CLASS IX (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-2

Time : 3 Hours   **Maximum Marks : 80**

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

Section - A

1. When a body is stationary :   [1]
(a) There is no force acting on it.
(b) The force acting on it is not in contact with it.
(c) The combination of forces acting on it balances each other.
(d) The body is in vacuum.

Ans : (c) The combination of forces acting on it balances each other.

or

A ball is rolling down a slope at a steady speed. Which of the following statements is correct?
(a) Frictional force is greater than the forward force.
(b) There is an unbalanced force downwards.
(c) There are no forces acting on the ball.
(d) The forces acting on the ball are balanced.

Ans : (d) The forces acting on the ball are balanced.

2. A 1 kg mass falls from a height of 10 m into a sand box. What is the speed of the mass just before hitting the sand box? If it travels a distance of 2 cm into the sand before coming to rest, what is the average retarding force?   [1]
(a) 12 ms^{-1} and 3600 N   (b) 14 ms^{-1} and 4900 N
(c) 16 ms^{-1} and 6400 N   (d) 18 ms^{-1} and 8100 N

Ans : (b) 14 ms^{-1} and 4900 N

Since, $\frac{1}{2}mv^2 = mgh$

$v = \sqrt{2gh} = \sqrt{2 \times 9.8 \times 10}$

$= 14\,\text{m/s}$

Now, $F.s = \frac{1}{2}mv^2$

$F = \frac{mv^2}{2s} = \frac{1 \times 196}{2 \times 2 \times 10^{-2}}$

$= 4900\,\text{N}$

3. What does the mass number of an atom represent? [1]
(a) Only the number of protons.
(b) The sum of protons and neutrons.
(c) The sum of protons and electrons.
(d) Only the number of neutrons.

Ans : (b) The sum of protons and neutrons.

4. If the distance between two bodies is increased by 25%, then the % change in the gravitational force is :   [1]
(a) Decreases by 36%   (b) Increases by 36%
(c) Increases by 64%   (d) Decreases by 64%

Ans : (a) Decreases by 36%

5. Which one of the following is a liquid non-metal? [1]
(a) Gallium   (b) Bromine
(c) Lead   (d) Hydrogen

Ans : (b) Bromine

6. Which of the following are negative effects on the environment from the excessive use of fertilizers in a farm situated near a lake?   [1]
(a) Decreased oxygen content in the water.
(b) Decreased light penetration in the water.
(c) Decreased population of aquatic organisms.
(d) All of these.

Ans : (d) All of these.

or

Which is a desirable characteristic in poultry?
(a) Low maintenance requirements.
(b) Reduced quality of chicken.
(c) Low tolerance to high temperature.
(d) Large size of the egg laying bird.

Ans : (a) Low maintenance requirements.

DIRECTION : For question numbers 7 and 8, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :

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

(c) A is true but R is false.

(d) Both A and R are false.

7. Assertion (A) : Plasma membrane is a selectively permeable membrane. [1]
Reason (R) : Plasma membrane allows entry and exit of substance from cell through the process of diffusion.

Ans : (c) A is true but R is false.

8. Assertion (A) : The growth of plants occurs only in certain specific regions. [1]
Reason (R) : Meristematic tissue is located only at certain points in a plant.

Ans : (a) Both A and R are true and R is correct explanation of the A.

9. The period of revolution of a certain planet in an orbit of radius R is T. Its period of revolution in an orbit of radius 4R will be : [1]
(a) 2 T (b) 22 $\sqrt{T}$
(c) 4 T (d) 8 T

Ans : (d) 8 T

Now, according to kepler's third low of planetary motion.

$$t \propto a^{3/2}$$
$$t^2 \propto a^3$$
For $\quad a = 2R$
$$t = T$$
Then, for $\quad a = 8R$
$$t = ?$$
$$\frac{T^2}{t^2} = \frac{(2R)^3}{(8R)^3}$$
$$\frac{T^2}{t^2} = \frac{8R^3}{512R^3}$$
$$t^2 = 64\,T^2$$
$$t = 8\,\text{T}$$

