Class IX Session 2023-24
Subject - Science
Sample Question Paper - 8

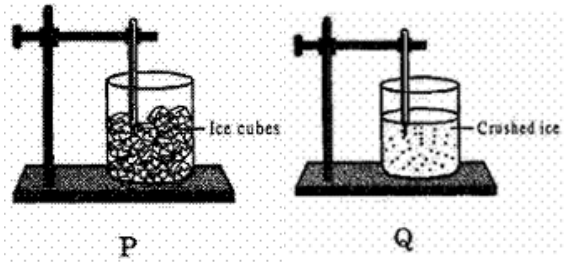
Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 objective type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Section A

1. Which experiments set-up is correct for determining the melting pt. of ice? **[1]**



a) Both P and Q
b) Q
c) P
d) Neither P nor Q

2. Lysosomes are the reservoirs of: **[1]**

a) steroid hormones
b) glycogen
c) digestive enzymes
d) oxidising enzymes

3. A signal from a space ship reaches the ground in 5 minutes. What was the distance of the space ship from the ground station? The speed of the signal is 3×10^8 m/s. **[1]**

a) 9×10^7 m
b) 9×10^{10} m
c) 9×10^6m
d) 3×10^6 m

4. Weeds affect the crop plants by - **[1]**

a) All of these

b) Dominating the plants to grow.

c) Killing of plants in the field before they grow.

d) Competing for various resources of crops (plants)

5. We use glycerine in temporary mount of the material because: **[1]**

a) it increases the clarity of the material

b) it increases the beauty

c) it avoids drying of the material

d) it provides the medium for floating the material

6. Which of these options are not a function of Ribosomes? **[1]**

i. It helps in manufacture of protein molecules
ii. It helps in manufacture of enzymes
iii. It helps in manufacture of hormones
iv. It helps in manufacture of starch molecules

a) (iii) and (iv)

b) (iv) and (i)

c) (i) and (ii)

d) (ii) and (iii)

7. The sample of water from a well is analysed. What will be the ratio of hydrogen and oxygen in it by mass? **[1]**

a) 16:1

b) 8**:**1

c) 1**:**16

d) 1**:**8 or 2**:**16

8. Most of the metabolic functions of plants are carried out by **[1]**

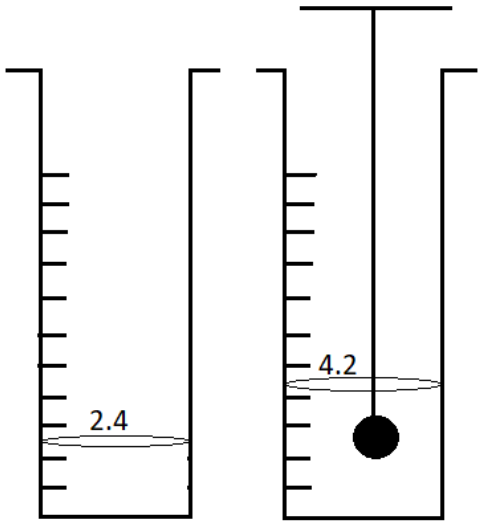
a) sclerenchyma

b) collenchyma

c) meristems

d) parenchyma

9. The position of the water level, in a measuring cylinder, before and after immersing a solid in it, are as shown in the figure given below. The volume of the given solid (in cm^3) is : **[1]**



a) 2.2

b) 1.8

c) 4.2

d) 6.6

10. If a moving body comes to rest, then it's acceleration is: **[1]**

a) Negative
b) Positive
c) Constant
d) Zero

11. The difference between isotopes and isobars **[1]**

a) Isotopes have same physical properties but isobars have different.
b) Isobars have same chemical properties but isotopes have different chemical proerties.
c) Both have same physical properties.
d) Isotopes have same chemical properties but isobars have different.

