Class IX Session 2025-26
Subject - Science
Sample Question Paper - 1

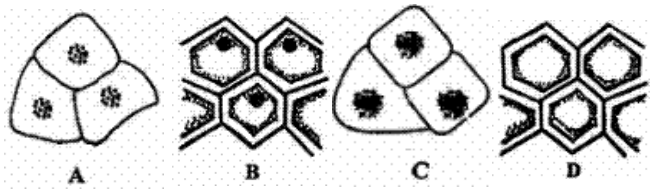
Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper consists of 39 questions in 3 sections. Section A is Biology, Section B is Chemistry and Section C is Physics.
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.

Section A

1. Which one of the following diagram represent the correct observation of a human cheek cell under compound microscope? **[1]**



a) B b) A

c) D d) C

2. Which of the following is absent in plant cells? **[1]**

a) Cell membrane b) Centriole

c) Vacuole d) Mitochondria

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

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

4. Identify the incorrect statement: **[1]**

A. The common name of xylem is bust.

B. sclerenchyma is used for making ropes

C. Companion cell is attached to the lateral side of the sieve tube

D. Cambium is a lateral meristem.

a) (B) b) (C)

c) (D) d) (A)

5. Internal parasites of cattle like fluke, damage **[1]**

a) intestine b) stomach

c) brain d) liver

6. **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.

7. **Assertion (A):** The cell wall in plants is non-living and freely permeable. **[1]**

Reason (R): Cell wall in plants provides mechanical strength.

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.

8. To solve the food problem of the country, which among the following is necessary? **[1]**

a) Increased production and storage of food grains b) People should have money to purchase the grains

c) Easy access of people to the food grain d) All of these

9. Poultry fowl are susceptible to the following pathogens - **[1]**

a) Fungus b) Bacterium

c) Virus d) All of these

10. Write short note on nucleus. **[2]**

11. Give three features of cardiac muscles. **[2]**

OR

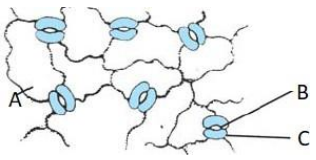
Draw a well-labelled diagram of neuron.

12. i. Give two advantages of apiculture. **[2]**

ii. Give an example of each, local variety and foreign variety of bee.

iii. Group the following as energy-yielding crops. Wheat, rice, berseem, maize, gram, oat, pigeon gram, sudangrass, lentil, soybean, groundnut, castor and mustard.

13. Observe the given below diagram and answer the following questions: **[3]**



i. What does A represent in the given diagram? How does cell 'A' of root hairs cells help in water absorption?

ii. How does B in the given diagram help the plants?

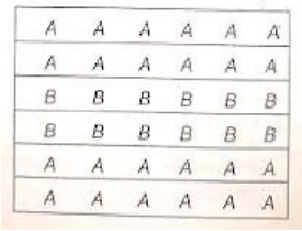
iii. Out of A, B, and C cells in the above diagram, which cell helps in the closing and opening of the stomata? Write the name of the cell.

14. Observe the following figure and answer the questions that follow. **[3]**

A - First type of crop

B - Second type of crop

Box represents the agricultural field in which crops are grown.



i. Which type of cropping pattern is seen in the picture?

ii. Discuss this cropping pattern.

iii. What should be kept in mind regarding the types of crops, while following this cropping method?

15. **Read the following text carefully and answer the questions that follow:** **[4]**

Plant cells, in addition to the plasma membrane, have another rigid outer covering called the cell wall. The cell wall lies outside the plasma membrane. The plant cell wall is mainly composed of cellulose. The nucleus has a double-layered covering called a nuclear membrane. The nuclear membrane has pores that allow the transfer of material from inside the nucleus to its outside, that is, to the cytoplasm. The nucleus contains chromosomes, which are visible as rod-shaped structures only when the cell is about to divide. Chromosomes contain information for the inheritance of characters from parents to the next generation in the form of DNA. The nucleus plays a central role in cellular reproduction, the process by which a single cell divides and forms two new cells.

i. Cellulose is a complex substance which provides? (1)

ii. What are chromosomes made up of? (1)

iii. How is plasmolysis in a plant cell defined? (2)

OR

In which type of solution will the cell shrink? (2)

16. Write the main functions of atleast ten cell components. **[5]**

OR

i. What will happen if cells are not properly organised in tissue?

ii. Under certain circumstances squamous epithelium is known as stratified squamous epithelium. Justify.

