CBSE Class 09 Science
Sample Paper 02 (2020-21)

Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

i. The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.

ii. Section–A - question no. 1 to 20 - all questions and parts thereof are of one mark each. These questions contain multiple-choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.

iii. Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should in the range of 30 to 50 words.

iv. Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should in the range of 50 to 80 words.

v. Section–D – question no. 34 to 36 are long answer type questions carrying 5 marks each. Answers to these questions should be in the range of 80 to 120 words.

vi. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

vii. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. Fog and cloud are both colloidal in nature. How do they differ?

OR

Which separation techniques will you apply for the separation of the fine mud particles suspended in water.

2. Is fresh air which we breathe in, a pure substance in terms of science?

3. Match the following with the correct response:

(a) Robert Brown	(i) Cell
(b) Purkinje	(ii) Nucleus
(c) Robert Hooke	(iii) Cell theory
(d) Schleiden	(iv) Protoplasm

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

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

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

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

4. Why is virus an exception of cell theory?

5. What did Galileo conclude on the basis of his experiments on the motion of objects?

6. What is the outermost layer found in the plant cell?

<p align="center">OR</p>

Name any cell organelle which is non-membranous.

7. What type of disease can be prevented through vaccination?

8. Will ^{35}Cl and ^{37}Cl have different valencies? Justify your answer.

9. Name the organelle which show the analogy as power house of the cell.

<p align="center">OR</p>

A person takes concentrated solution of salt. After sometime he starts vomiting. What is the phenomenon responsible for such a situation? Explain.

10. What types of mixtures are represented by the Air containing suspended particles.

11. What is essential to describe the position of an object?

<p align="center">OR</p>

Define uniform speed.

12. Define chronic disease.

13. Does Newton's third law apply to a system where bodies do not actually touch each other?

14. **Assertion:** A school bag has wide straps.

Reason: The weight of the books may spread over a large area of the child's shoulder.

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

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

c. A is true but R is false.

d. A is false but R is true.

15. **Assertion:** Disease can be defined as an impairment of the normal state of the living organism.

Reason: The tissues make up physiological systems or organ systems that carry out body functions.

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

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

c. A is true but R is false.

d. A is false but R is true.

OR

Assertion: Health is described as the state of complete physical, mental, and social well being.

Reason: Being healthy means that one feels good physically, has a positive outlook.

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

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

c. A is true but R is false.

d. A is false but R is true.

16. **Assertion:** An object can have constant speed but variable velocity.

Reason: Speed is a scalar but velocity is a vector quantity.

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.

17. **Read the passage and answer any four question:**

Mixtures are constituted by more than one kind of pure form of matter. Sodium

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

Solute + Solvent -> Solution

i. Brass is a mixture of:

    a. 30% zinc and 70% copper

    b. 70% zinc and 50% copper

    c. 60% zinc and 70% copper

    d. 30% zinc and 40% copper

ii. Tincture of iodine solution is made by dissolving:

    a. iodine in potassium iodide

    b. iodine in vaseline

    c. iodine in water

    d. iodine in alcohol

iii. In a water-sugar solution:

    a. water is solute and sugar is solvent

    b. water is solvent and sugar is solute

    c. water is solute and water is also solvent

    d. none of these

iv. The particles of a solution are smaller than:

    a. 1 nm in diameter

    b. 5 nm in diameter

    c. 6 nm in diameter

  d. 10 nm in diameter

v. Which of the following statements are true for pure substances?

  a. Pure substances contain only one kind of particle.

  b. Pure substances may be compounds or mixtures.

  c. Pure substances have different compositions throughout.

  d. Pure substances can be exemplified by all elements other than nickel.

