

SAMPLE PAPER - 5

Class 09 - Science

Time Allowed: 3 hours

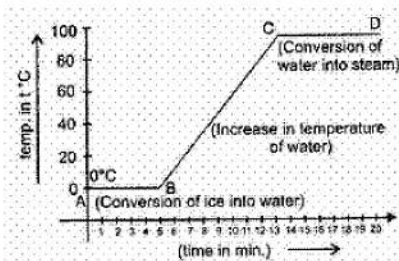
Maximum Marks: 80

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. The inferences drawn by the temperature versus time graph are [1]



- A. During the melting, temperature of substance does not change.
B. Temperature rises after all amount of ice melts.
C. At a specific temperature water starts boiling and temperature remains the same during the conversion of water into steam.

Which statement is correct regarding graph?

- a) Only (C) is correct
b) All (A), (B) and (C) are correct
c) Only (B) is correct
d) Only (A) is correct
2. Match the following with the correct response [1]

(1) Large-sized vacuoles	(A) Endo-osmosis
(2) Swelling of cells	(B) Nucleus

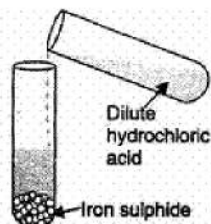


(3) Shrinkage of cell content	(C) Hypertonic solution
(4) Organelle that control all the activities	(D) Plant cells

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

3. What does the slope of the velocity-time graph give? [1]
a) acceleration b) force
c) displacement d) distance
4. The compost prepared with the help of earthworm is called _____. [1]
a) green manure b) vermicompost
c) compost d) manure
5. The dead element present in the phloem is [1]
a) phloem parenchyma b) phloem fibres
c) sieve tubes d) companion cells
6. The basic building units of an onion bulb, are called _____. [1]
a) scales b) cells
c) roots d) tissues
7. How many moles are present in 40 g of He? [1]
a) 10 moles b) 13 moles
c) 14 moles d) 12 moles
8. Which connective tissue supports and provides flexibility to the body parts? [1]
a) Tendon b) Bone
c) Cartilage d) Ligament
9. Which of the following is the evidence to show that there must be a force acting on the earth and directed towards the sun [1]
a) deviation of falling bodies towards the east b) apparent motion of sun around the earth
c) revolution of the earth around the sun d) phenomenon of day and night
10. Slope of a velocity-time graph gives [1]
a) the displacement b) the acceleration
c) the distance d) the speed
11. Which of the following has maximum number of atoms? [1]
a) 18 g of O₂ b) 18 g of H₂O
c) 18 g of CO₂ d) 18 g of CH₄
12. Ligaments and Tendons are formed of [1]
a) Epithelial tissue b) Cartilage

- c) Muscular tissue
d) Connective tissue
13. Living cells were discovered by [1]
a) A.V. Leeuwenhoek
b) Robert Brown
c) Robert Hooke
d) R. Virchow
14. What is the ratio of magnesium and sulphur by mass in magnesium sulphide? [1]
a) 3:4
b) 23:35.5
c) 2:1
d) 5:2
15. In the experiment shown a gas is evolved. Four groups of students have recorded their observations on the gas produced as shown in the following table. Choose the correct set of observations. Note that the positive response are shown by '✓' and negative by '✗' signs respectively. [1]



- | a) | Colour of the gas | Odour of the gas | Flammability | Action on lead acetate paper |
|----|-------------------|------------------|--------------|------------------------------|
| | ✗ | ✓ | ✗ | ✓ |
- | b) | Colour of the gas | Odour of the gas | Flammability | Action on lead acetate paper |
|----|-------------------|------------------|--------------|------------------------------|
| | ✗ | ✓ | ✓ | ✗ |
- | c) | Colour of the gas | Odour of the gas | Flammability | Action on lead acetate paper |
|----|-------------------|------------------|--------------|------------------------------|
| | ✗ | ✗ | ✓ | ✗ |
- | d) | Colour of the gas | Odour of the gas | Flammability | Action on lead acetate paper |
|----|-------------------|------------------|--------------|------------------------------|
| | ✓ | ✓ | ✗ | ✓ |
16. Which of the following is micro-nutrient? [1]
a) Boron
b) Nitrogen
c) Potassium
d) Phosphorus
17. **Assertion (A):** A car is said to have a uniform speed of say, 60 km per hour, if it travels 30 km every half hour, 15 km every quarter of an hour, 1 km every minute, and 1/60 km every second. [1]
Reason (R): The SI unit of speed is metres per second.
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):** A glass of cold water appear wet from the outside. [1]
Reason (R): Evaporation of water vapour.
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):** Student of class IX covered the potted plant with a glass jar, water vapour appears on the wall of the glass jar. [1]

Reason (R): Desert plants, the epidermis has a thick waxy coating of cutin chemical substance with waterproof quality on its outer surface.