Section B

17. Which of the following is needed by surgeons during surgery? **[1]**

a) Ethane b) Ether

c) Acid d) Propranolol

18. Calculate the formula unit mass of $ZnCl_2$? (nearest approximation) **[1]**

a) 111 u b) 124 u

c) 123 u d) 137 u

19. **Assertion (A):** True solution exhibits Tyndall effect. **[1]**

Reason (R): Particles are very large in size.

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. Match the following with the correct response**:** **[1]**

(a) Deuterium	(i) Radiocarbon Dating
(b) Carbon-14	(ii) Treatment of cancer
(c) Isotope of uranium	(iii) Nuclear Reactors
(d) Cobalt-60	(iv) An isotope of Hydrogen

a) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

b) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)

c) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

d) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

21. A sample of $CaCO_3$ contains 3.01×10^{23} ions of Ca^{+2} and CO_3^{-2}. The mass of the sample is: **[1]**

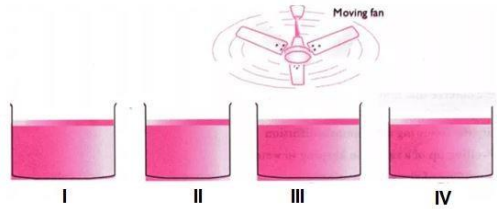
a) 100 g

b) 50 g

c) 200 g

d) 5 g

22. Look at the following figure and suggest in which of glass container the rate of evaporation will be highest? **[1]**



a) III

b) II

c) I

d) IV

23. Rusting of an article made up of iron is called **[1]**

a) corrosion and it is a physical as well as chemical change

b) dissolution and it is a chemical change

c) dissolution and it is a physical

d) corrosion and it is a chemical change

24. **Assertion (A):** One atomic mass unit (amu) is mass of an atom equal to exactly one-twelfth the mass of a carbon-12 atom. **[1]**

Reason (R): Carbon-12 isotope was selected as standard.

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.

25. Why are chemical reactions according to law of conservation of mass? **[2]**

26. Differentiate between a true solution and a colloid. **[3]**

OR

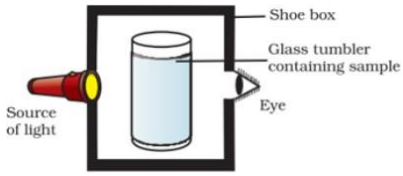
A group of students took an old shoe box and covered it with a black paper from all sides. They fixed a source of light (a torch) at one end of the box by making a hole in it and made another hole on the other side to view the light.

They placed a milk sample contained in a beaker/tumbler in the box as shown in the Fig. They were amazed to see that milk taken in the tumbler was illuminated. They tried the same activity by taking a salt solution but found that light simply passed through it?

i. Explain why the milk sample was illuminated. Name the phenomenon involved.

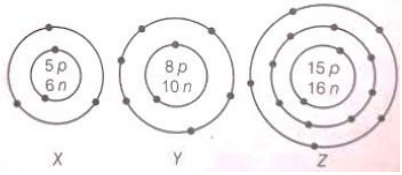
ii. Same results were not observed with a salt solution. Explain.

iii. Can you suggest two more solutions which would show the same effect as shown by the milk solution?



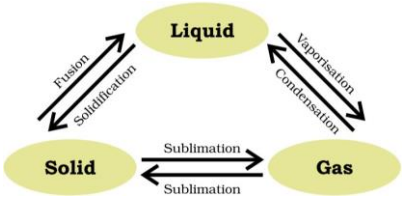
27. What information do you get from the figure about the atomic number, mass number and valency of atoms X, Y and Z? **[3]**

Give your answer in a tabular form.



