CBSE Class 09

Science

Sample Paper 9 (2019-20)

Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

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

Section A

1. Are the electrons stationary in the stationary states?

2. Define atomicity.

3. **Crop Season:** Different crops require different climatic conditions like temperature, moisture and photoperiods to grow well and complete their life cycle.
   The Indian cropping season is classified into two main seasons-(i) Kharif and (ii) Rabi based on the monsoon. The characteristics of these two main corp seasons are:

   i. **Kharif Season:**
      - Summer season from the month of June to October, i.e., during the rainy season.
      - Crops grown in this season require more water.

- Examples of Kharif season crops are Paddy, soybean, pigeon pea, maize, black gram, green gram and rice.

ii. **Rabi Season:**

1. Winter season from the month of November to April.
2. Crops grown in this season require less water.
3. Examples of Rabi season crops are Wheat, gram, peas, mustard and linseed.

Answer the following questions:

i. Mention the various cropping seasons in India.
ii. Differentiate between Rabi and Kharif crop.
iii. Give any two examples of Rabi and Kharif crops.
iv. What is zaid crop? Give example.

4. Animals are the multicellular eukaryotic organisms which belong to the kingdom Animalia.

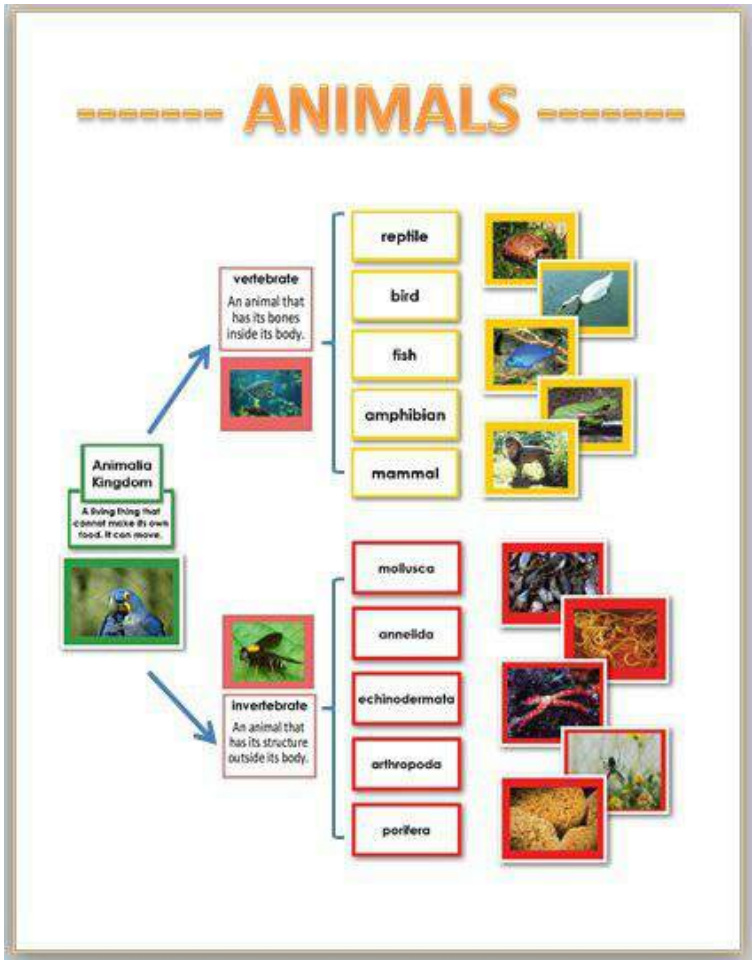
Criteria for classification

Animals are classified on the basis of different features.

- Cellular or tissue level of body organization
- Body symmetry
- Type of body cavity called a coelom
- Presence or absence of segmentation
- Presence or absence of a backbone

Classification of the kingdom Animalia includes Invertebrata and Vertebrata.

Invertebrata: It includes the group of animals that do not possess a vertebral column. It is classified into different phyla such as Porifera, Coelenterates, Platyhelminthes, Nematoda, Annelida, Arthropoda, Mollusca and Echinodermata.
Vertebrata: These are the most advanced group of animals with the true vertebral column and the strong endoskeleton. Vertebrates are grouped into different classes based on bilateral symmetry, notochord, dorsal nerve cord, paired gill pouches, triploblastic, and coelomate. These classes are Pisces, Amphibia, Reptilia, Aves and Mammalia.