18. **Read the passage and answer any four questions:**

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

 i. Identify the type of cell in the given figure

  a. Tracheids

  b. Companion cells

  c. Sieve tubes

  d. Vessels

 ii. In desert plants, the rate of water loss gets reduced due to the

  a. cuticle

  b. stomata

  c. lignin

  d. suberin

iii. Long tree has several branches. The tissue that helps in the sideways conduction of water in the branches is
    a. collenchyma
    b. xylem parenchyma
    c. parenchyma
    d. xylem vessels

iv. The dead element present in the phloem is
    a. companion cells
    b. phloem fibres
    c. phloem parenchyma
    d. sieve tubes

v. Which of the following statement is not related to the cardiac muscle?
    I. they show rhythmic contraction and relaxation throughout life.
    II. they do not work according to our will, so they are called involuntary muscle.
    III. they are non-straited, multinucleated and branched muscles.
    IV. the contraction and relaxation of the heart muscle helps to pump and distribute blood to different parts of the body
    a. (I) and (II)
    b. (II) and (III)
    c. Only (IV)
    d. Only (III)

19. **Read the passage and answer any four question**

Life is impossible without energy. The Sun is the biggest natural source of energy for us. An object that possesses energy can exert a force on another object. When this happens, energy is transferred from the former to the latter. The second object may move as it receives energy and therefore does some work. Thus, the first object had the capacity to do work. This implies that any object that possesses energy can do work. The energy possessed by an object is thus measured in terms of its capacity of doing work. According to the law of conservation of energy, the total energy before and after the transformation remains the same.

    i. One joule work is said to be done when
        (I) a force of 1 N displaces a body by 1 cm
        (II) a force of 1 N displaces a body by 1 m

(III) a force of 1 dyne displaces a body by 1 m

(IV) a force of 1 dyne displaces a body by 1 cm.

Choose the correct option among the following:

   a. (I) and (III)

   b. (I) and (IV)

   c. (II) and (III)

   d. Only (II)

ii. Energy can neither be_____nor be _____ it can only be transformed from one form to another.

   a. created, destroyed

   b. formed, reversed

   c. invented, discovered

   d. none of these

iii. 1KJ us equal to

   a. 1000J

   b. 200J

   c. 3000J

   d. 500J

iv. The head of a nail hammered into the wooden plank becomes hot. This is because of:

   a. conversion of K. E into heat energy.

   b. conversion of P. E into heat energy.

   c. conversion of chemical energy into heat energy.

   d. conversion of mechanical energy into heat energy.

v. Whenever energy gets transformed, the total energy

   a. became zero

   b. remain unchanged

   c. changes

   d. none of these

20. **Read the passage and answer any four questions:**

The electrons present in the outermost shell of an atom are known as the valence electrons. It was observed that the atoms of elements, completely filled with 8 electrons in the outermost shell. An outermost-shell, which had eight electrons was

said to possess an octet. The number of electrons gained, lost or shared so as to make the octet of electrons in the outermost shell. Protons are present in the nucleus of an atom. It is the number of protons of an atom, which determines its atomic number. The mass of an atom is practically due to protons and neutrons alone. The mass number is defined as the sum of the total number of protons and neutrons present in the nucleus of an atom. It is denoted by 'A'.
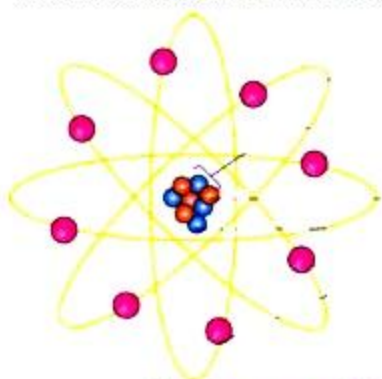
The Structure of Atom

i. How many electrons are present in the M-shell of an element with atomic number 20?

   a. 5

   b. 8

   c. 12

   d. 18

ii. Which of the following statement is always correct?

   a. An atom has an equal number of electrons and protons.

   b. An atom has an equal number of electrons and neutrons.

   c. An atom has an equal number of protons and neutrons.

   d. An atom has an equal number of electrons, protons and neutrons.

iii. The number of electrons in an element X is 15 and the number of neutrons is 16. Which of the following is the correct representation of the element?

   a. $^{31}X_{15}$

   b. $^{31}X_{16}$

   c. $^{16}X_{15}$

   d. $^{15}X_{16}$

iv. An atom with 3 protons and 4 neutrons will have a valency of

   a. 3

b. 7

c. 1

d. 4

v. Which of the following are true for an element?