12. The common characteristic of xylem tracheids and sieve tubes is that both are: **[1]**

a) thick-walled cells
b) dead cells
c) living cells
d) meant for conduction

13. The technical term for the “Group of similar cells performing a specific function” is**:** **[1]**

a) Tissue
b) Cell
c) Organ system
d) Organ

14. Arun has prepared 0.01% (by mass) solution of sodium chloride in water. Which of the following correctly represents the composition of the solutions? **[1]**

a) 1.00g of NaCl + 100g of water
b) 0.10 g of NaCl + 99.90g of water
c) 0.01g of NaCl + 99.99g of water
d) 0.11g of NaCl + 100g of water

15. To prepare a colloidal solution of starch, we should: **[1]**

a) add the thin paste of starch to hot water with stirring
b) add starch powder to cold water and boil
c) add the starch powder to boiling water and cool
d) heat starch, add it to cold water and then bring it to boil

16. The poultry birds groomed for obtaining meat are called _____ **[1]**

a) Pork
b) Growers
c) Broilers
d) Poultry

17. **Assertion (A):** An object may acquire acceleration even if it is moving at a constant speed. **[1]**
Reason (R): With change in the direction of motion, an object can acquire acceleration.

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):** It is easier to cook food at high altitudes. **[1]**
Reason (R): The boiling point of water decreases at high altitudes.

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):** Cells of cork or bark are dead, acts as a protective covering. **[1]**

Reason (R): In leguminous plants, the root nodules harbor nitrogen-fixing bacteria which convert atmospheric nitrogen into nitrates.

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):** The size of the nucleus is very small as compared to the size of the atom. **[1]**

Reason (R): The electrons revolve around the nucleus of the 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. Find the energy in joules consumed in 10 hours by four devices of power 500 W each. **[2]**

OR

If an electric iron of 1200 W is used for 30 minutes every day, find the electric energy consumed in the month of April.

22. We can get the smell of perfume sitting several metres away. Give reason. **[2]**

23. A human heart on an average is found to beat 75 times a minute. Calculate its frequency. **[2]**

24. If the melting point of an object A is high then what state you expect it to be at room temperature? **[2]**

25. A truck starts from rest and rolls down a hill with a constant acceleration. It travels a distance of 400 m in 20 s. Find its acceleration. Find the force acting on it if its mass is 7 metric tonnes. **[2]**

OR

A hockey ball of mass 200 g travelling at 10 ms^{-1} is struck by a hockey stick so as to return it along its original path with a velocity at 5 ms^{-1}. Calculate the magnitude of change of momentum occurred in the motion of the hockey ball by the force applied by the hockey stick.

26. Define valency by taking examples of silicon and oxygen. **[2]**

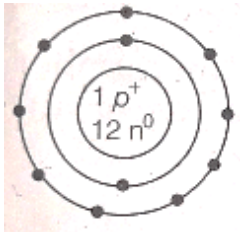
Section C

27. **[3]**

i. Which characteristic of sound helps to identify your friend by his voice while sitting with others in a dark room?

ii. State the relationship between frequency and time period of a wave. The wavelength of vibrations produced on the surface of the water is 4 cm. If the wave velocity is 20 m/s find the frequency and Time period.

28. Given below is the atomic structure of an atom of element $^{23}_{11}A$, according to Bohr's model of atom. **[3]**

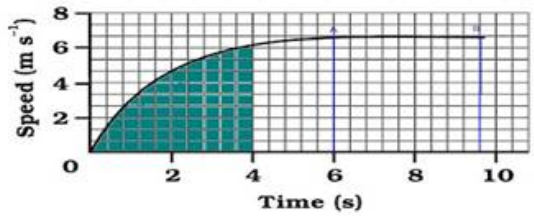


i. What is wrong with this structure of atom?

ii. Draw a correct representation of this atom.

iii. Write the chemical formula of the chloride of this element.

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

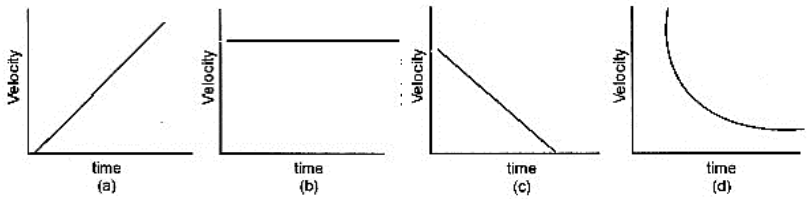


a. Find how far does the car travel in the first 4 seconds? Shade the area on the graph that represents the distance travelled by the car during the period.

b. Which part of the graph represents uniform motion of the car?