10. The HIV viruses spread from an infected person to a healthy person by .... [1]
(a) Blood transfusion (b) Sexual intercourse
(c) Placental transfusion (d) All of the above

Ans : (d) All of the abvoe

or

HIV virus attacks one of the following cells in our body. Which one?
(a) Red blood cells (b) White blood cells
(c) Liver cell (d) None of the above

Ans : (b) White blood cells

11. What are the two laws of chemical combination? [1]

Ans :

(a) Law of conservation of mass.
(b) Law of constant proportions.

12. Why do bicycles begin to slow down when we stop pedalling? [1]

Ans :

This is because of the frictional forces acting opposite to the direction of motion.

13. Answer question numbers 13.1–13.4 on the basis of your understanding of the following paragraph and the related studied concepts. [1]
Mohan had a biology practical exam. The biology laboratory in his school had lots of microscopes of different precision. When he reached the laboratory, he found that many microscopes were already mounted with a slide. Just for fun, he went and looked at a slide through the microscope and found the above image. He wasn't able to identify the organism or type of organism, so he called his friend Shyam to look at the slide. Shyam found out immediately what kind of organism this was.
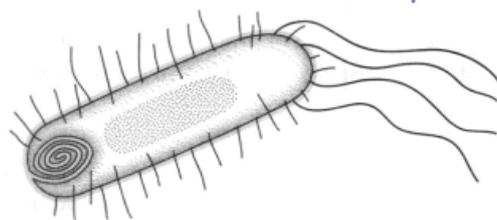
13.1 What is this organism? [1]
Ans : It is a prokaryotic cell.

13.2 How did Shyam find out the kind of organism? [1]
Ans : Shyam saw a poorly defined nuclear region due to the absence of a nuclear membrane. It is the characteristic of a prokaryotic cell.

13.3 Give two examples of such kind of organisms. [1]
Ans : E. Coli., and Bacteria.

13.4 What should a person ensure before looking at a slide through a microscope? [1]
Ans : A sample of a cell on the slide should always be dryed before being observed through a microscope.

14. Questions 14.1 to 14.4 are based on the Table A. Study this table related to melting points and boiling points of different substances and answer the following questions. [1]

Table : A

Component name	Boiling point (°C)	Melting point (°C)
Carbon dioxide	-57	-78
Propane	-42	-188
Ethanol	78.4	-114
Water	100	0
Glycerol	290	17.8

14.1 Name the substances from Table A that we can find in liquid state at room temperature (25 °C) [1]
Ans : Water and glycerol.

14.2 We are heating a bowl of water and a bowl of ethanol separately. We start from the same temperature and heat them on a similar kind of flame. Which bowl will get empty first? [1]
Ans : Ethanol, because the boiling point of ethanol is lesser than the boiling point of water.

14.3 What does the melting point of a solid indicate? [1]

Ans : The melting point of a solid is an indication of the strength of the force of attraction between its particles.

14.4 Glycerol is heated from 0 °C to 50 °C. When the temperature reaches 17.8 °C, the temperature remains constant for a while and only after some time, it starts to increase again. Why?   [1]

Ans : The melting point of glycerol is 17.8 °C. When the temperature reaches 290 °C, a change of state occurs from solid to liquid. The temperature remains constant because the heat supplied to the substance is used as latent heat of fusion.

Section - B

15. When a body covers equal distances in equal time intervals, its velocity can be variable. Explain giving an example.   [3]

Ans :

In a uniform motion, the body may cover equal distance in equal time intervals. But the direction of motion of the body may change. Thus, its velocity can be variable. For example, if a cyclist turns around a curve on the road at uniform speed, his velocity changes on account of the change in the direction of motion.