- 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):** Atom is electrically neutral. [1]

Reason (R): A neutral particle, neutron is present in the nucleus of atom.

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

Section B

21. A force of 20 N displaces a body through a distance of 1 m at an angle of 60° from its own direction. Calculate the amount of work done. [2]

OR

A horse pulls a cart with a force of 300 N, such that the system of horse and cart moves with uniform speed of 18 kmh^{-1} on a level road. Calculate the power developed by the horse in watt and also find its equivalent horse power. (Take $1 \text{ hp} = 746 \text{ W}$)

22. You want to wear your favorites shirt to a party, but the problem is that it is still wet after a wash. What steps would you take to dry it faster? [2]

23. A sound wave travels at a speed of 339 ms^{-1} . If its wavelength is 1.5 cm, what is the frequency of the wave? Will it be audible? [2]

24. Why are we able to sip hot tea or milk faster from a saucer rather than a cup? [2]

25. A javelin throw is marked foul if an athlete crosses over the line marked for throw. Explain why the athletes often fall to stop themselves before the line. [2]

OR

Why is it difficult to balance our body, when we accidentally step on a peel of banana?

26. Which of the following electronic configurations is wrong and why? [2]

- (a) 2, 8, 2
(b) 2, 8, 8, 2
(c) 2, 8, 9, 1

Section C

27. Kunal and Abhimanyu were waiting to go across a railway crossing. Kunal jumped over the barrier and curiously put his ear on the railway track. Abhimanyu opposed Kunal and pulled him away from the railway track. [3]

- a. Why did Kunal put his ear on the railway track?
b. Can sound travel faster through (i) copper (ii) water?
c. Why did Abhimanyu pull Kunal away from the railway track?

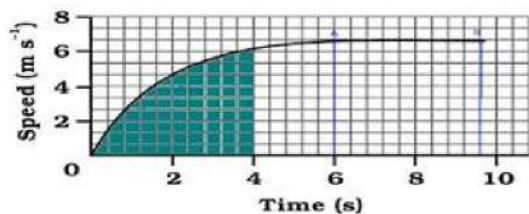
28. Study the data given below and answer the questions which follow: [3]

Particle	Electrons	Protons	Neutrons
A	2	3	4

B	10	9	8
C	8	8	8
D	8	8	10

- Write the mass number and atomic number of particles A, B, C, D.
- Which particles represent a pair of isotopes? Explain.

29. The speed-time graph for a car is shown in Fig. [3]



- How far does the car travel in the first 4 seconds? Shade the area on the graph that represents the distance travelled by the car during the period.
- Which part of the graph represents uniform motion of the car?

OR

The average time taken by a normal person to react to an emergency is one fifteenth of a second and is called the 'reaction time'. If a bus is moving with a velocity of 60 kmh^{-1} and its driver sees a child running across the road, how much distance would the bus had moved before he could press the brakes? The reaction time of the people increases when they are intoxicated. How much distance had the bus moved if the reaction time of the driver were $\frac{1}{2} \text{ s}$ under the influence of alcohol?

30. Anil lives in a village and his school is 8 km away from his home. His father suggests buying a motor cycle to go to school. Anil opposes the idea and opts for a bicycle instead. [3]
- Write the energy transformation taking place while Anil rides his bicycle.
 - Justify (the stand taken by Anil in your own words).
 - How can he convince his friends to do the same?

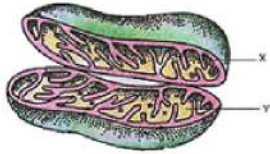
31. The following is the distance-time table of an object in motion: [3]

Time (in second)	Distance (in metre)
0	0
1	1
2	8
3	27
4	64
5	125
6	216
7	343

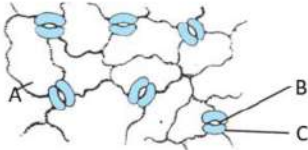
- What conclusion can you draw about the acceleration? Is it constant, increasing, decreasing or zero?
- What do you infer about the force acting on the object?