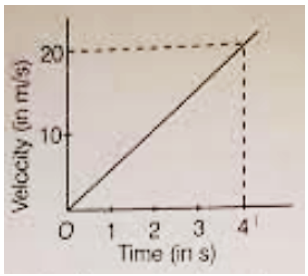
OR

What type of motion is represented by the following graphs.



30. Calculate the force of gravitation between the earth and the sun, given that the mass of the earth = 6×10^{24} kg and of the sun = 2×10^{30} kg. The average distance between the two is 1.5×10^{11} m. **[3]**

31. 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. **[3]**



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

OR

Why does the skin of your fingers shrinks when you wash clothes for a long time?

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

Section D

34. A car falls off a ledge and drops to the ground in 0.5 s. Let g = 10 ms^{-2} (for simplifying the calculations). **[5]**

i. What is its speed on striking the ground?

ii. What is its average speed during the 0.5 s?

iii. How high is the ledge from the ground?

OR

Derive an expression for the force of attraction between two bodies and then define gravitational constant.

35. What are cell organelles? Write the names of different cell organelles. **[5]**

OR

Differentiate between

i. Cell wall and cell membrane.

ii. Nuclear region of a bacterial cell and nuclear region of an animal cell.

iii. Prokaryotic cell & eukaryotic cell.

36. Pragya tested the solubility of three different substances at different temperatures and collected the data as given below (results are given in the following table, as grams of substance dissolved in 100 grams of water to form a saturated solution). **[5]**

Temperature in K					
Substance dissolved	283	293	313	333	353
Solubility					
Potassium Nitrate	21	32	62	106	167
Sodium Chloride	36	36	36	37	37
Potassium Chloride	35	35	40	46	54
Ammonium Chloride	24	37	41	55	66

a. What mass of potassium nitrate would be needed to produce a saturated solution of potassium nitrate in 50 grams of water at 313 K?

b. Pragya makes a saturated solution of potassium chloride in water at 353 K and leaves the solution to cool at room temperature. What would she observe as the solution cools? Explain.

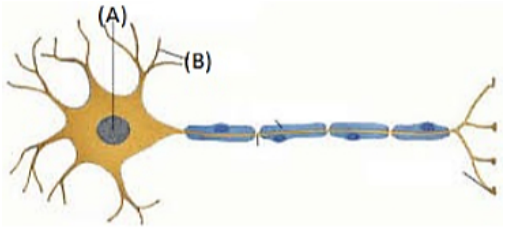
c. Find the solubility of each salt at 293 K. Which salt has the highest solubility at this temperature?

d. What is the effect of change of temperature on the solubility of a salt?

Section E

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

Given below is the diagram of the human nerve cell.



(i) Label the part (A) and (B).

(ii) What is the function of nervous tissue?

OR

Mention all part of the human body composed of nervous tissue.

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

Cattle Breeding

Cross-breeding helps in the development of certain desired characteristics in animals like, Increased milk production, Resistance against diseases, Breeds that require less amount of quality feed.

Exotic breed cattle (long lactation) are interbred with the locally bred cattle (high resistance to the diseases) to produce high quality bred that contain both the characteristics. In order to obtain a good quality of milk from the cattle, it is important to manage shelter, food, breeding and disease control of cattle. Cattle are prone to various

internal and external parasites, bacteria and virus which are likely to affect their milk production.

(i) What are milch animals ?

(ii) What are the draught animals?

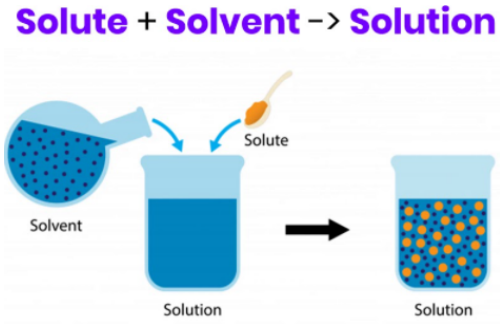
(iii) How does cross-breeding help in cattle breeding?