28. **Read the following text carefully and answer the questions that follow:** **[4]**

Matter around us exists in three different states–solid, liquid and gas. These states of matter arise due to the variation in the characteristics of the particles of matter. Solids have a tendency to maintain their shape when subjected to outside force. Solids may break under force but it is difficult to change their shape, so they are rigid. the difference in various states of matter is due to the difference in the distances between the constituent particles. Pressure and temperature determine the state of a substance, whether it will be solid, liquid or gas.



i. write the properties of solid state of matter? (1)

ii. How does solid gets converted directly into gaseous states of matter? (1)

iii. What is vaporization? (2)

OR

Give an example from which we can say that gas can directly converted into solid state of matter? (2)

29. Write an experiment to show that cathode rays travel in straight line? **[5]**

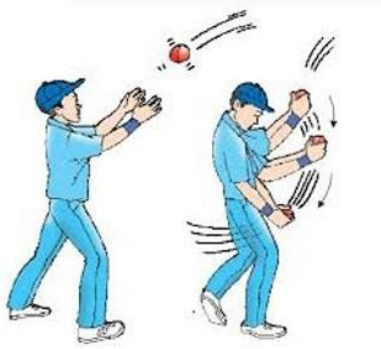
OR

i. Write two differences between isotopes and isobars.

ii. Write uses of Co-60 and U-235.

Section C

30. The given image correlates with which law of motion? **[1]**



a) Third law of motion

b) Second law of motion

c) First law of motion

d) Law of momentum

31. On tripling the speed of motion of a body, the change in K.E. is: **[1]**

a) 9 times

b) 8 times

c) 2 times

d) 4 times

32. **Assertion (A):** The velocity of sound changes as we go up in the atmosphere. **[1]**

Reason (R): Pressure decreases as we go up in the atmosphere.

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.

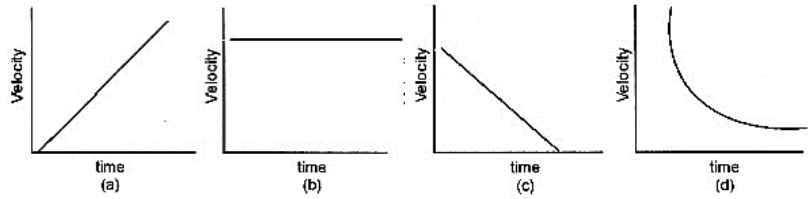
33. A truck starts from rest and rolls down a hill with a constant acceleration. It travels a distance of 400 m in 20 s. Find its acceleration. Find the force acting on it if its mass is 7 metric tonnes. **[2]**

34. A force of 10 N displaces a body by a distance of 2 m at an angle 60^o to its own direction. Find the amount of work done. **[2]**

OR

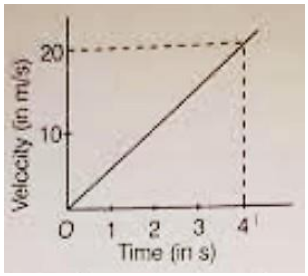
A rocket is moving up with a velocity v. If the velocity of this rocket is suddenly tripled, what will be the ratio of two kinetic energies?

35. What type of motion is represented by the following graphs. **[3]**



36. Flash and thunder are produced simultaneously. But thunder is heard a few seconds after the flash is seen, why? **[3]**

37. 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]**



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

The commercial unit of energy is kilowatt-hour which is written as kWh. The SI unit of electrical energy is

joule.

A joule is the amount of electrical energy consumed when an appliance of 1 watt power is used for one second. Joule represents a very small quantity of energy so we use a bigger unit called kilowatt hour.

One kilowatt hour is the amount of electrical energy consumed when an electrical appliance with a power rating of 1 kilowatt is used for 1 hour.

1 kW h is the energy used in one hour at the rate of 1000 J s - 1 (or 1 kW).

1 kW h = 1 kW × 1 h

= 1000 W × 3600 s

= 3600000 J

1 kW h = 3.6 × 106 J.

The energy used in households, industries and commercial establishments are usually expressed in kilowatt hour. For example, electrical energy used during a month is expressed in terms of 'units'. Here, 1 'unit' means 1 kilowatt hour. The electricity meter installed in our home records the electrical energy consumed by us in kilowatt-hours.

i. What is the commercial unit of energy? (1)

ii. What is the SI unit of electrical energy? (1)

iii. How is electrical energy used during a month expressed and recorded? (2)

OR

Find out the relation between Kilowatt-hour and joule. (2)

39. From a cliff of 49 m high, a man drops a stone. One second later, he throws another stone. They both hit the ground at the same time. Find out the speed with which he threw the second stone. **[5]**

OR

What is the magnitude of the gravitational force between the earth and a 1 kg object on its surface? (Mass of the earth is 6×10^{24} kg and radius of the earth is 6.4×10^{6} m).