Answer the following questions:

i. What is the fundamental difference between invertebrates and vertebrates?
ii. Name the phyla included in Invertebrata.
iii. Give the salient features of the advanced group of animals.
iv. Mention the major classes under vertebrata.

5. Water drops sticking to the wheel come out along the tangential line due to

a. inertia

b. acceleration

c. momentum

d. force

OR

A truck carries sand. Due to hole in the base of truck, significant amount of sand falls continuously. For the same condition of working of the engine, the speed of the truck should

a. increase

b. cannot be found

c. remain the same

d. decrease

6. A fish _____ by squeezing out air, from its _____.

a. dives, floating tube
b. dives, float
c. float, lungs

d. lungs, float

7. Match the following with correct response.

Column A	Column B
(1) Law of conservation of energy	(A) kinetic energy
(2) Stretched rubber band possess	(B) Energy neither be created nor be destroyed
(3) At mean position pendulum attains maximum	(C) Interconvertible

(4) Various energy forms are	(D) Potential energy

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

8. Match the following with correct response.

(1) Amplitude
(2) Time period
(3) Frequency
(4) Velocity

(A) Duration to complete one oscillation
(B) Distance covered by sound in unit time
(C) Number of oscillation in one second
(D) Maximum displacement from mean position

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

OR

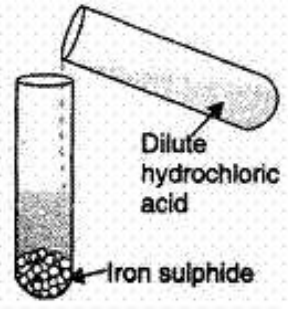
You find your mass to be 42 kg on a weighing machine. Is your mass more or less than 42 kg?

9. Which one of the following yields maximum milk/year?

a. Holstein Friesian
b. Frieswal
c. Sahiwal
d. Red Sindhi

10. In the experiment shown a gas is evolved. Four groups of students have recorded their observations on the gas produced as shown in the following table. Choose the correct set of observations. Note that the positive response are shown by ✓ and

negative by '✗' signs respectively.



a.

Colour of the gas	Odour of the gas	Flammability	Action on lead acetate paper
✗	✓	✗	✓

b.

Colour of the gas	Odour of the gas	Flammability	Action on lead acetate paper
✗	✓	✓	✗

c.

Colour of the gas	Odour of the gas	Flammability	Action on lead acetate paper
✗	✗	✓	✗

d.

Colour of the gas	Odour of the gas	Flammability	Action on lead acetate paper
✓	✓	✗	✓

11. Fat-soluble vitamins are:

    a. A, D, E, K

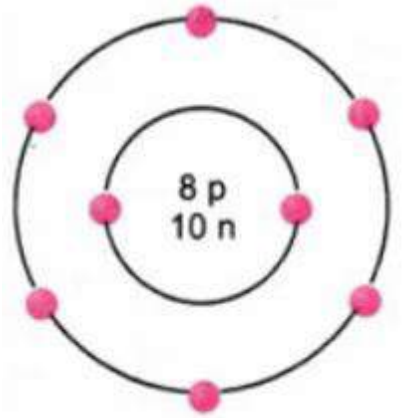
    b. None

    c. A, B, C, D

    d. A, C, D, K

12. The given figure depicts the atomic structure of an atom of an element X. What is the

atomic number of X.



a. 8

b. 2

c. 18

d. 10

OR

Liquid to gas and gas to liquid changes are called:-

a. condensation and vaporisation

b. vaporisation and condensation

c. condensation and sublimation

d. sublimation and condensation

13. **Assertion:** An iron almirah is a solid at room temperature.

Reason: Water can flow and it assumes the shape of the containing vessel.

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

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

c. Assertion (A) is true but reason (R) is false.

d. Assertion (A) is false but reason (R) is true.

14. **Assertion:** A tiger can accelerate from rest at the rate of 4 m/s^2.

    Reason: The velocity attained by it in 10s is 40 m/s.

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

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

    c. Assertion (A) is true but reason (R) is false.

    d. Assertion (A) is false but reason (R) is true.

15. i. Give two advantages of apiculture.
    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.