32. What is prokaryotic cell? Differentiate between prokaryotic cell & eukaryotic cell? [3]

OR



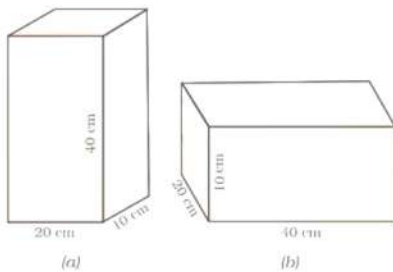
- Label X and Y
 - What is the function of X?
 - What is the composition of Y?
 - Identify the above diagram and what is its common name?
33. Observe the given below diagram and answer the following questions: [3]



- What does A represent in the given diagram? How does cell 'A' of root hairs cells help in water absorption?
- How does B in the given diagram help the plants?
- Out of A, B, and C cells in the above diagram, which cell helps in the closing and opening of the stomata? Write the name of the cell.

Section D

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



- 20 cm × 10 cm and
- 40 cm × 20 cm.

OR

- A person weighs 110.84 N on the moon, whose acceleration due to gravity is 1/6 of that the earth. If the value of g on the earth is 9.8 m/s^2 , then calculate
 - g on the moon
 - mass of person on the moon
 - weight of person on the earth
 - How does the value of g on the earth is related to the mass of the earth and its radius? Derive it.
35. Differentiate between [5]
- Cell wall and cell membrane.
 - Nuclear region of a bacterial cell and nuclear region of an animal cell.
 - Prokaryotic cell & eukaryotic cell.

OR

Write a note on Golgi apparatus and the functions it performs.



36. Distinguish between compounds and mixtures.

[5]

Section E

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

[4]

The process of taking up a permanent shape, size, and a function is called differentiation. Differentiation leads to the development of various types of permanent tissues. A few layers of cells beneath the epidermis are generally simple permanent tissue. another type of permanent tissue is complex tissue. Complex tissues are made of more than one type of cells. All these cells coordinate to perform a common function. Xylem and phloem are examples of such complex tissues. Xylem consists of tracheids, vessels, xylem parenchyma and xylem fibres. Phloem is made up of five types of cells: sieve cells, sieve tubes, companion cells, phloem fibres and the phloem parenchyma.

(i) Identify the type of cell in the given figure



(ii) Which part of desert plants reduces the loss of water?

OR

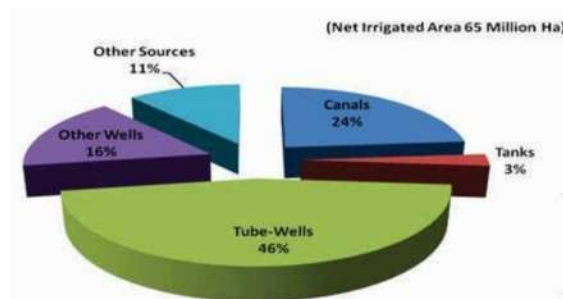
What is the dead element present in the phloem?

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

[4]

Irrigation

The process of supplying water to crop plants through human efforts by means of canals, wells, reservoirs, tube wells etc., is known as irrigation. Most agriculture in India is dependent on timely monsoons and sufficient rainfall spread through most of the growing season. However, the extra water required by crops is met through irrigation.



(i) Which is the most common source of irrigation?

(ii) Mention the various sources of irrigation.

(iii) Which is the least use source of irrigation?

OR

What are the other sources of irrigation?

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

[4]

Sodium chloride, commonly known as salt, is an ionic compound with the chemical formula NaCl, representing a 1:1 ratio of sodium and chloride ions. With molar masses of 22.99 and 35.45 g/mol respectively, 100 g of NaCl

contains 39.34 g Na and 60.66 g Cl. Ravi prepared a solution of sodium chloride by mixing 5.85 g of salt in 1 litre of water.



- (i) Molar mass of sodium chloride.
- (ii) Number of moles of sodium chloride dissolved. [Atomic masses of sodium and chlorine are 23 u and 35.5 u respectively]
- (iii) Concentration of the sodium chloride solution.

OR

Compute the number of ions present in 5.85 g of sodium chloride .