OR

Mention the preconditions for a good yield of milk.

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

Mixtures are constituted by more than one kind of pure form of matter. Sodium chloride is itself a pure substance matter. The solution is a homogeneous mixture of two or more substances. Lemonade, soda water etc. are all examples of solutions. Alloys are mixtures of two or more metals or a metal and a non-metal and cannot be separated into their components by physical methods. A solution has a solvent and a solute as its components. The component of the solution that dissolves the other component in it (usually the component present in a larger amount) is called the solvent. The component of the solution that is dissolved in the solvent (usually present in lesser quantity) is called the solute.



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

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

(iii) What is pure substance?

OR

What do you mean by Alloy?

Solution

Section A

1. **(b)** Q
Explanation: Q is correct arrangement of determination of melting point of Ice because its contains crushed ice cubes. In P ice cubes added in place of crush ice, so its not correct arrangement of determination of melting point of Ice.

2. **(c)** digestive enzymes
Explanation: Lysosomes enclose digestive enzymes to digest the degenerative cells and tissues

3. **(b)** 9×10^{10} m
Explanation: Time = 5 minutes = $5 \times 60 = 300$ sec.
Distance = speed $\times$ time
$= 3 \times 10^{8}$ m/s $\times$ 300 $= 9 \times 10^{10}$ m

4. **(d)** Competing for various resources of crops (plants)
Explanation: The growth of weeds in the fields is harmful because they compete with other crops for nutrients, water, space, light. A **weed** is a plant considered undesirable in a particular situation, "a plant in the wrong place". A plant that is a weed in one context is not a weed when growing in a situation where it is in fact wanted, and where one species of plant is a valuable crop plant, another species in the same genus might be a serious weed. They compete with the desired plants for the resources that a plant typically needs, namely, direct sunlight, soil nutrients, water, and space for growth, providing hosts and vectors for plant pathogens giving them greater opportunity to infect and degrade the quality of the desired plants.

5. **(c)** it avoids drying of the material
Explanation: Glycerine is used for temporary mounting as it is hygroscopic and does not allow the mounted material to dry up.

6. **(a)** (iii) and (iv)
Explanation: Ribosomes are involved in protein synthesis. Enzymes are also proteins. Hence, ribosomes also make enzymes.

7. **(d)** 1**:**8 or 2**:**16
Explanation: The atomic mass of Hydrogen is 1 u and that of Oxygen is 16 u. The formula of water is H_2O. Hence, the ratio of Hydrogen and Oxygen by mass in water will be 2**:**16 or 1**:**8. The ratio will be the same irrespective of the source of the water.

8. **(d)** parenchyma
Explanation: Parenchyma carries out most of the plant's metabolism. They are "lifetime dividers" and important in healing. They also store starch, oils, and water (H_2O).

9. **(b)**

   1.8

Explanation: Volume of block = change in level by volume = (4.2 – 2.4) = 1.8 cm^3

10. **(a)** Negative
Explanation: If a moving body comes to rest, then its acceleration is negative, as it’s velocity becomes zero. therefore the

acceleration is also zero.

11.

(d) Isotopes have same chemical properties but isobars have different.

Explanation: Isotope compounds have the same number of electrons. Isotopes have the same chemical properties as the number of electrons present in them are the same because only electrons participate in chemical reactions. While isobar compounds have the same mass number but the different atomic numbers and chemical properties depend upon the number of electrons so isobars have different chemical properties.

12.

(d) meant for conduction

Explanation: Xylem is composed of tracheids, vessels, xylem parenchyma, and xylem fibres. Tracheids and vessels are tubular structures and thus they provide a channel for conduction of water and minerals. Phloem is composed of sieve tubes, companion cells, phloem fibre and phloem parenchyma. Sieve tubes are tubular cells with perforated walls. Sieve tubes are the conducting elements of phloem.