16. Find the following. Use [Atomic mass of Al = 27 u, C = 12 u, O = 16 u, H = 1 u and N_A = 6.022×10^{23} mol^{-1}]

    i. Number of molecules in 90 g of H_2O.
    ii. Number of moles in 19 g of H_2O_2.
    iii. Formula unit mass of $Al_2(CO_3)_3$.

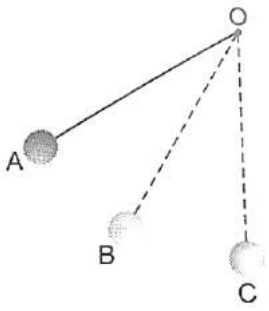
OR

If number of electrons in an atom is 8 and number of protons is also 8, then:

(i) What is the atomic number of the atom?

(ii) What is the charge on the atom?

17. The diagram below shows a pendulum which was released from position A.



a. What form(s) of energy did the pendulum have at
   i. A?
   ii. B?
   iii. C?
b. Eventually, the pendulum would stop moving. Explain what has happened to the initial energy of the pendulum.

18. Parul has gone for a picnic near a lake along with her classmates and teacher. All the children were happy to be in such a beautiful place and started playing. All the children spread the toffee wrappers and empty chips packs in either the lake or the garden. The teacher observed that it was only Parul who collected all these wastes and put them in the dustbins. Teacher was delighted by Parul's act and told everyone to follow Parul's example. Answer the following questions based on the above information:

   i. What values are being promoted by Parul?
   ii. How can throwing waste in the lake affect the environment?
   iii. Suggest some ways by which you can spread awareness about pollution in your school?

OR

Raghu switched from traditional to modern farming practices in which he used large amounts of fertilisers and pesticides to gain an increase in profit.

   i. What are the adverse effects of modern farming?
   ii. What is soil pollution?
   iii. What do you think will be effect on the soil in long run?
   iv. What alternative method could be more beneficial for farming?

19. Which organelle is called 'digestive bag' and why?

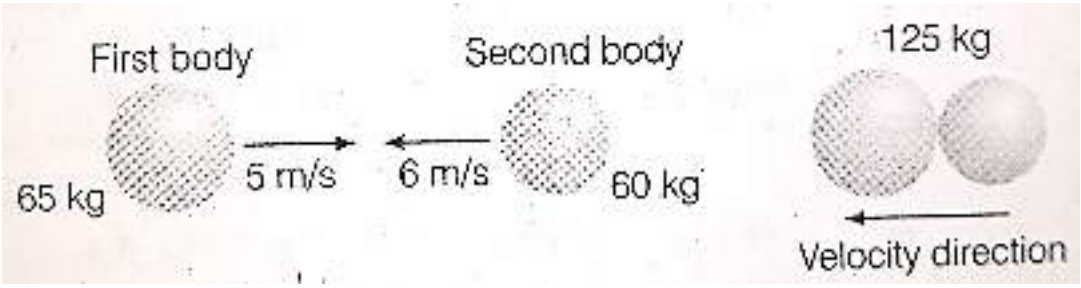
20. Diagrammatically show the difference between the three types of muscle fibres.

21. How will you separate a mixture containing kerosene and petrol which are miscible with each other? The difference in their boiling points is more than 25 °C.

22. A ball thrown up vertically returns to the tower after 6 s. Find

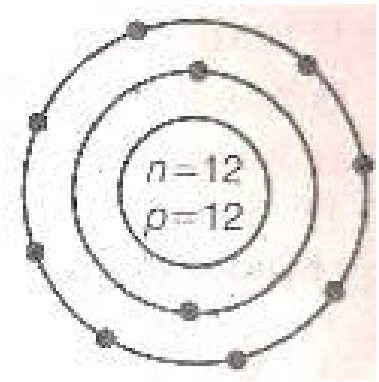
    i. the velocity of the ball with which it was thrown up,
    ii. the maximum height it reaches, and
    iii. the position of the ball after 4 s.

23. Two bodies as shown in the figure collide with each other and join thereafter, with what velocity will they move after combining together?



24. A person holds a bundle of hay over his head for 30 minutes and gets tired. Has he done some work or not? Justify your answer.

OR



    i. Identify the ion from the given figure.
    ii. Write the electronic configuration of the ion and atom mentioned in the figure.
    iii. How do we get the number of protons as 12?