Solution

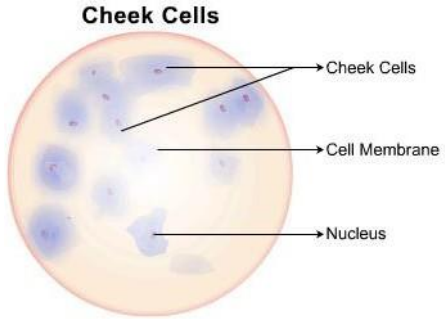
Section A

1.

(d) C

Explanation:

As in all animal cells, the cells of the human cheek do not possess a cell wall. A cell membrane that is semi-permeable surrounds the cytoplasm. Unlike plant cells, the cytoplasm in an animal cell is denser, granular and occupies a larger space. The vacuole in an animal cell is smaller in size, or absent. The nucleus is present at the centre of the cytoplasm. The absence of a cell wall and a prominent vacuole are indicators that help identify animal cells, such as cells seen in the human cheek.



2.

(b) Centriole

Explanation:

A centriole is an organelle that helps cells divide, or make copies of themselves. Centrioles are only found in animal cells. All centrioles are made of protein strands called microtubules.

3.

(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.

4.

(d) (A)

Explanation:

The common name of xylem is wood.

5.

(d) liver

Explanation:

Cattle eat the vegetation and become infected. The fluke migrates to the liver, infects the bile duct and matures into an adult.

6.

(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.

7.

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

Explanation:

The cell wall is permeable because it allows all substances to move across the cell wall.

8.

(d) All of these

Explanation:

To solve the food problem of the country, the following is necessary

i. Increased production and storage of food grains.
ii. Easy access of people to the food grain.
iii. People should have money to purchase grains.

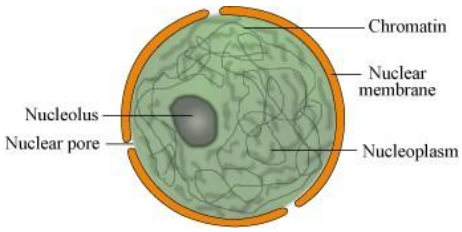
9.

(d) All of these

Explanation:

all the pathogens affect the poultry. Pathogens, disease-causing microorganisms including fungi, bacteria and protozoa, are associated with increased veterinary costs, poor flock uniformity, increasing concomitant diseases, reduction in profitability and ultimately with risks to animal welfare and human health. Pathogens can be easily introduced to a poultry flock via air, pests, people, water and feed. Their prevalence and impact is largely dependent upon the quality of the environment and the health and welfare of the birds. Healthy birds have a higher tolerance to performance-limiting pathogens than stressed animals. Vectors for pathogen transfer can be mechanical and biological

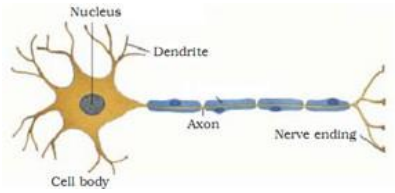
10. The nucleus is also known as the 'control centre of the cell'. It is generally centrally placed. It is bounded by a nuclear membrane, in which nuclear pores are present. The fluid inside the nucleus is called nucleoplasm. Nucleoplasm contains a thread-like structure called chromatin and nucleolus. Chromatin contains DNA, which condensed to form chromosomes during cell division. Nucleolus synthesizes ribosomes.



11. (i) **Cells/ Fibres :** They are small, cylindrical, uninucleate striated with short lateral branches.
(ii) **Intercalated Disc :** In the area of union between the two adjacent cardiac muscle fibres develop zig – zag junctions called intercalated discs. They function as impulse boosters.
(iii) **Rhythmic Contractions :** The muscles are involuntary and non fatigued which continue to contract and relax tirelessly throughout life.

OR

Structure of Neuron



A neuron consists of a cell body with a nucleus and cytoplasm, from which thin hair-like parts arise. It has a single long part called the axon and many short, branched parts called dendrites. The nerve endings receive the impulses.