I. Atomic number = number of protons + number of electrons

II. Mass number = number of protons + number of neutrons

III. Atomic mass = number of protons = number of neutrons

IV. Atomic number = number of protons = number of electrons

a. (I) and (II)

b. (I) and (III)

c. (II) and (III)

d. (II) and (IV)

Section B

21. A solution of H_2SO_4 acid is labeled as 95 percent. What mass of this solution should be diluted with water to get 5 L of solution containing 10 g of H_2SO_4 per litre?

OR

Which of the tubes in Fig (a) and (b) will be more effective as a condenser in the distillation apparatus?

(a)   (b)
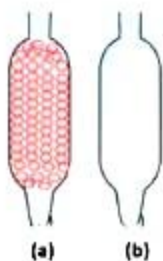
22. A compound was found to have the following percentage composition by mass Zn = 22.65%, S = 11.15%, H = 4.88%, O = 61.32%. The relative molecular mass is 287g/mol. Find the molecular formula of the compound, assuming that all the hydrogen in the compound is present in water of crystallizations.

23.

a. Label X and Y

b. What is the function of X?

c. What is the composition of Y?

d. Identify the above diagram and what is its common name?

OR

What would happen if the plasma membrane ruptures or breaks down.

24. Daniel is not keeping happy and is unable to focus on studies. His friend Raj observed the same and inquired Daniel. Raj was told by Daniel that his younger brother is not keeping good health. His neck has swollen. The fact that Daniel's family was not including iodised salt in their diet came to light. Raj immediately suggested certain measures and insisted that Daniel's brother must see the doctor without any delay.
    1. What values are displayed by Raj?
    2. What can be possibly the disease from which Daniel's brother is suffering?
    3. Name the element whose isotope is used in the treatment for the disease.

25. A car travels a certain distance with a speed of 40 kmh^{-1} and returns with a speed 40 kmh^{-1}. Calculate the average speed for the entire journey?

26. Sony says that the acceleration in an object could be zero even when several forces are acting on it. Do you agree with her? Why?

Section C

27. A boy on a cliff 49 m high drops a stone. One second later, he throws a second stone after the first. They both hit the ground at the same time. With what speed did he throw the second stone?

OR

Suppose that the radius of the earth becomes twice of its original radius without any change in its mass. Then what will happen to your weight?

28. Which would have greater effect on kinetic energy of an object - doubling the mass, or doubling the velocity?

29. Which of the following are tri-atomic and tetra-atomic molecules? CH_3Cl, $CaCl_2$, NH_3, PCl_3, P_2O_5, H_2O, C_2H_5OH

30. How are acute diseases different from chronic diseases?

31. The element sulphur has atomic number 16, and mass number 32. State the number of protons, electrons and neutrons in it. Give the arrangement of the electrons in

different energy shells. What is the valency of the element ?

32. What happens when cell is placed in -

    (a) Hypertonic solution

    (b) Hypotonic solution

    (c) Isotonic solution

33. Suppose a ball is thrown vertically upward from a position P above the ground. It rises to the highest point Q and returns to the same point P. What is the net displacement and distance travelled by the ball?

Section D

34. Describe Newton's third law of motion.

OR

    i. State second law of motion.

    ii. A bus starts from the stop and take 20 second to get the speed of 10m/s. If the mass of the bus along with passengers is 10000 kg, calculate the force applied by the engine of bus to push the bus at the speed of 10m/s.

35. List the characteristics of cork. How are they formed? Mention their role.

36. The following questions are about one mole of sulphuric acid [H_2SO_4].

    a) Find the number of gram hydrogen atoms in 1 mole of [H_2SO_4]?

    b) How many atoms of hydrogen does it have?

    c) How many atoms (in grams) of hydrogen are present for every gram atom of oxygen in it?

    d) Calculate the number of atoms in H_2SO_4?