25. Which separation techniques will you apply for the separation of the following?

    i. Sodium chloride from its solution in water.
    ii. Ammonium chloride from a mixture containing sodium chloride and ammonium chloride.
    iii. Small pieces of metal in the engine oil of a car.
    iv. Different pigments from an extract of flower petals.
    v. Butter from curd.
    vi. Oil from water.
    vii. Tea leaves from tea.
    viii. Iron pins from sand.
    ix. Wheat grains from husk.
    x. Fine mud particles suspended in water.

OR

Classify each of the following as a physical or a chemical change. Give reasons.

    i. Drying of a shirt in the sun.
    ii. Rising of hot air over a radiator.
    iii. Burning of kerosene in a lantern.
    iv. Change in the colour of black tea on adding lemon juice to it.
    v. Churning of milk cream to get butter.

26. Give one example of each of the following situations:

    i. Uniformly accelerated motion.
    ii. Motion with uniform retardation.
    iii. Accelerated motion with uniform magnitude of velocity.
    iv. Motion in a direction with acceleration in perpendicular direction.
    v. Motion in which v-t graph is a horizontal line parallel to X-axis.

27. 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.

28. i. State two examples of viral diseases.
    ii. After an injury, an injection is given immediately. What is it and why is it given?

iii. What type of food is advised when we fall sick and why?

OR

What are vertebrates? What are their main features?

29. i. Suppose the mass of the earth somehow increases by 10% without any change in its size. What would happen to your weight?
    ii. Suppose the radius of the earth becomes twice of its present radius without any change in its mass. What will happen to your weight?
30. i. Describe Bohr's model of an atom. Draw a sketch of Bohr's model of an atom with three shells.
    ii. What was the drawback of Rutherford's model of an atom?

OR

i. Which has more number of atoms?
   a. 10 g of nitrogen (N_2)
   b. 10 g of ammonia (NH_3)

ii. Calculate the total number of moles in 0.585 g of sodium chloride.
[Atomic mass of N = 14 u, H = 1 u, Cl = 35.5 u, Na = 23 u]

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Science

Sample Paper 9 (2019-20)

Solution

Section A

1. A stationary state is a pure quantum state with all observables independent of time. No, the electrons are not stationary. Only the energy which is associated with the electrons is stationary or fixed.

2. Atomicity is the number of atoms present in one molecule of a substance.

3. i. The various cropping seasons in India are Rabi crop, Kharif crop and Zaid crop.
   ii. Rabi crops are sown during the winter season which requires less water.
   Kharif crop is sown during summer/rainy season which requires abundant water.
   iii. Examples of Rabi crop- wheat, gram.
   Examples of Kharif crop -paddy, soybean.
   iv. There is a short season between Kharif and Rabi season in the months of March to July. The crops that grow in this season are **Zaid crops**. These crops are grown on irrigated lands and do not have to wait for monsoons. Some examples of Zaid types of crops are pumpkin, cucumber, bitter groud.
4. i. Invertebrates include animals without vertebral column(backbone) and vertebrates are with the vertebral column.
   ii. Invertebrates include different phyla such as Porifera, Coelenterates, Platyhelminthes, Nematoda, Annelida, Arthropoda, Mollusca and Echinodermata.
   iii. The important features include bilateral symmetry, notochord, dorsal nerve cord, paired gill pouches, triploblastic, and coelomate.
   iv. The major classes are Pisces, Amphibia, Reptilia, Aves and Mammalia.
5. (a) inertia

   Explanation: Inertia is the resistance of any physical object to any change in its state of motion. This includes changes to the object's speed, direction, or state of rest.

OR

(a) increase

Explanation: Speed of truck should be increased to cause minimum loss

6. (a) dives, floating tube **Explanation:** In order to **dive**, the fish squeezes out air from its **floating tube**. This in turn increases its density and hence, it settles at the base of the river-bed, etc.
7. (d) 1-B, 2-D, 3-A, 4-C **Explanation:**

   (1) Law of conservation of energy is stated as energy neither be created nor be destroyed but it converted into one form to another form.
   (2) Stretched rubber band possess potential energy.
   (3) At mean position pendulum attains maximum kinetic energy.
   (4) Various energy forms are Inter convertible.

8. (d) 1-D, 2-A, 3-C, 4-B **Explanation:** The maximum displacement of the particles of a medium from their mean positions during the propagation of a wave is called the amplitude of the wave.

   The time required to produce one complete wave (or wave cycle) is called the time period of the wave.