13. **(a)** Tissue

Explanation: A group of similar cells performing a specific function and having a common origin is called tissue. Tissues form organs to perform a particular function. Organs form organ systems.

14.

(c) 0.01g of NaCl + 99.99g of water

Explanation: Mass% = $\frac{\text{mass of solute}}{(\text{mass of solute} + \text{mass of solvent})} \times 100$

$= \frac{0.01g \times 100}{(0.01+99.99)0} = \frac{0.01 \times 100}{100.00} = 0.01\%$

Hence, the mass of solute =0.01 g and the mass of solvent = 99.99gms.

15. **(a)** add the thin paste of starch to hot water with stirring

Explanation: The colloid of starch is prepared by the dispersion method. 2-3 g of powdered/crushed starch is dissolved in 3-4 ml of water to make a thin paste. This paste is added to100 ml of boiling water while stirring. Allow the solution to cool and filter. The filtrate is colloid of starch.

16.

(c) Broilers

Explanation: An egg-laying poultry bird is called hen (layers) and the poultry birds groomed for obtaining meat are called chicken or broilers.

17. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: This is the equation of a parabola. A parabola results when one quantity is proportional to the square of the other. When an object is moving with a constant velocity (zero acceleration), the displacement versus time graph is a straight line and its slope is velocity.

When an object is moving at a constant speed but its direction of motion changes, its velocity changes ant thus acceleration is produced. The motion of an object in a circular path is such an example. In a uniform circular motion, the direction of motion of the object changes continuously and hence the velocity changes continuously even though the speed is constant.

18.

(d) A is false but R is true.

Explanation: It is difficult to cook food at high altitudes since the boiling point of water decreases at high altitudes and it does not provide sufficiently high temperature to the food to get cooked.

19.

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

Explanation: Cells of cork or bark are dead, compactly arranged without intercellular spaces, and have a chemical called subering in their walls that makes them impervious to gases and water. In this way, it acts as a protective tissue.

20.

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

Explanation: Both A and R are true but R is not the correct explanation of A.

Section B

21. Since Energy = power $\times$ time

= 4 $\times$ 500 $\times$ 10 = 20000 Wh = 20 kWh

OR

Given , Power of electric iron, P =1200 W= $\frac{1200}{1000}$ = 1.2 kW

Time, t = $\frac{30}{60}$ = 0.5 h

Electric energy consumed in a day = Power × time =(1.2 × 0.5) kWh

Electric energy consumed in month of April (i.e. 30 days) , E = (1.2 × 0.5) × 30 = 18kWh.

22. Perfume is actually a mixture of a number of pleasant-smelling vapours. Their particle diffuses quite fast and can reach a person who may be even at several metres away from a person who has used perfume.
23. Frequency is defined as the number of beats per second. The heart beats 75 times in 60 second, therefore its frequency is v = $\frac{75}{60} = 1.25HZ$
24. Melting point is the temperature at which a solid melts/change into a liquid state. So, if the melting point of an object A is higher means that it requires greater temperature to change into liquid the object will remain the same, i.e. solid at room temperature because the room temperature is less than the melting point and thus the object cannot change its state.
25. According to the question,

    Initial velocity of truck (u) = 0

    Distance,S= 400 m and time,t = 20 s

    Mass of truck,m=7metric tones = 7000kg

    From the relation,

    $S = ut + \frac{1}{2}at^2$

    $\Rightarrow$ 400 =0 + 200a

    $\Rightarrow$ 400 = 200a

    $\Rightarrow$ a = 400/200 = 2 ms^{-2}

    Thus,the acceleration of the truck is 2 ms^{-2}

    Therefore, $F = m \times a = 7000 \times 2$ = 14000 N

    Thus,the force acting on the truck is 14000 N

    OR

    Mass of ball (m) = 200 g = 0.2 kg

    Initial velocity of ball (u_1) = 10 ms^{-1}

    Final velocity of ball (u_2) = -5ms^{-1}

    (Negative sign denotes that ball is moving in opposite direction)

    Initial momentum of ball = mu_1

    = 0.2 × 10 = 2 Ns

    Final momentum of ball = mu_2

    = 0.2 × (-5) = -1Ns

    Change in Momentum = Final Momentum - Initial Momentum

    = -1 - 2 = -3Ns

    Negative sign denotes that change in momentum is in the direction opposite to the direction of initial momentum of the ball.
26. Valency is the combining capacity of each atom to form molecules. It is that number of electrons which an atom gives or takes or shares to complete its octet in the outermost shell (valence shell), and acquire a stable configuration.