OR

    a. Write the postulates of Dalton's atomic theory (Any three).

    b. What is the difference between the molecules of an element and the molecule of a compound?

Solution

Section A

1. Fog and cloud are the examples in which liquid is the dispersed phase and gas (air) is the dispersion medium. The only difference between them is that clouds are formed in the upper atmosphere while fog gets formed in the region close to earth.

OR

Sedimentation : As a result of sedimentation, mud particles will settle as precipitate. It can be separated later on by filtration or decantation

2. No, it is not a pure substance but it is a homogeneous mixture of several gases (e.g., nitrogen, oxygen, carbon dioxide, water vapours etc.).

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

   Explanation: While the nucleic part of the cell had been observed by Leeuwenhoek in 1682, it was Robert Brown who named it the "cell nucleus". In 1839, Johann Evangelist Purkinje coined the term 'protoplasm' for the fluid substance of a cell. Robert Hooke observed the microscopic structure of the bark of a cork tree and in doing so, discovered and named the cell – the building block of life. The 'Cell theory' was proposed by Matthias Jakob Schleiden and Theodor Schwann.

4. Virus do not have any membrane and therefore do not show characteristics of life until and unless they enter a living organism and utilizes their cell machinery to increase their number. So cell theory is not true for virus.

5. A body continues to move with the same velocity if no unbalanced force acts on it.It stays at rest or moves in a straight line with constant speed, i.e. it will remain unaccelerated.

6. Cell wall

OR

Ribosome

7. Protection againts deseases like smallpox, rabies, polio, diphtheria, chickenpox and hepatitis is provided through vaccination. It has been possible to eradicate smallbox from all regions of the world through a massive vaccination programme.

8. ^{35}Cl and ^{37}Cl are isotopes of the same element - chlorine. Isotopes have the same number of electrons. Hence, their valencies do not differ. They have the same valency.

9. The organelle which shows the analogy as a powerhouse of the cell is Mitochondria.

OR

Solution of salt is hypertonic solution, so it causes irritation and excessive dehydration in stomach due to exosmosis, which make the person uncomfortable causing reverse movements and thus vomiting.

10. Air containing suspended particles is an heterogeneous mixture.

11. We need to specify a reference point called the origin.

OR

The speed of an object is said to be uniform speed if it travels equal distances in equal intervals of time.

12. A disease which lasts for many years is called chronic disease. Some of the chronic diseases may last for the entire life. A chronic disease often results in debility. Example: arthritis, tuberculosis, diabetes, hypertension, etc.

13. Yes, whenever the bodies are in actual contact or even if there is an interaction between the bodies (e.g., attraction or repulsion between two magnets, charges, etc.), Newton's third law is applicable.

14. (a) Both A and R are true and R is the correct explanation of assertion.
Explanation: A school bag has wide straps so that the weight of the books may spread over a large area of a child's shoulder producing less pressure.

15. (b) Both A and R are true but R is not the correct explanation of assertion.
Explanation: The disease can be defined as an impairment of the normal state of the living organism that disturbs or modifies the performance of the vital functions. The tissues make up physiological systems or organ systems that carry out body functions.

OR

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

Explanation: Health is described as the state of complete physical, mental, and social well being. Thus, being healthy means that one feels good physically, has a positive outlook and is able to cope with social and mental pressures without much difficulty.

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

    Explanation: Since velocity is a vector quantity, hence as its direction changes keeping magnitude constant, velocity is said to be changed. But for constant speed in equal time interval distance travelled should be equal.

17. i. (a) 30% zinc and 70% copper
    ii. (d) iodine in alcohol
    iii. (b) water is solvent and sugar is solute
    iv. (a) 1 nm in diameter
    v. (a) Pure substances contain only one kind of particle.