16. Suresh's mother mixed oil and water in kitchen by mistake. Suresh told her that he can separate the mixture. Name the technique used by Suresh and explain how he will do. Draw the diagram and write the principle of this technique.   [3]

Ans :

A mixture of two immiscible liquids (such as water and oil) can be separated by using a separating funnel. When the mixture of water and mustard oil is put in a separating funnel, it forms two layers. Water being heavier, forms the lower layer in the separating funnel whereas oil being lighter forms the upper layer. On opening the stop cock of separating funnel, the lower layer of water comes out first and collected in a beaker. When water layer has completely runoff, then stop cock is closed. the oil is left behind in the separating funnel. It can be removed in a separate beaker by opening the stop cock again.
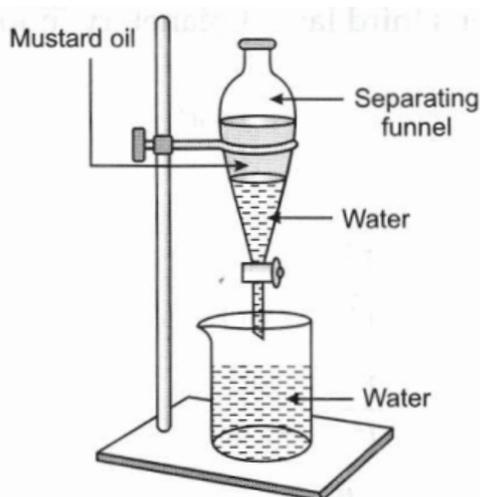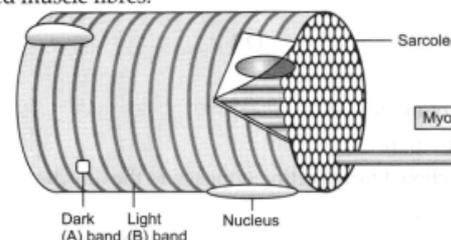

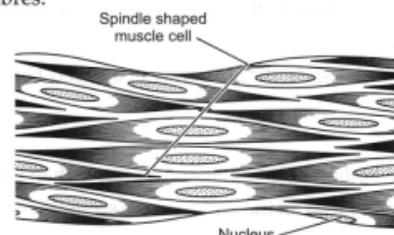**17.** Draw well labelled diagrams of various types of muscles found in human body.   [3]

Ans :

Different types of muscle fibres :
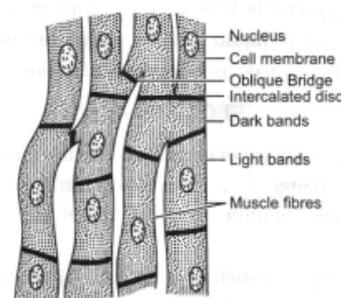
(a) Single striated muscle fibres.

(b) Smooth muscle fibres.

(c) Cardiac muscle.

18. (a) A body of mass 9 kg is lying on a surface of table. Calculate the net force acting on it.   [3]

(b) Do all action and reaction forces produce acceleration of equal magnitudes in both objects? Why or why not?

(c) A balloon is inflated and released. Why does it fly forward as air escapes out of it?

Ans :

(a) Net force acting on the body is zero as it is at rest.

(b) No, though action and reaction are equal in magnitude, they may not produce. acceleration of equal magnitudes because each force acts on different objects which have different mass.

(c) Air pushed out of the balloon exerts an equal reaction force acts on the balloon and it moves forward.

or

Explain the process of rocket propulsion in the light of Newton's third law of motion.

Ans :

The process of rocket propulsion is based on Newton's third law of motion. As the fuel burns, the gases are released with tremendous force in downward direction. Their reaction forces push the rocket in upward direction.