    Valency = Number of valence electrons (for 4 or lesser valence electrons)

    Valency = 8 - Number of valence electrons (for more than 4 valence electrons)

    Atomic number of silicon = 14; electronic configuration is 2, 8, 4. Therefore, 4 valence electrons can be shared by silicon to complete the octet (8 electrons in the outermost shell). Hence, the valency of silicon is 4.

    Atomic number of oxygen = 8; electronic configuration is 2, 6. Therefore, 2 electrons can be gained easily to complete the octet. Hence, the valency of oxygen is 8 - 6 = 2.

Section C

27. i. Timbre or quality of sound that is distinct from its pitch and intensity helps to identify your friend by his voice while sitting with others in a dark room.

    ii. Frequency = $\frac{1}{\text{Time Period}}$

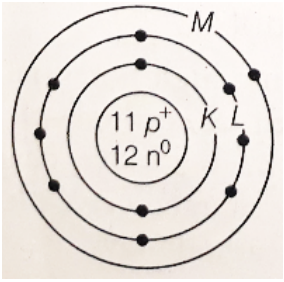
    λ = 4 cm = 0.02 m, v = 20 m/s , V = ? and T = ?

    $V = \frac{v}{\lambda} = \frac{20}{0.04}$ = 500 Hz

    $T = \frac{1}{V} = \frac{1}{500} =$ 0.002 s

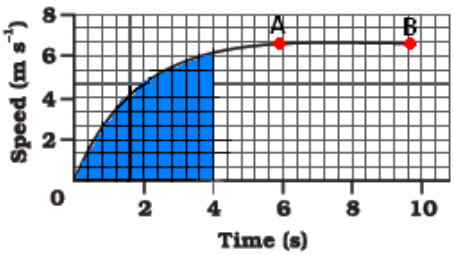
28. 1. The element A is Na has three shells K, L and M but here only 2 shells are given, Further, L-shell cannot have more than 8 electrons but here 9 electrons are given.

2. The correct structure is



3. As Na has 1 valence electron, thus it has a valency of +1 and chlorine has a valency of -1. Hence, the formula of its chloride is *A*CI, i.e. NaCl.

29.



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 = 2/5 seconds

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

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

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

i. Velocity-time graph is a straight line. Therefore, it represents uniformly accelerated motion.

ii. Velocity-time graph is a straight line parallel to the time axis. It represents uniform motion.

iii. Velocity-time graph is a straight line having a negative slope. It represents uniformly retarded motion.

iv. Velocity-time graph is a curve having a negative slope. It represents non-uniformly retarded motion.

30. $F_{gravitation} = \frac{G \times M_e \times M_s}{(Dist.\ of\ the\ earth\ from\ the\ sun)^2}$

$= \frac{6{,}67 \times 10^{-11} \times 6 \times 10^{24} \times 2 \times 10^{30}}{1.5 \times 10^{11} \times 1.5 \times 10^{11}}$

$= \frac{6.67 \times 6 \times 2 \times 10^{30-11+24-11-11}}{2.25}$

$= 35.57 \times 10^{21}$N

31. 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= $\frac{1}{10} kg \times 5 m/s^2$

= 0.5 kg-m/s^2 = 0.5 N [$\because$ 1 kg-m/s^2 = 1 N]

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

The solution of soaps and detergent is hypertonic as compared to the osmotic concentration of our skin. Therefore, the washing solution results in exosmosis in skin cells that come in contact with it for some time. Due to this reason, the skin over the fingers shrinks, while washing clothes for a long time.