18. i. (a) tracheids
    ii. (a) cuticle
    iii. (d) xylem vessels
    iv. (b) pholem fibers
    v. (d) only (III)

19. i. (d) Only (II)
    ii. (a) 1000J
    iii. (a) created, destroyed
    iv. (a) conversion of K. E into heat energy.
    v. (b) remain unchanged

20. i. (b) 8
    ii. (a) An atom has equal number of electrons and protons.
    iii. (a) $^{31}X_{15}$
    iv. (c) 1
    v. (d) (II) and (IV)

Section B

21. The concentration of the acid is given as 95 percent.

    This means that 95 g of H_2SO_4 is present in 100 g of the acid solution.

1 L of the diluted H_2SO_4 solution should contain 10 g of H_2SO_4.

Therefore, 5 L of the diluted solution should contain 50 g of H_2SO_4.

50 g of H_2SO_4 will be present in $\frac{50 \times 100}{95}$ g of the solution

or 50 g of H_2SO_4 will be present in 52.63 g of the solution.

Therefore, 52.63 g of the given solution should be diluted with water to get 5 L of solution containing 10 g of H_2SO_4 per litre.

<div align="center">OR</div>

The tube in figure (a) will be more effective as a condenser in the distillation apparatus.

This is because due to the presence of beads in the tube (a) will give a large surface area as compared to the tube in which there are no beads. And, the tube with large surface area leads to effective cooling. Thus, tube (a) will be the more effective condenser in the distillation apparatus. A condenser condenses steam to water in a distillation process. It converts gases into liquids by cooling them.

22. Zn : S:O:H = $\frac{22.65}{65}$: $\frac{11.15}{32}$: $\frac{61.32}{10}$: $\frac{4.88}{1}$

= 0.3485:0.3484:3.833:4.88

To obtain an integral ratio, we divide by smallest number

$= \frac{0.3485}{0.3484}$: $\frac{0.3484}{0.3484}$: $\frac{03.833}{0.3484}$: $\frac{4.88}{0.3484}$

= 1 : 1 : 11 : 14

∴ empirical formula is Zn $SO_{11}H_{14}$

Let Molecular formula be $(ZnSO_{11}H_{14})_n$

RMM for the molecular = n(65 + 32 + (11*16) + 14

Formula = 287

287n = 287

n = 1

∴ **Molecular formula is Zn $SO_{11}H_{14}$**

23. a. X- crista Y- matrix.

   b. A crista is a fold in the inner membrane of a mitochondrion. Function of X is to increase surface area of inner membrane for ATP Synthesis.

   c. Composition of Y. It contains the mitochondrial DNA in a structure called a

nucleoid. It contains ribosomes that produce proteins used by the mitochondrion. It contains granules of ions that appear to be involved in the ionic balance of the mitochondrion.

d. Mitochondrion (Cut lengthwise). Common Name. Powerhouse of cell.

<div align="center">OR</div>

The plasma membrane provides shape and support to the cell. It is a selectively permeable membrane and keeps a check on the movement of substances in and out of the cell by the process of diffusion or osmosis.If the plasma membrane is ruptured, then the cell might leak out its organelles to the surrounding medium and the activities inside the cell will be interrupted, further leading to the cell dying.

24.   i. Caring for his friend, awareness, empathy.

    ii. Goiter.

  iii. Iodine.

25. Given v_1 = 50 kmh^{-1} and v_2 = 490 kmh^{-1}

Let S be the distance. Therefore total distance travelled by the body is = S + S = 2S

Now time taken for the first motion $t_1 = \dfrac{S}{V_1} = \dfrac{S}{50}$

Time taken for the second motion $t_2 = \dfrac{S}{V_2} = \dfrac{S}{40}$

Total time taken t = t_1 + t_2 = $\dfrac{S}{50} + \dfrac{S}{40}$

Hence average speed V_{av} =

$\dfrac{Total\ distance\ travelled}{Total\ time\ taken} = \dfrac{2S}{t} = \dfrac{2S}{\dfrac{S}{40} + \dfrac{S}{50}} = 44.5\ kmh^{-1}$

26. Yes, Sony is right because if several forces acting on an object are balanced forces, i.e., their resultant is zero (i.e., $\Sigma F = 0$), then there is no acceleration of the object.