If a time t, mass of burnt fuel $= m$, velocity of burnt fuel $= v$ and mass of rocket $= M$, then, Velocity of rocket, $V = - mv/M$

19. List some adaptations of reptiles towards terrestrial mode of life. [3]

Ans :

The adaptations of reptiles towards terrestrial mode of life are:
(a) Skin is thick, dry and non-glandular to check the loss of water.
(b) Body is covered by an exoskeleton of epidermal scales which forms a waterproof coat.
(c) Excretion is uricotelic which requires minimum water loss.
(d) Main mode of respiration is pulmonary respiration.
(e) Embryo is protected by embryonic membranes, so reptiles have become first true terrestrial vertebrates.
(f) Fertilisation is internal as male has copulatory organs.

20. Define force. What are the various types of forces? Mention at least four. [3]

Ans :

Force is a push and pull that tends to produce a change in state of a body from rest or motion. The different types of forces are:
(a) Gravitational force
(b) Electrostatic force
(c) Electromagnetic force
(d) Nuclear force

or

Why does a block of wood released under water come up to the surface of water?

Ans :

Buoyant force is the upward force experienced by an object when it is submerged inside a liquid. The magnitude of the force is equal to the weight of water displaced by that object. The density of wood is lesser than that of water so the water displaced by it will have more weight than its own weight. That is, the buoyant force is more than the weight of the wood. So the wood will come up to the surface of water and only that part of the wood will be submerged, when weight of displaced water is equal to the weight of wood.

21. Explain in details the structure of nucleus with the help of a diagram. [3]

Ans :

Robert Brown in 1831 discovered the nucleus in the cell. Nucleus is the largest cell structure. It is spherical or oval in shape and is a prominent structure. It is usually located in the center of the cell. Nucleus has the following important parts:
(a) **Nuclear membrane :** It is a doubled layered membrane, which separates nucleus from the cytoplasm.
(b) **Nucleoplasm :** It is a homogeneous and granular dense fluid present inside the nucleus, in which chromatin and nucleolus are suspended.
(c) **Chromatin material :** It consists of long, coiled network of thread-like structures.
(d) **Nucleolus :** It is more or less round structure found inside the nucleus.
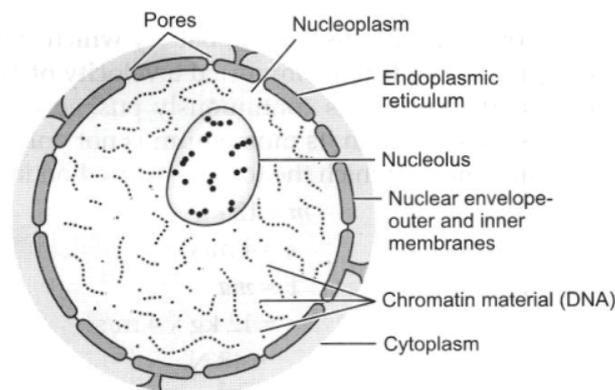
Structure of Nucleus

22. Comment on the following statements: [3]
(a) Rate of evaporation of an aqueous solution decreases with increase in humidity.
(b) Evaporation produces cooling.
(c) Conversion of solid state to liquid state is called fusion. What is meant by latent heat of fusion?

Ans :

(a) If humidity is high, then air already has lot of water vapours, it will not take more water vapours easily. Therefore, the rate of evaporation will be slow.
(b) In evaporation, surface molecules take heat from surroundings and cause cooling effect.
(c) It is the amount of heat required to convert one kilogram of solid into liquid at one atmospheric pressure at its melting point. It is known as latent heat of fusion.

or

(a) Which gas is supplied to hospitals in cylinders for artificial respiration?
(b) What does the diffusion of gases tell us about their particles?
(c) Why do liquids easily flow?

Ans :

(a) The nitrous oxide is supplied in cylinders containing 450 to 18,000 L of gas. Nitrous oxide has a critical temperature above the room temperature. So, it is stored as a liquid in pressurised cylinders with nitrous oxide vapour present in the space above the liquid.
(b) Diffusion is the movement of particles from higher concentration to lower concentration. Diffusion in gases is quite faster than the liquids and solids which reveal that the particles in gas are not fixed. The intermolecular force of attraction is less which helps in easy escape.
(c) Liquids can flow easily because their particles can move over each other. When water is poured into a glass, the particles of water move over each other and into the corners of the glass. The particles keep on moving over each other as the water takes the shape of the glass.