Solution
SAMPLE PAPER - 5
Class 09 - Science
Section A

1. **(b)** All (A), (B) and (C) are correct

Explanation:

- A. During the change of state, given heat is used to change the state. So temperature remains same. AB and CD parts show constant temperature
B. BC part represents increase in temperature.
C. CD is water starts boiling and temperature remains the same during the conversion of water into steam.

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

Explanation: Shrinkage of cell occurs due to exo-osmosis in a hypertonic medium. A hypertonic solution is one which has a lesser concentration of water as compared to that inside the cell. During exo-osmosis, there is a higher external osmotic pressure and a net flow of water from the cell. Swelling of cells occurs due to endo-osmosis. The inward flow of water into the cell containing an aqueous solution through a semi-permeable membrane is called as endo-osmosis. Nucleus is the organelle that control all the activities of a cell. Plant cells have large-sized vacuoles.

3. **(a)** acceleration

Explanation: We can find out the value of acceleration from the slope of the velocity-time graph of a moving body.

$$\text{Acceleration} = \frac{\text{Change in velocity}}{\text{time}} = \text{Slope of the velocity-time graph provided.}$$

4. **(b)** vermicompost

Explanation: Vermicomposting involves degradation of organic matter into fertile manure by using special type of earthworms called as red worms. The nutrient rich manure is called as vermicompost. The process of preparing manure with the help of red worms is called vermicomposting. The red worm is a type of earthworm that lives in the soil rich in organic matter. Organic soils are rich in nitrogen and carbon with plenty of moisture and microbes.

5. **(b)** phloem fibres

Explanation: Phloem fibres are thick walled, elongated spindle shaped dead cells which possess narrow lumen. They provide mechanical support to the tissue. Phloem parenchyma are thin walled-living cells of parenchyma. They have two functions, storage and lateral food conduction.

6. **(b)** cells

Explanation: Cells are the basic and fundamental unit of life, in both plants and animals.

7. **(a)** 10 moles

Explanation: Number of moles of Helium = Mass of Helium / Molar mass of Helium = $\frac{40}{4} = 10$ moles. Atomic mass or molar mass of Helium is 4 u.

8. **(c)** Cartilage

Explanation: Cartilage is a connective tissue that provides support and flexibility to the body parts. It smoothens bone surfaces at joints. It is also present in the nose, ear, trachea, and larynx.

9. **(c)** revolution of the earth around the sun

Explanation: The revolution of the earth around the sun takes place in a trajectory orbit. The average distance between the earth and the sun is approximately 150 million km.

10. **(b)** the acceleration

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

11. **(d)** 18 g of CH₄

Explanation:

- 18 g of CH₄ contains a maximum number of atoms.

$$\begin{aligned} \text{The Molar mass of CH}_4 &= \text{The atomic mass of C} + 4 \times \text{the atomic mass of H} \\ &= 12 + 4 = 16 \text{ g} \end{aligned}$$

$$\text{Number of atoms} = 1 + 4 = 5$$

$$\text{Thus, Number of atoms} = \text{Number of atoms in the molecule} \times \frac{\text{Mass of substance}}{\text{Molar mass}} \times N_A$$

$$= 5 \times \frac{18}{16} \times N_A$$

$$= 5.63 N_A$$

- The number of atoms in 18 g of H₂O:

$$\text{Molar mass of H}_2\text{O} = 18 \text{ g; Number of atoms} = 2 + 1 = 3$$

$$= 3 \times \frac{18}{18} \times N_A$$

$$= 3 N_A$$

- The number of atoms in 18 g of O₂:

$$\text{Molar mass of O}_2 = 32 \text{ g; Number of atoms in O}_2 = 1 + 1 = 2$$

$$= 2 \times \frac{18}{32} \times N_A$$

$$= 1.12 N_A$$

- The number of atoms in 18 g of CO₂:

$$= 3 \times \frac{18}{44} \times N_A$$

$$= 1.23 N_A$$

12. (d) Connective tissue

Explanation: Two bones can be connected to each other by another type of connective tissue called the ligament. Tendons connect bones to muscles and are another type of connective tissue.

13. (a) A.V. Leeuwenhoek

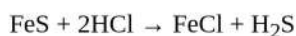
Explanation: A.V. Leeuwenhoek in 1674 with the improved microscope, discovered free-living cells of algae Spirogyra in pond water for the first time.