   The frequency of a wave is defined as the number of waves produced per second.

   The distance travelled by a wave in one second is called the velocity of the wave.

   OR

   When we weigh our body, an upward force on it. The upward force is the buoyant force. As a result the body gets pushed slightly upwards, causing the weighing machine to show the value less than the actual value.

9. (a) Holstein friesian **Explanation:** Holstein Friesians are a breed of dairy cattle originating from the Dutch provinces of North Holland and Friesland, and Schleswig-Holstein in Northern Germany and Jutland. They are known as the world's highest-production dairy animals.
10. (a)

Colour of the gas	Odour of the gas	Flammability	Action on lead acetate paper
×	✓	×	✓

Explanation: If we add HCl in FeS it will release H_2S Reaction takes place as follows:

$FeS + 2HCl \rightarrow FeCl + H_2S$

H_2S gas turns lead acetate paper black. It is colourless, has smell of rotten eggs, does not catch fire.

11. (a) A, D, E, K
Explanation: Vitamin A, D, E and K are fat-soluble vitamins whereas vitamin B and C are water-soluble vitamins. Vitamins are classified as either water-soluble or fat-soluble. There are 13 vitamins that the body needs. Vitamins such as vitamins A, D, E, and K are the 4 fat-soluble vitamins. There are 9 water-soluble vitamins (8 B vitamins and vitamin C). Water-soluble vitamins dissolve easily in water and, in general, are readily excreted from the body.
12. (a) 8
Explanation: Atomic number = number of protons = 8

OR

(b) vaporisation and condensation
Explanation: At the boiling point, the particles of a liquid have sufficient kinetic energy to overcome the forces of attraction holding them together and separate into individual particles. And the liquid boils to form a gas.(vaporisation)

When a gas-cooled enough, then its particles lose so much kinetics energy that they slow down, move closer together until they start being attracted to each other, and form a liquid. (condensation).

13. (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
Explanation: Almirah is rigid and has fixed shape. So, it is a solid at room temperature.

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

Explanation: Initial velocity (u) = 0 , acceleration (a) = 4 m/s^2

v = u + at

v = 0 + 4 × 10

v = 40 m/s

15. 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.

16. i. Molar mass of H_2O = 18 g (for 1 mol)

$\because$ 18 gH_2O contains 6.022×10^{23} molecules

$\therefore$ 90 gH_2O will contain $\frac{6.022 \times 10^{23} \times 90}{18}$

$= 3.0110 \times 10^{23}$

$= 3.011 \times 10^{24}$ molecules

ii. Molar mass of $H_2O_2 = 2 \times 1 + 2 \times 16$

= 34 g/mol

$\because$ 34 g of H_2O_2 = 1 mole of H_2O_2

$\therefore$ 19 g of $H_2O_2 = \frac{1}{34} \times 19$ = 0.56 mol

iii. $Al_2(CO_3)_3$. $2 \times 27 + 3 \times 12 + 9 \times 16$

= 54 + 36 + 144 = 234 u

OR

(**i**) **Atomic number** (Z) of a chemical element is the **number of protons** in the nucleus of that atom.

Therefore, atomic number (Z) = number of protons = number of electrons = 8

(**ii**) The atom will be **neutral** (no net charge) as a whole because number of protons (positive charge) is equal to the number of electrons (negative charge).

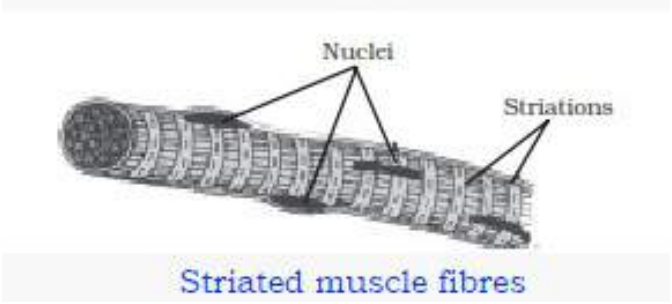
17. a. i. Potential energy
    ii. Potential energy + Kinetic energy
    iii. Kinetic energy
    b. The initial energy is transformed into heat energy when the pendulum bob strikes the air molecules. Thus, the amplitude of pendulum decreases and finally it stops.
18. i. Concern for environment, good manners.
    ii. Throwing waste in the lake will contaminate the water. This will lead to the death of plants and animals in the lake. This polluted water will then become the breeding ground for germs and bacteria which may be disease-causing.
    iii. By organising discussions/setting up cleanliness committees/holding debate and speech contests/organizing cleanliness camps /celebrating Environment day.