33. There are five types of connective tissues:-

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

Functions:

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

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

(c) It also helps in combating foreign toxins.

(d) It fixes skin to underlying muscles.

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

Functions:

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

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

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

Functions:

(a) It serves as a reservoir of fat.

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

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

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

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

(a) Cartilage: The cartilage is a specialised connective tissue which is compact and less vascular. Cartilage can be found in ear, nose tip, epiglottis, inter-vertebral discs, end of long bones, lower ends of ribs and rings of trachea. There are three varieties of cartilage - hyaline, elastic, and fibro-cartilage. The most abundant type is hyaline, found as supportive tissues in the nose, ears, trachea, larynx, and smaller respiratory tubes.

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

Functions:

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

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

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

(d) Bone anchors the muscles.

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

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

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

Functions:

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

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

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

Section D

34. We have given that,

Time taken , t = $\frac{1}{2}$ second

Initial velocity, u = 0 ms^{-1}

Acceleration due to gravity, g = 10 ms^{-2}

Acceleration of the car, a = + 10 ms^{-2} (downward)

i. speed v = at

v = 10 ms^{-2} $\times$ 0.5 s

= 5 ms^{-1}

Thus,

Its speed on striking the ground = 5 ms^{-1}

ii. Average spped = $\frac{u+v}{2}$

= $\frac{(0ms^{-1}+5ms^{-1})}{2}$

= 2.5 ms^{-1}

Thus,

Its average speed during the 0.5 s = 2.5 ms^{-1}

iii. Distance travelled, s = $\frac{1}{2}at^2$

= $\frac{1}{2} \times 10ms^{-2} \times (0.5s)^2$

= $\frac{1}{2} \times 10\text{ms}^{-2} \times 0.25\text{s}^2$

= 1.25m

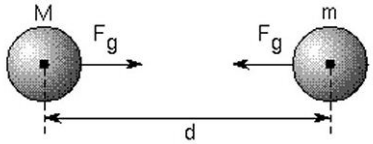
Thus,

Height of the ledge from the ground = 1.25 m

OR

Newton's Law of universal gravitation: Everybody in the universe attracts every other body with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

Let us consider two bodies A and B of masses m_1 and m_2 which are separated by a distance d.



Then the force of gravitation (F) acting on the two bodies is given by

$F \propto m_1 \times m_2$ .....(1)

and $F \propto \frac{1}{d^2}$ .....(2)

Combining equations (1) and (2), we get

$F \propto \frac{m_1 \times m_2}{d^2}$

$F = k \frac{m_1 \times m_2}{d^2}$

Where, k= proportionality constant, known as universal gravitational constant, G having value = 6.67 $\times$ 10^{-11} Nm^2 kg^{-2}.

Therefore, F = G $\times \frac{m_1 m_2}{d^2}$, Which is required expression for force of attraction between two bodies.

Here, if the masses m_1 and m_2 of the two bodies are of 1 kg and the distance (d) between them is 1 m, then putting m_1 = 1 kg, m_2 = 1 kg and d = 1m in the above formula, we get

F = G $\times \frac{1}{1^2}$,

G = F

Definition of the gravitational constant G: Gravitational constant, G is numerically equal to the force of gravitation which exists between two bodies of unit masses kept at a unit distance from each other.

35. Cell organelles are the intracellular structures present in the cytoplasm. Various cell organelles are –
    1. Mitochondrion – It produces energy
    2. Endoplasmic reticular – synthesize lipids and proteins
    3. Golgi apparatus - Storage, packaging and dispatch various substances.
    4. Lysosomes – Digest intracellular substances
    5. Ribosomes – Synthesize proteins
    6. Vacuoles – Provide turgidity and store house of various organic substances

OR

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.

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.

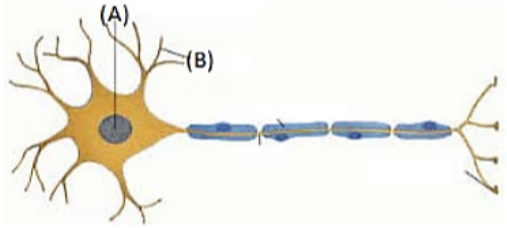
Prokaryotic cell	**Eukaryotic cell**
The size of a cell is generally small.	The size of a cell is generally large.
The true nucleus is absent.	The true nucleus is present.
It contains a single chromosome.	Contains more than one chromosome.
Membrane-bound cell organelles absent.	Membrane-bound cell organelles present.