23. A car travels at 54 km/h for first 20s, 36 km/h for next 30 s and finally 18 km/h for next 10 s. Find its average speed. [3]

Ans :

Speed:	$v_1 = 54 \, \text{km/h} = 15 \, \text{m/s}$
	$v_2 = 36 \, \text{km/h} = 10 \, \text{m/s}$
	$v_3 = 18 \, \text{km/h} = 5 \, \text{m/s}$
Time:	$t_1 = 20 \, \text{s}$
	$t_2 = 30 \, \text{s}$
	$t_3 = 10 \, \text{S}$
Distance	$s_1 = 15 \times 20 = 300 \, \text{m}; s_2$
	$s_2 = 10 \times 30 = 300 \, \text{m}; s_3$
	$s_3 = 5 \times 10 = 50 \, \text{m}$
Total distance	$s = s_1 + s_2 + s_3$
	$= 300 + 300 + 50 = 650 \, \text{m}$
Total time :	$t = t_1 + t_2 + t_3 = 20 \, \text{s} + 30 \, \text{s} + 10 \, \text{s}$
	$= 60 \, \text{s}$

$$\text{Average speed} = 650/60 = 10.83 \, \text{m/s}$$

24. What are the main practices involved in keeping of animals or animal husbandry? [3]

Ans :

Main practices involved in animal husbandry are :
(a) **Breeding :** It is done to obtain animals with desired characters. Breeding can develop high milk-yielding and high meat-yielding animals.
(b) **Feeding :** It deals with the study of proper food called feed, mode and time of feeding for different animals.
(c) **Weeding :** It is the elimination of uneconomical animals.
(d) **Heeding :** It means the proper care and management of the animals.

Section - C

25. (a) Force necessary to change the momentum of an object depends on the time rate at which momentum is changed." Discuss with an example.
(b) What would be the force required to produce an acceleration of 4 m/s2 on a body of mass 12 kg? [5]

Ans :

(a) Consider an example of a car with discharged battery which is being pushed on a straight road. To start the engine, it needs to be imported a velocity of 1ms^{-1}. When a sudden push is applied, it hardly starts. But if it is continuously pushed over sometime, it accelerates gradually. This means the change in its momentum is not only determined by magnitude of force, but also by the time for which the force is exerted on it.

(b) Mass of body, $m = 12 \, \text{kg}$

Acceleration, $\qquad a = 4 \, \text{m/s}^2$

We have Force, $\quad F = ma = 12 \, \text{kg} \times 4 \, \text{m/s}^2$

$$= 48 \, \text{N}.$$

or

State which of the following situations are possible and give an example for each of these.
(a) An object with acceleration but with zero velocity.
(b) An object moving in a certain direction with an acceleration in the perpendicular direction.

Ans :

(a) An object with constant acceleration can have zero velocity. For example, an object which is at rest on the surface of the earth will have zero velocity but still being acted upon by the gravitational force of earth with an acceleration of 9.81 m/s' towards the centre of the earth. Hence, when an object starts falling freely, at that particular moment, it can have acceleration but at zero velocity.

(b) When an athlete moves with a velocity of constant magnitude along the circular path, the only change in his velocity is due to the change in his direction. Here, the motion of the athlete along a circular path is an example of accelerated motion where acceleration is always perpendicular to the motion of the object at a given instance. Hence, it is possible when an object moves on a circular path.

26. (a) List any four properties of a colloid and mention any two properties in which colloids differ from suspension.
(b) Why does solution of sodium chloride not show tyndall effect whereas the mixture of water and milk shows?
(c) Write one difference between concentration and solubility? [5]

Ans :

(a) Four properties of a colloid :
(i) Their particles can be seen with powerful microscope.
(ii) They appear to be homogeneous but actually they are heterogeneous.
(iii) They show tyndall effect.
(iv) They can pass through filter paper.