OR

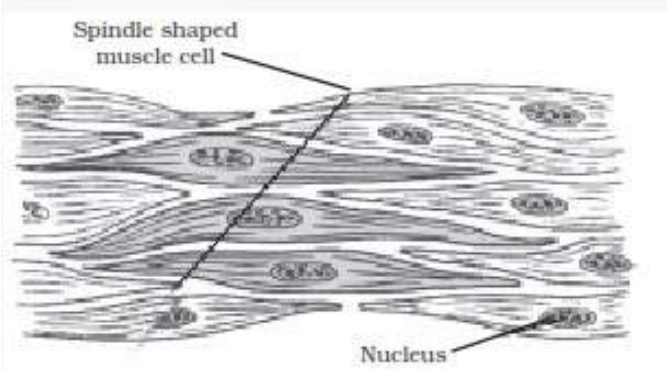
i. The adverse effects of modern farming involves the use of fertilisers and pesticides which leads to soil pollution.
ii. In a long run it will destroy the soil structure by killing the soil microorganism which recycle nutrients in the soil.
iii. Organic farming.

19. Lysosomes are called digestive bags. Lysosomes hold enzymes that were created by the cell. The purpose of the lysosome is to digest things. They contain digestive enzymes which break down the organic material present in the cell.

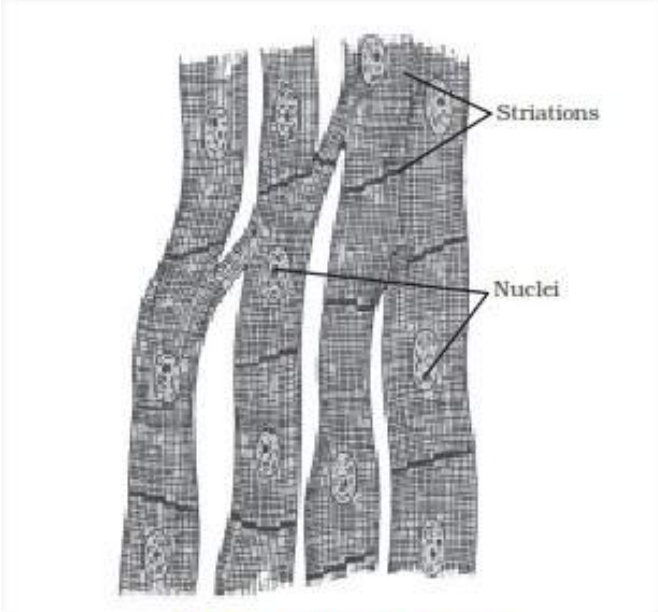
20. The three types of muscle fibres are - striated muscles, smooth or unstriated muscles and cardiac muscles.



Striated muscle fibres



Smooth muscle fibres



Cardiac muscle fibres

21. Since the difference in the boiling points of kerosene and petrol is more than 25 °C, they can be separated by fractional distillation. The process of separation of two miscible liquids by the process of distillation, by making use of the difference in boiling points, is called fractional distillation.

    Method to separate a mixture containing kerosene and petrol:-

    1) A fractionating column is attached to the set up used for distillation.
    The fractionating column gives the effect repeated distillation by offering resistance to the passage of kerosene vapours.

    2) The design of the fractionating column is such that vapours of the liquid with higher boiling point (kerosene in this case) are preferentially condensed inside the column and they are not allowed to pass to the Liebig's condenser.

3) The vapours of the liquid with lower boiling point (petrol) pass on to the Liebig's condenser where they condense. The condensed petrol is collected in the first receiver.

4) The first receiver is replaced by another receiver to collect kerosene when the reading of the thermometer in the set up starts rising.