12. i. Two advantages of apiculture are:

a. It produces honey and wax.
b. It is a low investment additional income-generating activity for farmers.

ii. **Local variety-** *Apis cerana indiaca*
Foreign variety- *Apis mellifera*.

iii. **Energy yielding crops-** Wheat, rice, maize and oats.

13. 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.

14. i. Intercropping is seen in the picture.

ii. In this cropping pattern, two or more crops are grown simultaneously in a definite pattern on a field.

iii. The nutritional requirements of the selected plants should be different. It ensures maximum utilisation of the nutrients supplied.

15. i. Cellulose is a complex substance which provides structural strength to the plants.

ii. Chromosomes are present as thread like structures packed inside the nucleus of a plant cell or animal cell. Each chromosome is made up of protein and a single molecule of DNA (deoxyribonucleic acid).
Therefore, chromosomes are made of DNA and protein

iii. Plasmolysis in a plant cell is defined as the process of shrinkage of the cytoplasm as a result of loss of water from the cell. It occurs when plant cells are placed in a solution that has a higher concentration of solutes than the cell does.
OR
Hypertonic solution.

16. The ten cell components are:

i. **Plasma membrane:** It acts as a semipermeable membrane and allows only selective substances to pass through it.

ii. **Chromosomes:** To carry hereditary characters of an organism from one generation to another.

iii. **Lysosomes:** Breakdown of unwanted macromolecules is the main function of these organelles.

iv. **Ribosomes:** These help in protein synthesis.

v. **Nucleus:** Control centre of the cell. It contains cellular DNA (genetic information) in the form of genes.

vi. **Mitochondria:** The main function of mitochondria in aerobic cells is the production of energy by the synthesis of ATP.

vii. **Nucleolus:** Biosynthesis of ribosomal RNA (rRNA) and acts as a platform for protein synthesis.

viii. **Cell wall:** It provides protection and rigidity to the plant cell.

ix. **Chloroplasts:** These are the sites of photosynthesis within plant cells.

x. **Endoplasmic reticulum:** Serves as channels for transport of materials.

OR

i. Different organisms whether unicellular or multicellular need to perform many functions in the body such as respiration, digestion, locomotion. In multicellular organisms, cells present in a group and specialized in one particular function form a tissue. Some tissues help in growth, while others in locomotion and some in body movement. So, if cells are not organized in these tissues, then a highly organized and specialized process will become disorganized. There will be no coordination in the functioning of the cells and body.

ii. The squamous epithelial cells line the cavities of the mouth, oesophagus, alveoli, and blood vessels. This tissue gives protection against mechanical injury and also blocks the entry of germs. If the squamous epithelium is arranged in many layers, it is known as a compound squamous tissue called the stratified squamous epithelium. We find these kinds of tissues in the skin and also the lining of the oesophagus.

Section B

17.

(b) Ether

Explanation:

Ether is used by surgeons during surgery. Ether is highly volatile and antiseptic in nature. It is used to make a wound sterile. It was one of the first anesthetics used in surgery.

18.

(d) 137 u

Explanation:

Formula unit mass of $ZnCl_2$ is $(66 + 35.5 \times 2 = 137u)$

The atomic mass of Zn is 66 and the atomic mass of Cl is 35.5

19.

(d) A is false but R is true.

Explanation:

True solutions do not exhibit the Tyndall effect since the particle size is very small to scatter light.

20.

(d) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

Explanation:

- Deuterium is an isotope of Hydrogen.
- Carbon-14 is a radioactive isotope used in radiocarbon dating.
- An isotope of uranium is used as fuel in nuclear reactors.
- Cobalt isotope (Co–60) is used for the treatment of cancer. It is radioactive in nature. It is used for producing rays to kill the cancerous cells.

21.

(b) 50 g

Explanation:

The mass of one mole of $CaCO_3$ is equal to 100 g. 6.022×10^{23} ions are equivalent to one mole. Therefore, mass of 3.01×10^{23} ions will be equivalent to $(\frac{100}{2})$ g or 50 g.

22. **(a)** III

Explanation:

The rate of evaporation increases with an increase in surface area because evaporation is a surface phenomenon. Also, with the increase in air speed, the particles of water vapour will move away with air, which will increase the rate of evaporation.

23.