14. (a) 3:4

Explanation: The atomic mass of magnesium is 24. The atomic mass of sulphur is 32. Therefore, the ratio of magnesium and sulphur by mass in magnesium sulphide (MgS) is 24:32 or 3:4.

	Colour of the gas	Odour of the gas	Flammability	Action on lead acetate paper
15. (a)	✗	✓	✗	✓

Explanation: If we add HCl in FeS it will release H₂S Reaction takes place as follows:



H₂S gas turns lead acetate paper black. It is colourless, has smell of rotten eggs, does not catch fire.

16. (a) Boron

Explanation: Boron is an essential micronutrient which means it is essential for plant growth and development but is required in very small quantities.

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

Explanation: A body has a uniform speed if it travels equal distances in equal intervals of time, no matter how small these time intervals may be. For example, a car is said to have a uniform speed of say, 60 km per hour, if it travels 30 km every half hour, 15 km every quarter of an hour, 1 km every minute, and 1/60 km every second

18. (c) A is true but R is false.

Explanation: The water vapour in the air condenses on the cold surface of the glass.

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

Explanation: When the potted plant is covered by a glass jar water vapour appears on the jar because of transpiration due to which water is released from the plant in the form of water vapour which appears on the glass jar.

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

Explanation: Atom is electrically neutral because the number of protons (positively charged particle) is equal to the number of electrons (negatively charged particle).

Section B

21. Here, Force (F) = 20 N, Displacement (S) = 1 m.
 Angle between force and displacement $\theta = 60^\circ$.
 \therefore Work done, $W = FS \cos \theta = 20 \times 1 \times \cos 60^\circ = 20 \times 1 \times \frac{1}{2} = 10 \text{ J}$. ($\cos 60^\circ = 1/2$)
 Therefore, The work done in displacing a given body through 1m = 10J.

OR

Given : Force acting on the horse-cart system = 300 N, Initial velocity
 $= 18 \text{ kmh}^{-1} = \frac{5}{18} \times 18 = 5 \text{ ms}^{-1}$
 Therefore power developed by the horse = Force \times velocity = $300 \times 5 = 1500 \text{ W}$
 Therefore equivalent horse power = $\frac{1500}{746} = 2.01 \text{ hp}$

22. Conditions that can increase the rate of evaporation of water are:

- An increase in the surface area by spreading the shirt.
- An increase in the temperature by putting the shirt under the sun.
- Increase in the wind speed by spreading it under the fan.

23. The speed of sound wave = 339 ms^{-1}

Wavelength of sound wave = 1.5 cm = 0.015 m

\therefore Frequency of sound wave = $\frac{\text{Speed of sound}}{\text{Wavelength}} = \frac{339}{0.015} = 22600 \text{ Hz}$

The sound will not be audible, because a human being can hear only up to 20,000 Hz.

24. Saucer has a bigger surface area as compared to cup. Since evaporation is a surface phenomenon, by using a saucer instead of cup we are increasing the surface area for evaporation to occur. Faster evaporation of particles of tea or milk allows cooling and taking a sip becomes easier.

25. It is on account of inertia of motion. The athlete runs a considerable distance so as to build up momentum, which is helpful in throwing the javelin at a longer distance. However, sometimes the large momentum of athlete prevents him from stopping before the marked line therefore the throw is declared foul.

OR

In the course of walking on the hard ground, as we push the earth backward with our feet, the earth applies a reaction and pushes us in the forward direction. However, when the reaction is missing we tend to fall. This often happens when we step on a banana peel. The peel slips under our feet and hence does not apply any reaction. Thus, we lose our balance and fall.

26. Electronic configuration 2, 8, 9, 1 is incorrect because after filling 8 electrons in third shell, the next two electrons fill the fourth shell to maintain the stability of the atom. Electronic configurations (a) 2, 8, 2 and (b) 2, 8, 8, 2 are correct.

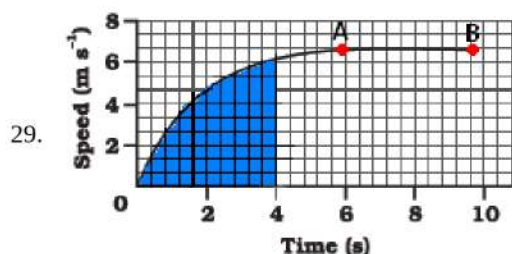
Section C

27. a. To hear the sound of the coming train because sound travel within the rail track and get the idea of distance of incoming train.
 b. Copper.
 c. For safety as he cared for his friend.

