $5 \times 6.022 \times 10^{23}$

= 3.011×10^{23}

For MgCl2

Given, number of moles = 0.5 mole

$\therefore$ Number of particles = $0.5 \times 6.022 \times 10^{23}$

= 3.011×10^{23}

Mass = number of moles $\times$ molar mass

(Molar mass of $MCl_2 = 24 + 2 \times 35.5$

= 24 + 71

= 95 g mol-1

= $0.5 \times 95 = 47.5$ g

Thus, the completed table is as

Species property	H_2O	CO_2	Na Atom	$MgCl_2$
Number of moles	2	0.5	0.5	0.5
Number of particles	12044×10^{24}	3.011×10^{23}	3.011×10^{24}	3.011×10^{23}
Mass	36 g	22g	115 g	47.59g