(b) Particles of NaC1 solution, Na^+ and Cl^- are very small and can't scatter light due to honogenous mixture whereas particles of milk are bigger and can scatter light due to its heterogenous mixture.

(c) (i) Concentration is amount of solute dissolved in a unit quantity (mass or volume) of a solution. While solubility is the maximum amount of the solute that can be dissolved in a given amount of the solvent.
(ii) Concentration is expressed as percent by weight or volume, mole fraction, molarity etc. Solubility is the ability of a solute to dissolve in a solvent at given temperature and pressure. It is expressed as grams/ litre or moles/litre.

27. Why is mitochondria called 'powerhouse of cell'? Give three similarities and one difference between mitochondria and plastid. [5]

Ans :

Mitochondria is called the 'powerhouse of cell' because energy required by various chemical activities needed for life is released by mitochondria in the form of ATP. Body uses energy stored in ATP for making new

chemical compounds and for mechanical work.

Three similarities between mitochondria and plastids are:

(a) Both mitochondria and plastids have their own DNA and ribosomes.

(b) Both mitochondria and plastids have more than one membrane layer.

(c) External structure of mitochondria and plastids are same.

S. No	Mitochondria	Plastids
1	Found in all eukaryotic cells	Found in only plant cells

or

Correlate the structure and location with the function in case of:

(a) Simple squamous epithelium

(b) Columnar epithelium

Ans :

(a) **Simple squamous epithelium :** It consists of extremely thin and flat cells forming a delicate lining, e.g. the oesophagus and the lining of the mouth. Skin epithelial pattern of layers, the epithelum is called stratified squamous epithelium.

(b) **Columnar epithelium :** It consists of tall cells which are pillar-1 i ke having elongated nuclei. It is found in the inner lining of the intestine where absorption and secretion occurs. This columnar epithelium facilitates movement across the epithelial barrier.

28. Describe the water cycle with the help of a diagram. [5]

Ans :

The stages involved in a complete water cycle are:
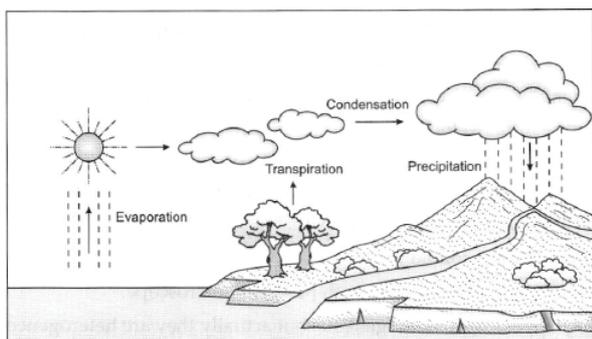
Stage I : Evaporation and Transpiration: The sunlight heats up the water bodies and leads to the evaporation of water. Water bodies might include rivers, lakes, oceans, swamps, etc. Plants and trees also lose water to the atmosphere through transpiration. All this vapour goes up with the rising air currents towards the sky.

Stage II : Condensation : As the vapours rise high, the cooler temperatures make them cool down and turn back into liquid—condensation. Wind and air currents move the moisture around, leading to the formation of clouds.

Stage III : Precipitation : Wind movements cause the clouds particles to collide. As they become water laden, they develop into rain bearing clouds and fall

back onto the earth's surface by the process known as precipitation. This may occur in the form of rain, hail, snow or sleet depending upon the temperature conditions.

Stage IV : Runoff and Infiltration : The precipitation either runs off into oceans, rivers and ground surface or is absorbed into the soil (infiltration).

29. (a) What was missing in Thomson's model of the atom?