36. a. The amount of potassium nitrate required to produce a saturated solution at 313 K in 100 g of water = 62 g
    The amount of potassium nitrate that would be required to produce a saturated solution at 313 K in 50 g of water = (62 x 50) / 100 g
    Therefore, 31 g of potassium nitrate would be required to produce a saturated solution at 313 K in 50 g of water.
    b. At 373 K, preparation of a saturated solution will need 54 g of potassium nitrate. At a room temperature of 293 K, a saturated solution of potassium nitrate requires just 35 g potassium nitrate. As the solution cools, excess potassium nitrate (54 g – 35 g = 19 g) will precipitate out as insoluble salt.
    c. Solubility of potassium nitrate, sodium chloride, potassium chloride and ammonium chloride in 100 g of water at 293 K are 32 g, 36 g, 35 g and 37 g respectively.
    Ammonium chloride has the highest solubility (37 g) at this temperature.
    d. Effect of change of temperature on the solubility of a salt: As a general rule, the solubility of the salts is directly proportional to the temperature. If the temperature is increased, the solubility of the salt generally increases.

Section E

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

Given below is the diagram of the human nerve cell.



(i) (A) - cell body and (B) - dendrites.

(ii) Nervous tissue are highly specialized for being stimulated and then transmitting the stimulus very rapidly from one place to another within the body.

OR

Brain, spinal cord and nerves are composed of nervous tissue.

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

Cattle Breeding

Cross-breeding helps in the development of certain desired characteristics in animals like, Increased milk production, Resistance against diseases, Breeds that require less amount of quality feed.

Exotic breed cattle (long lactation) are interbred with the locally bred cattle (high resistance to the diseases) to produce high quality bred that contain both the characteristics. In order to obtain a good quality of milk from the cattle, it is important to manage shelter, food, breeding and disease control of cattle. Cattle are prone to various internal and external parasites, bacteria and virus which are likely to affect their milk production.

(i) Animals that produce milk are called **milch animals**. In India, buffaloes are the primary source of milk. Example - Cows, goats, buffaloes.

(ii) Animals that are used for carrying out agricultural work like tilling, carting etc. are called draught animals (males and females that are poor in milk-yielding varieties).

(iii) Cross-breeding helps in the development of certain desired characteristics in animals like,

i. Increased milk production.
ii. Resistance against diseases.
iii. Breeds that require less amount of quality feed.

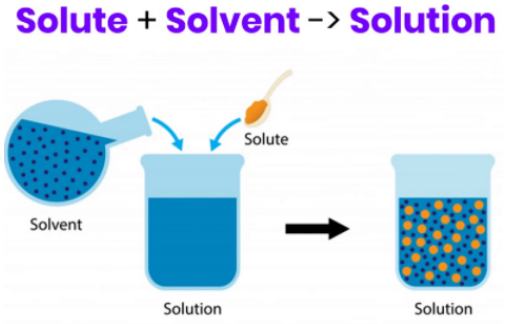
OR

In order to obtain good quality milk from the cattle, it is important to manage shelter, food, breeding, and disease control of cattle.

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

Mixtures are constituted by more than one kind of pure form of matter. Sodium chloride is itself a pure substance matter. The solution is a homogeneous mixture of two or more substances. Lemonade, soda water etc. are all examples of solutions. Alloys are mixtures of two or more metals or a metal and a non-metal and cannot be separated into their components by physical methods. A solution has a solvent and a solute as its components. The component of the solution that dissolves the other component in it (usually the component present in a larger amount) is called the solvent. The component of the solution that is dissolved in the solvent

(usually present in lesser quantity) is called the solute.



(i) Water is solvent and sugar is solute.

(ii) 1 nm in diameter

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

OR

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