22. i. Time taken by ball to reach maximum height(t) = 6/2 = 3 s

v = u + gt

$0 = u + (-9.8) \times 3$

u = 29.4 m/s (the velocity with which it was thrown up)

ii. The maximum height it reaches: therefore $h = ut + {}^1\!/_2 gt^2$

$= 29.4 \times 3 + {}^1\!/_2 \times (-9.8) \times 3^2$

= 88.2 - 44.1

= 44.1 m

iii. Its position after 4 s will be:

Since in first 3 s it will reach the maximum height and in next 1 s it will start a free fall so, u = 0, t =1

$h = ut + {}^1\!/_2 gt^2$

$= 0 \times t + {}^1\!/_2 \times 9.8 \times 1$ = 4.9 m

therefore, after 4s the position of ball = 44.1 - 4.9 = 39.2 m

23. Given, m_1 = 65 kg, m_2 = 60 kg

u_1 = +5 m/s positive direction

u_2 = -6 m/s negative direction, v = ?

Total momentum of two bodies before collision = $m_1u_1 + m_2u_2$

= 65 $\times$ 5 + 60 $\times$ (-6) = -35 kg-m/s

If v is the velocity of two combined bodies.

Agter collision, the total momentum will be = $m_1v_1 + m_2v_2$ [$\because$ $v_1 = v_2 = v$]

=(65 + 60) kg $\times$ v m/s = 125 v kg-m/s

$\therefore$ According to the law of conservation of momentum,

$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2 \Rightarrow$ -35 = 125v

$\therefore\ v = \frac{-35}{125} = -0.28\ m/s$

So, two bodies will move with a velocity of 0.26 m/s in the direction of the second body.

24. When a person holds a bundle of hay over his head for 30 minutes and gets tired he applies force in upward direction and displacement of bundle of hay is in forward direction which is perpendicular to the direction of force applied, therefore, displacement is zero

$W = F \times sCos\theta$
$= F \times sCos90^0$
$= F \times 0 = 0$
No work done.

OR

i. Mg^{2+} ion is mentioned in the given figure.
ii. The electronic configuration of Mg^{2+} ion = 2, 8 and that of $_{12}Mg$ atom = 2, 8, 2
iii. Number of protons in Mg atom = 2 + 8 + 2 = 12

25. i. Evaporation and crystallization
ii. Sublimation
iii. Filteration
iv. Chromatography
v. Centrifugation
vi. By using separating funnel
vii. Filteration
viii. Magnetic separation
ix. Winnowing
x. Loading and decantation

OR

i. It is a physical change because moisture in the shirt is converted from its liquid state to gaseous state because of the heat of the Sun.
ii. It is a physical change because water in the radiator is converted from a liquid state to gaseous state.

iii. It is a chemical change because combustion of kerosene occurs and new products are formed.
iv. It is a chemical change because there is a reaction between citric acid present in lemon and the compounds of the tea resulting in the formation of new products.
v. It is a physical change because the cream suspended in milk is separated by churning (centrifugation).

26. i. Object dropped down from a height towards the surface of the earth.
ii. Object thrown up with a velocity, retards uniformly.
iii. Uniform circular motion, say planetary motion.
iv. A bullet fired horizontally from a rifle, has acceleration in downward direction (due to gravity).
v. A car moving with uniform velocity along a straight line.

27. 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.

28. i. AIDS and dengue fever.
ii. The injection is of anti-tetanus serum. It is given immediately after injury because the bacteria that cause tetanus enter the body through a cut or wound in the skin. So, to avoid its infection, the injection is given immediately.
iii. Bland and nourishing food is advised during sickness because such food is easily digestible, provides sufficient energy and nutrients for the regeneration of cells and tissues.

OR

Vertebrates are the animals included in the phylum Chordata in which the spinal chord is made of small vertebrae.

There are five classes of vertebrates:

(i) Pisces (ii) Amphibians (iii) Reptiles (iv) Aves and (v) Mammalia.

The main features of vertebrates are given as under:

(i) They possess a solid notochord.

(ii) The body has bilateral symmetry.

(iii) They have a true vertebral column.

(iv) They have a dorsal hollow nerve cord.

(v) They are triploblastic.

(vi) They respire through lungs and the aquatic forms through gills.

(vii) They are coelomate.

29. i. We know that, Original weight, $W_0 = mg = \frac{GMm}{R^2}$, where M is the mass of the earth, m= mass of body.