(b) Write any two observations of Rutherford's model of atom. [5]

Ans :

(a) In 1911, Rutherford showed that Thomson's model was "wrong": The distribution of positive and negative particles were not uniform. Rutherford showed that the atom contains a small, massive, positively charged nucleus. He also agreed with Nagaoka that the electrons move in circular orbits outside the nucleus.

(b) Two observations of Rutherford's model of atom are:

(i) Most of alpha-rays passed through gold foil undeviated.

(ii) Some alpha-rays deviated through larger angles.

or

(a) Why does an atom of argon have zero valency? Explain using the electronic configuration of argon.

(b) Define valency by taking the examples of magnesium (At. No. = 12) and oxygen (At. No. = 8).

(c) With the help of schematic representation of atomic structure of magnesium and sulphur, explain how electrons are distributed in different orbits.

Ans :

(a) Argon has its octet complete (2, 8, 8). therefore, it cannot gain or loss or share electrons. So, its valency is equal to zero.

(b) Valency is defined as number of electrons lost or gained to become stable. Mg (12) has electronic configuration 2, 8, 2. It can lose two electrons to become stable; therefore, its valency is equal to 2.

(c) (i) Atomic structure of magnesium

Magnesium
$^{24}_{12}Mg$
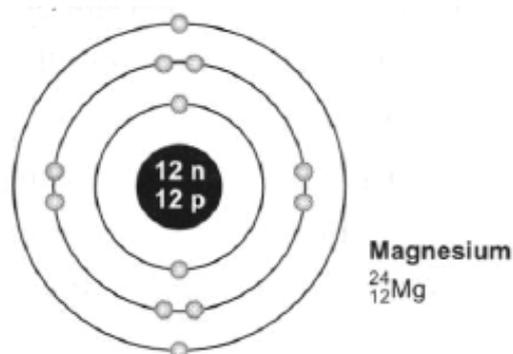
$K = 2, L = 8, M = 2$

(ii) Atomic structure of sulphur
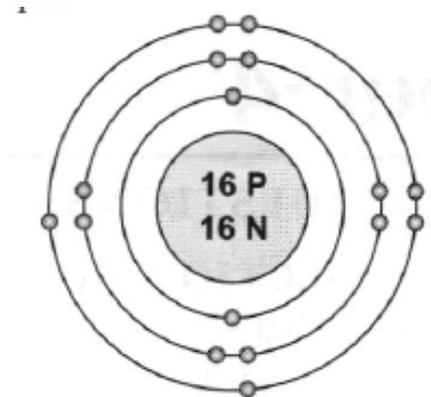
Sulfur $1s^2 2s^2 2p^6 2s^2 3p^4$
K = 2, L = 8, M = 6

30. (a) A stone is allowed to fall from a tower of height 200 m and at the same time another stone is projected vertically upwards from the ground at a velocity of 20 m/s. Calculate when and where the stones will meet.

   (b) The walls of your classroom are in motion but appear stationary. Explain   [5]

Ans :

(a) Assume that the stones will meet after t seconds,
   For the stone thrown downwards, $u = 0$
   By second equation of motion

$$h = ut + \frac{1}{2}at^2 = 0 \times t + \frac{1}{2} \times 10 \times t^2$$

$$h = 5t^2$$

For the stone thrown upwards,

$$u' = 20\,\text{m/s}$$

By second equation of motion,

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

$$= 20 \times t - \frac{1}{2} \times 10 \times t^2$$

$$= 20t - 5t^2$$

$$h + h' = 100\,\text{m}$$

$$5t^2 + 20t - 5t^2 = 100$$

$$20t = 100$$

$$t = 5\ \text{seconds}$$

Therefore, $\qquad h = 5t^2$

$$h = 5t^2$$

$$h = 5 \times (5)^2$$

$$h = 125\,\text{m}$$

The two stones will meet after a time of 5 seconds and a point 125 m from the top of the tower.

(b) The walls of classroom are at rest with respect to us because their relative position remains constant. But to a person in outer space they appear moving as the earth rotates.