28. i.

Particle	Atomic number	Mass number
A	3	$3 + 4 = 7$
B	9	$9 + 8 = 17$
C	8	$8 + 8 = 16$
D	8	$8 + 10 = 18$

- ii. Particles C and D as they have same number of protons, i.e. same atomic number but different mass number.



- a. Distance travelled by car in the 4 second

The area under the slope of the speed – time graph gives the distance travelled by an object.

In the given graph

56 full squares and 12 half squares come under the area slope for the time of 4 seconds.

Total number of squares = $56 + \frac{12}{2} = 62$ squares

The total area of the squares will give the distance travelled by car in 4 seconds. on the time axis,

5 squares = 2 seconds, therefore 1 square = $\frac{2}{5}$ seconds

on speed axis there are 3 squares = 2 m/s

therefore, area of one square = $\frac{2}{5} \text{ s} \times \frac{2}{3} \text{ s} = \frac{4}{15} \text{ m}$

so area of 62 squares = $\frac{4}{15} \text{ m} \times 62 = \frac{248}{15} \text{ m} = 16.53 \text{ m}$

Hence the car travels 16.53 m in the first 4 seconds.

b. The straight line part of graph, from point A to point B represents a uniform motion of car.

OR

Given speed of the bus = $60 \text{ kmh}^{-1} = \frac{5}{18} \times 60 = 16.7 \text{ ms}^{-1}$

Time of reaction = $\frac{1}{15} \text{ s}$

Time of reaction under the influence of alcohol = $\frac{1}{2} \text{ s}$

i) Distance travelled by the bus in the first case distance = Speed \times time = $16.7 \times \frac{1}{15} = 1.11 \text{ m}$

ii) Distance travelled by the bus in the second case distance = Speed \times time = $16.7 \times \frac{1}{2} = 8.35 \text{ m}$

30. a. chemical energy of food converts to heat and then to muscular energy which converts into kinetic energy on paddling the cycle.
 b. Anil wisely opts for the bicycle as he was concerned towards environment, to avoid noise and air pollution. Also cycling is beneficial for health.
 c. By informing them about the harms of pollution and putting forward the advantages of cycling.
31. i. Here, initial velocity, $u = 0$

Using Newton's second law of motion, $s = ut + \frac{1}{2}at^2 = \frac{1}{2}at^2$ [$\because u = 0$]

We get, $a = \frac{2s}{t^2}$

Time (in second)	Distance (in metre)	$a = 2s/t^2$
0	0	0
1	1	2
2	8	4
3	27	6
4	64	8
5	125	10
6	216	12
7	343	14

Thus, acceleration is increasing.

ii. Since acceleration is increasing, so the net unbalanced force is acting on the object.

32. Prokaryotic cells are incomplete cells. They do not have membrane bound organelles. For ex-Bacteria, Mycoplasma, etc.

Eukaryotes can be single-celled or multi-celled, such as you, me, plants, fungi, and insects.

S.No	Prokaryotic	Eukaryotic Cell
1.	Nucleus is Absent	Nucleus is Present
2.	It is a Unicellular	It is a multicellular
3.	Mitochondria Absent	Mitochondria Present
4.	Cell size is 1-10 Um	Cell size is 10-100 Um
5.	These are incomplete cells.	These are complete cells.
6.	Their genetic material is not bounded by membrane, called nucleoid.	Genetic material is bounded by nuclear membrane, called nucleus
7.	It contain single chromosome	It contains more than one chromosome.

OR

- a. X- crista Y- matrix.
- b. A crista is a fold in the inner membrane of a mitochondrion. Function of X is to increase surface area of inner membrane for ATP Synthesis.
- c. Composition of Y. It contains the mitochondrial DNA in a structure called a nucleoid. It contains ribosomes that produce proteins used by the mitochondrion. It contains granules of ions that appear to be involved in the ionic balance of the mitochondrion.
- d. Mitochondrion (Cut lengthwise). Common Name. Powerhouse of cell.
33. i. In the given diagram of the epidermis, A represents the epidermal cells of the roots bear long hair-like parts called root hairs. With the help of these cells, root hairs greatly increase the total absorptive surface area and help in water absorption.
- ii. B represents the stomata. Stomata are the pores present in the epidermis of the leaves. Stomata help in the exchange of gases with the atmosphere during photosynthesis and respiration. Also, the process of transpiration (loss of water in the form of water vapour) takes place through stomata.
- iii. C cell that represents the guard cells. These cells are kidney-shaped that enclose the stomata and thus help in the opening and closing of stomata.