Let the new mass of earth = M'

According to question, New mass, M' = M + 10% of M = M + $\frac{10}{100}$ M = M + $\frac{M}{10}$ = $\frac{11M}{10}$ = 1.1M

∴New weight, $W_n = \frac{GM'm}{R^2} = \frac{G \times 1.1Mm}{R^2}$

Now, Ratio of new weight to original weight = $\frac{New\ weight}{Original\ weight} = \frac{1.1GMm/R^2}{GMm/R^2}$ = 1.1

New weight becomes 1.1 times the original weight of body.

i.e., weight of body will increase by 10%.

ii. Again, Original Weight, $W_0 = \frac{GMm}{R^2}$, where R is the radius of the earth.

According to question, when R changes to 2R, the new weight is given by,

New weight, $W_n = \frac{GMm}{4R^2}$

Now, Ratio of new weight to original weight = $\frac{New\ weight}{Original\ weight} = \frac{GMm/4R^2}{GMm/R^2} = \frac{1}{4}$

Therefore, New weight becomes $\frac{1}{4}$ times of original weight

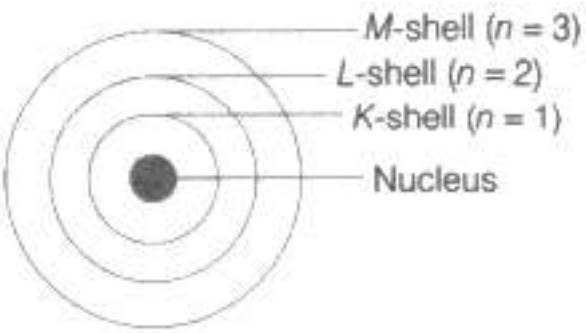
30. i. To overcome the objections raised against Rutherford's model of the atom, Neils Bohr put forward the following postulates about the model of an atom:

a. An atom consists of the positively charged nucleus around which electrons

revolve in discrete orbits, i.e. electrons revolve in certainly permissible orbits and not just in any orbit.

b. Each of these orbits is associated with a certain value of energy. Hence, these orbits are called energy shells or energy levels. As the energy of an orbit is fixed (stationary), the orbit is also called stationary state.
c. Starting from the nucleus, energy levels (orbits) are represented by numbers (1, 2, 3, 4, etc.) or by alphabets (K, L, M, N, etc.).
d. The electrons present in the first energy level (E_1) have the lowest energy. Energies increases on moving towards outer energy levels.
e. The energy of an electron remains the same as long as it remains in discrete orbit and it does not radiate energy while revolving.
f. When energy is supplied to an electron, it can go to higher energy levels. While an electron falls to a lower energy level when it radiates energy.

Three shells or orbits are presented by the letters K, Z, M (or the numbers, n = 1, 2, 3)



ii. The drawbacks of Rutherford's model of an atom are:
   a. It could not explain the stability of an atom when charged electrons are moving under the attractive force of the positively charged nucleus.
   b. Rutherford's model could not explain the distribution of electrons in the extra nuclear portion of the atom.

OR

i. a) Molecular mass of nitrogen = $2 \times 14 = 28$ u

Mass of 1 mole of nitrogen = 28 g

Number of molecules in 28 g of nitrogen = 6.022×10^{23}

Number of molecules in 1 g of nitrogen = $\frac{6.022 \times 10^{23}}{28}$

Number of molecules in 10g of nitrogen = $\frac{6.022 \times 10^{23}}{28} \times 10 = 2.15 \times 10^{23}$

Number of atoms in 10g of nitrogen (N_2) = $2 \times 2.15 \times 10^{23} = 4.30 \times 10^{23}$

b) Molecular mass of ammonia = $14 + 3 \times 1 = 17$ u

Mass of 1 mol of ammonia = 17 g

Number of molecules in 17 g of ammonia = 6.022×10^{23}

Number of molecules in 1 g of ammonia = $\frac{6.022 \times 10^{23}}{17}$

Number of molecules in 10 g of ammonia = $\frac{6.022 \times 10^{23}}{17} \times 10 = 3.54 \times 10^{23}$

Number of atoms in 10 g of ammonia (NH_3) = $4 \times 3.54 \times 10^{23} = 1.46 \times 10^{24}$

Thus, 10 g of NH_3 contains more number of atoms.

ii. Molecular mass of sodium chloride (NaCl) = 23 + 35.5 = 58.5 u

58.5 g of sodium chloride (NaCl) = 1 mol

1 g of sodium chloride (NaCl) = $\frac{1}{58.5}$ mol

0.585 g of sodium chloride (NaCl) = $\frac{1}{58.5} \times 0.585$ mol = 0.01 mol