(d) corrosion and it is a chemical change

Explanation:

corrosion and it is a chemical change

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

Explanation:

For universally accepted atomic mass unit in 1961, C12 - was selected as standard. However, the new symbol used is 'u' (unified mass) in place of amu.

25. In all chemical reactions, there is only exchange of reactants taking place when products are formed. Since there is no loss or gain of mass, the chemical reactions are according to law of conservation of mass.

26.

True solution	Colloid
1. A true solution is a homogeneous mixture of two or more substances.	1. A colloidal solution is a heterogeneous mixture of two substances.
2. The size of the particles is less than 1 nm.	2. The range of particle size is between 1 nm and 100 nm.
3. It is always clear and transparent.	3. It is translucent.
4. The particles cannot be seen even with a microscope.	4. The particles of a colloidal solution can be seen with the help of a microscope.
5. It does not show Tyndall effect.	5. It shows Tyndall effect since a beam of light can be scattered by the particles.
6. Example: Salt solution	6. Example: Milk

OR

i. Milk is a colloid. The particulate matter present inside milk scatter the light passing through milk and shows Tyndall effect.

ii. Salt solution is a homogeneous solution. Small particles present in a salt solution do not scatter light and hence, a salt solution does not exhibit Tyndall effect.

iii. Detergent solution and sulphur solution will also show Tyndall effect.

27. The tabular form is as below:

Element	Atomic Number (= no. of p)	Mass Number {= no. of (p+n)}	Number of Electrons (= no. of p)	Electronic Configuration	Valency
X	5	5 + 6 = 11	5	2, 3	3
Y	8	8 + 10 = 18	8	2, 6	2
Z	15	15 + 16 = 31	15	2, 8, 5	3, 5

28. i. Solids have a definite mass and shape**.** The intermolecular distances are short and intermolecular forces are strong in solids. They have fixed volumes. They have definite boundaries and r constituent particles have fixed positions and oscillate about their mean positions.

ii. Sublimation is the process in which solid directly changes to gas. For example - camphor, which directly converted from solid to gas .

iii. Vaporization can be defined as the process in which the liquid state changes into the vapour state. As a result of an increase in temperature, the kinetic energy of the molecules increases.

OR

Deposition,when a substance in gas form changes states to become a solid. The gaseous substance gets deposited (usually as crystals) bypassing the intermediate liquid state. An example of deposition is when water vapor in the atmosphere changes directly into ice, such as the formation of frost.

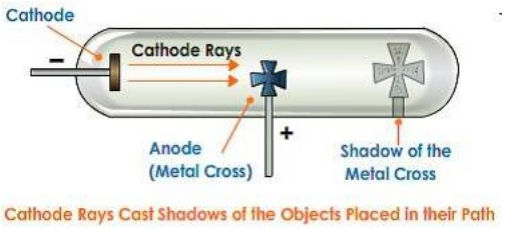
29. Experiment to show that cathode rays travel in the straight line:-

a. Take a discharge tube coated with a fluorescent substance

b. Place an opaque object in the path of the cathode rays.

c. When cathode rays were made to pass through the discharge tube then discharge the glowed wherever cathode rays fall except in the region of the shadow of the opaque object.

d. The above experiment shows that cathode rays travel in the straight line.



Cathode Rays Cast Shadows of the Objects Placed in their Path

OR

i. Difference between isobars and isotopes:

Isotopes	**Isobars**
These are the atoms of the same element having the same atomic number but different mass numbers	These are the atoms of the different elements having the same mass number but different atomic numbers
They have identical chemical properties and different physical properties. e.g. ${}_{1}^{1}H$, ${}_{1}^{2}H$, ${}_{1}^{3}H$	They have different chemical properties and different physical properties because these are the atoms of different elements. e.g. ${}_{18}^{40}Ar$ and ${}_{20}^{40}Ca$

ii. An isotope of cobalt (Co-60) is used in the treatment of cancer.
An isotope of uranium (U-235) is used as fuel in a nuclear reactor.

Section C

30.

(b) Second law of motion

Explanation:

The image shows that while catching a fast-moving cricket ball, a fielder in the ground gradually pulls his hands backwards. While doing so, the fielder increases the time during which the high velocity of the moving ball decreases to zero. Thus, the acceleration of the ball is decreased and therefore the impact of catching the fast-moving ball is also reduced. Hence, the image correlates with the second law of motion which states that the rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of the force.