Section D

34. We have given that,

The mass of the wooden block = 5 kg

The dimensions = 40 cm × 20 cm × 10 cm

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

i.e,

Now we know that,

$$\text{Thrust} = F = m \times g$$

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

$$= 49 \text{ N}$$

Area of a side = length × breadth

$$= 20 \text{ cm} \times 10 \text{ cm}$$

$$= 200 \text{ cm}^2 = 0.02 \text{ m}^2$$

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

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

$$= 2450 \text{ Nm}^{-2}.$$

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

Area length × breadth

$$= 40 \text{ cm} \times 20 \text{ cm}$$

$$= 800 \text{ cm}^2 = 0.08 \text{ m}^2$$

From equation (i)

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

The pressure exerted by the side 20 cm × 10 cm is 2450 Nm⁻² and by the side 40 cm × 20 cm is 612.5 Nm⁻².

OR

The value of g on the earth is 9.8 m/s²

- i. a. g on the moon is given by

$$g' = \frac{g}{6} = \frac{9.8}{6} = 1.63 \text{ m/s}^2$$

b. Mass of the person on the moon = $\frac{110.84}{1.63} = 68 \text{ kg}$

- c. Mass will be constant and does not change from place to place. Hence the mass of the person on the earth is the same that on the moon.

$$\text{Weight of person on the earth} = mg = 68 \times 9.8 = 666.4 \text{ N}$$

- ii. According to the Newton's law of gravitation, the force of attraction between earth and the body is given by

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

where, M = mass of the earth, R = radius of the earth, m = mass of person and $G = 6.67 \times 10^{-11} \text{ N-m}^2/\text{kg}^2$

Force produces an acceleration 'g'. So from Newton's second law, $F = mg \dots(ii)$



Equating (i) and (ii) we get,

$$mg = \frac{GMm}{R^2}$$

$$\therefore g = \frac{GM}{R^2}$$

i.	Cell wall	Cell membrane
	It is present in bacteria, fungi, and plant cells. It is absent in animal cells and protozoans.	It is present in all cells.
	There is no other name of the cell wall.	The cell membrane is also known as the plasma membrane or plasmalemma.
	The cell wall is completely permeable.	The cell membrane is semi-permeable.
	The cell wall is made up of cellulose.	The cell membrane is made up of lipids and proteins.
35. ii.	Nuclear region of bacterial cell	Nuclear region of an animal cell
	Smaller in size.	Larger in size.
	The nuclear membrane is absent, the nucleolus is absent. The nucleus is regarded as the nucleoid.	Nuclear membrane with nucleolus present.
iii.	Prokaryotic cell	Eukaryotic cell
	The size of a cell is generally small.	The size of a cell is generally large.
	The true nucleus is absent.	The true nucleus is present.
	It contains a single chromosome.	Contains more than one chromosome.
	Membrane-bound cell organelles absent.	Membrane-bound cell organelles present.

OR

Golgi apparatus or Golgi bodies or Golgi complex is composed of membrane-bound fluid-filled vesicles, vacuoles and cisternae. In animal cells they are larger and only one or two in number, while in plants they are smaller and more in number. Also, in plant cells, they are distributed throughout the cytoplasm and are called dictyosomes.

Functions:

1. It is involved in the transport and modification of protein, lipids as well as carbohydrates.
2. It helps in the formation of cell plate during cell division.
3. It is also involved in the formation of lysosomes and peroxisomes.
4. The material synthesised near endoplasmic reticulum is packaged and dispatched to various targets and outside the cell through the Golgi apparatus.