This may be seen as follows:

From Newton's second law, $\Sigma F = ma$

If $\Sigma F = 0$, ma = 0 or acceleration, a = 0

<div align="center">**Section C**</div>

27. For the first stone, we are given,

u = 0 ms^{-1}, h = 49 m

Using the relation, S = ut + $\dfrac{1}{2}$ at^2 we have

$49 = 0 \times t + \frac{1}{2} \times 9.8 \times t^2 \Rightarrow t^2 = \frac{98}{9.8} = 10 \Rightarrow t = \sqrt{10} = 3.16$ s

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

For the motion of the second stone: The second stone was thrown one second after the first stone. But, both the stones reach the ground at the same time. Thus, the time taken by the second stone to reach the ground is one second less than that taken by the first stone. So,

$t_2 = t - 1 = (3.16 - 1)$ s = 2.16 s

Hence for the second stone, we have

U =? ms^{-1}, g = 9.8 ms^{-2}, h = 49, t = 2.16 s

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

$49 = u \times 2.16 + \frac{1}{2} \times 9.8 \times (2.16)^2 \Rightarrow 49 - 22.86 = 2.16$ u

or $26.14 = 2.16$ u $\Rightarrow \frac{26.14}{2.16} = 12.10$ ms^{-1}

Thus, the second stone was thrown downward with a speed of 12.1 ms^{-1}.

OR

We know that F = $\frac{GMm}{R^2}$ as a weight of a body is the force with which a body is attracted towards the earth,

$\therefore$ W = mg = $\frac{GMm}{R^2}$, M = mass of earth, m = mass of body, R = radius of earth, G = gravitational constant.

According to question, If the radius of the earth (R') becomes twice of its original radius(R),

Then, New weight, W' = $\frac{GMm}{R'^2} = \frac{GMm}{4R^2} = \frac{W}{4}$

i.e., the weight will be reduced to one-fourth of the original weight of body.

28. We know that KE $\propto$ m and KE $\propto v^2$

Therefore, by doubling the mass, the kinetic energy doubles, while by doubling the velocity, the kinetic energy increases four times. Therefore, doubling the velocity will have a greater effect on the kinetic energy of an object.

29. (i) Tri-atomic molecules are $CaCl_2$, H_2O.

(ii) Tetra-atomic molecules are NH_3, PCl_3.

30. _____

Acute Diseases	Chromic Diseases
1. Last for short periods of time, *e.g.,* common cold.	1. Last for a long time, even life-time, *e.g.,* elephantiasis.
2. Cause major effects on general health in a very short time.	2. It takes a long time to cause major effects on general health.
3. Feeling of tiredness does not occur all the time.	3. In case of chronic disease, one feels tired all the time.
4. Weight-loss does not occur and one does not become short of breath.	4. Weight-loss occurs and one becomes short of breath.
5. Acute diseases do not have long-term effects.	5. Chronic disease have long-term effects.

31. Atomic number = 16, and mass number = 32

No. of protons = Atomic number = 16

No. of electrons = No. of protons = 16

No. of neutrons = Mass no. – no. of protons

= 32 – 16 = 16

Electronic arrangement = K(2), L(8), M(6)

Valency is the combining capacity of an element.

Last orbit consist of 6 electron, so it can easily accept two electron to complete his octet.

Valency of the element = 8 – 6 = 2

32. (a) Cell will shrink due to exosmosis.

(b) Cell will swell up due to endosmosis

(c) There will be no net movement of solvent. Hence, there will be no change in the shape and size of the cell.

33. Net displacement is zero because the ball has returned back to the ground (original position). Distance travelled by the ball is twice the distance between position P and Q i.e. PQ+QP = 2PQ

Section D

34. According to Newton's third law of motion, 'To every action, there is an equal and opposite reaction; action and reaction forces act on different bodies.'