31. **(a)** 9 times

Explanation:

K.E. is proportional to V^2.

So, when speed is tripled, KE. is nine-time.

32.

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

Explanation:

As we move up the pressure of air, density of air, both decrease. But, velocity of sound will not change as long as the temperature of air remains constant. Since temperature falls as we ascend up, hence the velocity of sound also decreases.

33. 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

34. By definition: Work = Force $\times$displacement in the direction of force = Fs $\cos\theta$

Given : F = 10 N, s = 2 m, $\theta = 60^o$

Therefore W = 10 × 2 × cos 60° = 10 $\times$ 2 $\times \frac{1}{2}$ = 10 J

OR

Initial velocity = u, then final velocity, v= 3v

Initial kinetic energy = $\frac{1}{2}mu^2$

Final kinetic energy (KE) = $\frac{1}{2}mv'^2 = \frac{1}{2}m(3u)^2 = 9\left(\frac{1}{2}mu^2\right)$

$(KE)_{initial}$: $(KE)_{final}$ =1:9.

35. 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.

36. Since speed of thunder (sound) is much less (332 m/s) as compared to speed of flash (light) which is about 3×10^8m/s therefore light travels faster than sound hence thunder is heard a few seconds after the flash is seen.

37. 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

$\therefore$ Acceleration of the ball,

$a = \frac{v-u}{t} = \frac{20m/s-0}{4s} = 5m/s^2$

Also, mass of the ball

$a = 100g \Rightarrow \frac{100}{1000}kg = \frac{1}{10}kg$

$\therefore$ 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]

38. i. The commercial unit of energy is kilowatt-hour which is written as kWh. One kilowatt hour is the amount of electrical energy consumed when an electrical appliance with a power rating of 1 kilowatt is used for 1 hour.

ii. The SI unit of electrical energy is joule. A joule is the amount of electrical energy consumed when an appliance of 1 watt power is used for one second.

iii. The electrical energy used during a month is expressed in terms of 'units'. 1 'unit' means 1 kilowatt hour. The electricity meter installed in our home records the electrical energy consumed by us in kilowatt-hours.

OR

1 kW h = 1 kW $\times$ 1 h

= 1000 W $\times$ 3600 s

= 3600000 J

1 kW h = 3.6 $\times$ 106 J.

39. **For the first stone :**

Initial velocity, u = 0 ms^{-1}, Height of cliff, h = 49 m, g= 9.8m/s^2

As we know, $S = ut + \frac{1}{2}at^2$.

We, have, h = ut + $\frac{1}{2}$ gt^2

$\therefore 49 = 0 \times t + \frac{1}{2} \times 9.8 \times t^2$

$\Rightarrow t^2 = \frac{9.8}{9.8} = 10$

$\Rightarrow t = \sqrt{10} = 3.16$ s

i.e., first stone would take 3.16 s to reach the ground.

For the second stone:

The time taken by the second stone to reach the ground is one second less than that taken by the first stone as both the stones reach the ground from the same height, h= 49m.

That is, for the second stone, time, t = (3.16 - 1) s = 2.16 s

$\therefore$For the second stone,

g = 9.8 ms^{-2}, h = 49 m, t = 2.16 s, u = ?

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

We have, h = ut + $\frac{1}{2}$ gt^2

$\Rightarrow 49 = u \times 2.16 + \frac{1}{2} \times 9.8 \times (2.16)^2$

$\Rightarrow$ 49 - 22.86 = 2.16u or 26.14 = 2.16u

$\Rightarrow u = \frac{26.14}{2.16} = 12.1$ ms^{-1}

Therefore, the speed with which he threw the second stone = 12.1 ms^{-1}

OR

$F_{gravitation} = \frac{G \times M_e \times m_0}{r^2}$

$= \frac{6.67 \times 10^{-11} \times 6 \times 10^{24} \times 1}{(6.4 \times 10^6)^2}$

$= \frac{6.67 \times 6 \times 10^{-11+24}}{6.4 \times 6.4 \times 10^{12}}$

$= \frac{6.67 \times 6}{6.4 \times 6.4} \times 10^{-11+24-12}$

$= 0.9770 \times 10N = 9.770N$