36. S.No.	Compounds	Mixtures
1.	Compounds are formed as a result of chemical reactions between two or more elements or compounds.	1. Mixture is formed by simply mixing two or more constituents. There are no chemical reactions between the constituents.
2.	The components of a compound are always present in a definite ratio by mass.	2. The components of a mixture may be present in any ratio.
3.	The properties of a compound are entirely different from its constituents.	3. The properties of a mixture are the same as those of its constituents.
4.	Compounds are always homogeneous in nature.	4. Mixtures are usually heterogeneous (except in solutions).
5.	Compound formation is accompanied by absorption or evolution of light, heat or electrical energy.	5. Heat, light or electrical energy may not be evolved or absorbed during the formation of a mixture.
6.	Melting and boiling points of a compound are usually sharp and fixed.	6. Melting and boiling points of a mixture are usually not sharp and fixed.

7.	The constituent elements of a compound can not be separated by any physical method. Special chemical methods or electrochemical methods are employed to separate them.	7.	The constituent elements of the mixture can be easily separated by physical means.
8.	For example, Water, Carbon dioxide.	8.	For example, A mixture of iron filings and sulphur.

Section E

37. Read the text carefully and answer the questions:

The process of taking up a permanent shape, size, and a function is called differentiation. Differentiation leads to the development of various types of permanent tissues. A few layers of cells beneath the epidermis are generally simple permanent tissue. another type of permanent tissue is complex tissue. Complex tissues are made of more than one type of cells. All these cells coordinate to perform a common function. Xylem and phloem are examples of such complex tissues. Xylem consists of tracheids, vessels, xylem parenchyma and xylem fibres. Phloem is made up of five types of cells: sieve cells, sieve tubes, companion cells, phloem fibres and the phloem parenchyma.

- Tracheids
- Cuticles reduce the loss of water.

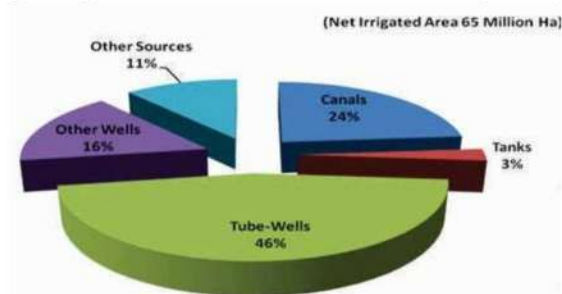
OR

Phloem fibres

38. Read the text carefully and answer the questions:

Irrigation

The process of supplying water to crop plants through human efforts by means of canals, wells, reservoirs, tube wells etc., is known as irrigation. Most agriculture in India is dependent on timely monsoons and sufficient rainfall spread through most of the growing season. However, the extra water required by crops is met through irrigation.



- The most common source of irrigation is tube wells. Irrigation is the artificial process of applying controlled amounts of water to land to assist in the production of crops.
- The various sources of irrigation are canals, tanks, tube wells, other wells, and other sources like rainwater harvesting.
- The last source of irrigation tanks.

OR

The other sources include rainwater harvesting and watershed management.

39. Read the text carefully and answer the questions:

Sodium chloride, commonly known as salt, is an ionic compound with the chemical formula NaCl, representing a 1:1 ratio of sodium and chloride ions. With molar masses of 22.99 and 35.45 g/mol respectively, 100 g of NaCl contains 39.34 g Na and 60.66 g Cl. Ravi prepared a solution of sodium chloride by mixing 5.85 g of salt in 1 litre of water.



- Molar mass of sodium chloride (NaCl) = Atomic mass of sodium (Na) + Atomic mass of chlorine (Cl)
= 23 + 35.5 u = 58.5 g/mol
- Number of moles = $\frac{\text{Given mass}}{\text{Gram molecular mass}} = \frac{5.85}{58.5} = 0.1 \text{ mol}$
- Concentration of solution = $\frac{\text{Number of mass of solute}}{\text{Volume of solution}} = \frac{0.1}{1} = 0.1 \text{ mol/L}$

OR

molecular mass of NaCl = mass of Na atom + mass of Cl atom
= 23 + 35.5
= 58.5 g

5.85 g of NaCl = mass of sodium chloride/ molecular mass of NaCl = $\frac{5.85}{58.5} = 0.1 \text{ moles}$

or 0.1 moles of NaCl particle.

Each NaCl particle is equivalent to 2 ions, i.e., one Na^+ and one Cl^-

Total moles of ions = $0.1 \times 2 = 0.2$ moles

Number of ions = $0.2 \times 6.022 \times 10^{23}$

= 1.2042×10^{23} ions.