When an object, say A, exert a force (action) on another object, say B, then B also exerts a force (reaction) on the A. These two forces are always equal in magnitude but

opposite in direction.
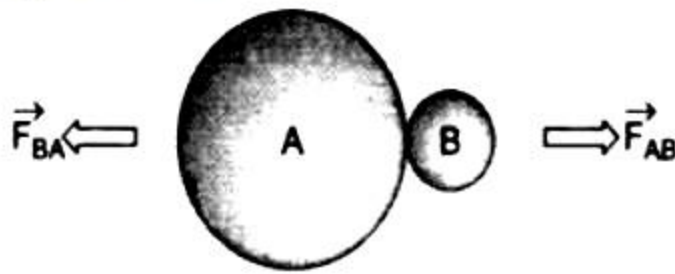
Newton's third law

As shown in the above figure, if F_{AB} be the force exerted by body A on B and F_{BA} is the force exerted by B on A, then according to Newton's third law of motion,

$$\vec{F}_{AB} = -\vec{F}_{BA}$$

or, Force on B by A = Force on A by B

or, Action = Reaction

This law clarifies that a single force can never exist and that the forces always exist in pairs. The two opposing forces are known as action and reaction. The forces of action and reaction always act on two different bodies.

<div align="center">OR</div>

Newton's Second Law of Motion: The rate of change of momentum is directly proportional to the force applied in the direction of force.

According to the question:

Initial velocity (u) = 0, final velocity (v) = 10m/s, time (t) = 20 second, Mass (m) = 10000 kg,

Therefore, force (F) = ?

We know that force (F) = $m\dfrac{(v-u)}{t}$

$F = (10000)\dfrac{(10-0)}{20}$

$= \dfrac{100000}{20}$

= 5000 N

Thus the required force is 5000 N.

35. Cork covers the old stems of woody trees.

Characteristics of cork are as follows:

   i. Cells of cork are dead at maturity.

ii. These cells are compactly arranged.

iii. Cells do not contain intercellular spaces.

iv. Cells possess chemical substance suberin in their walls.

v. They are several layers thick.

vi. Cork is impervious to gases and water.

As plants grow older, a strip of the secondary lateral meristem (called cork cambium) develops in the cortical region. It cuts cells towards both the outer and inner sides. Gradually, this secondary tissue replaces the epidermal layer of the stem. This forms several layer thick corks.

Role of cork is mentioned below:

i. It protects the internal tissues from mechanical injury and from parasitic attacks.

ii. It contains small pores (called lenticels) for gaseous exchange.

iii. It provides mechanical strength.

36. **1Mole of H_2SO_4 = gram molecular Mass of $H_2 SO_4$ = 6.023 × 10^{23} molecules/atoms**

a) In $H_2SO_4 \rightarrow$ 2 gram of hydrogen atoms are present

b) 1Mole of H_2SO_4 have 6.023 × 10^{23} atoms.

So, 2 gram of hydrogen = 2× 6.023 × 10^{23}

= 12.046 × 10^{23}

c) In H_2SO_4;

for every 2 hydrogen atoms there are average 4 oxygen atoms

so for 1 hydrogen = $\frac{4}{2}$ oxygen are present

= 2 oxygen are present

For 1 oxygen = $\frac{2}{4}$ hydrogen one present

= 0.5 Hydrogen are present

d) 1 Mole of H_2SO_4 = 6.023 × 10^{23} atoms.

OR

a. **The postulates of Dalton's Atomic Theory are as follows:**

i. The matter is made up of indivisible particles known as atoms.

ii. All the atoms of an element have identical mass while the atoms of different

elements have different masses.

iii. Atoms of different elements combine in fixed ratios to form compounds.

b. The molecule of the element is made up of only one kind of atoms but the molecules of a compound are made up of two or more kinds of atoms.

For example, **Water(H_2O) is a compound.** The one molecule of water contains two types of atoms two of the hydrogen and one of oxygen. While **Hydrogen is an element:** it is made up of only from the atom of hydrogen.