Sample Paper 3 Solutions

Class IX 2022-23

Science (086)

Time: 3 Hours **Max. Marks: 80**

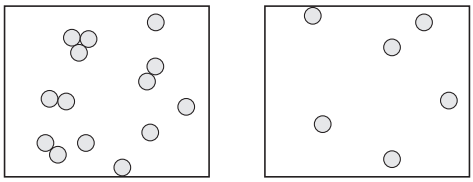
General Instructions:

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

SECTION-A

Select and write one most appropriate option out of the four options given for each of the questions 1 – 20.

1. The diagrams show the arrangement of particles of a substance at temperatures 20°C and 40°C.

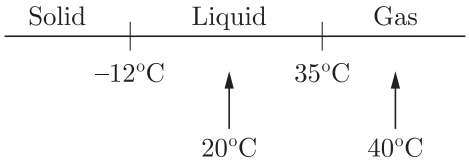


What are the likely melting and boiling points of the substance?

	Melting point/°C	**Boiling point/°C**
(a)	−12	35
(b)	−25	45
(c)	−98	100
(d)	44	80

Ans : (a)

At 20°C, substance is a liquid. At 40°C, substance is a gas. Thus, its melting point is below 20°C and its boiling point is below 40°C.



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2. Select the incorrect statements(s).

1. Although ice, water and water vapour all look different and display different physical properties, they are chemically the same.
2. During burning of a candle, both physical and chemical changes take place.
3. Both water and cooking oil are liquid but their chemical characteristics are different. They differ in odour and inflammability.
4. It is the physical property of oil that makes it different from water.

(a) 1 and 2 (b) 2 and 3

(c) 1, 2 and 3 (d) Only 4

Ans : (d) Only 4

It is the chemical property of oil that makes it different from water.

3. Which of these is/are conserved during a chemical reaction?

(a) mass only
(b) charge only
(c) both mass and charge
(d) neither mass nor charge

Ans : (c) both mass and charge

According to the law of conservation of mass, mass can neither be created nor be destroyed in a chemical reaction. It is always conserved.
The law of conservation of charge says that the net charge of an isolated system will always remain constant.

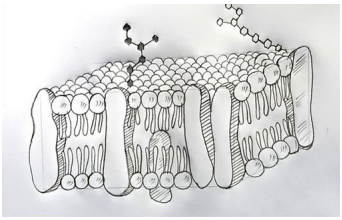
4. We know that like charges repel each other. Then how do the protons, which are all positively charged, stay together in an atom's nucleus?

(a) The neutral charge of the neutron keeps them together.
(b) Nuclei keep decaying in short intervals because of this.
(c) The nucleic force is stronger than their mutual repulsion.
(d) That like charges repel is not true at the level of the nucleus.

Ans : (c) The nucleic force is stronger than their mutual repulsion.

The strong nuclear force is responsible for holding together the nucleus. At the distance scale of a proton (about 1 femtometer, or 10^{-15}meters), the strong nuclear force is about 137 times stronger than the electromagnetic force. Therefore, the repulsive force due to both the protons being electrically positive is not strong enough to break the nucleus apart.

5. Plasma membrane is composed of



(a) cellulose and lipids
(b) lipids and proteins
(c) peptidoglycan and lipids
(d) cellulose and proteins

Ans : (b) lipids and proteins

Plasma membrane is a living, thin, delicate, elastic, selectively permeable. Chemically, it is made up of 75% phospholipid. In addition to phospholipid, the membrane contains proteins, cholesterol and polysaccharides.

6. Which of the following protects the animal cell from the outside environment?

(a) Cell wall
(b) Plasma membrane
(c) Nuclear membrane
(d) Cytoplasm

Ans : (b) Plasma membrane

Plasma membrane found in all cells that separates, the interior of the cell from the outside environment.

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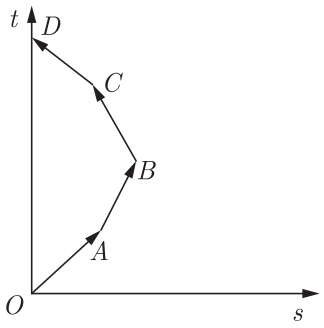
7. Which of the following options is correct for the object having a straight line motion represented by the following graph?



(a) The object moves with constantly increasing velocity from O to A and then it moves with constant velocity.
(b) Velocity of the object increases uniformly.
(c) Average velocity is zero.
(d) The graph shown is impossible.

Ans : (c) Average velocity is zero.

From given, it is clear that the net displacement is zero. So, average velocity will also be zero.

8. A hockey player pushes the ball on the ground. It comes to rest after travelling certain distance because

(a) the player stops pushing the ball.

(b) balanced force acts on the ball.

(c) the opposing force acts on the ball.

(d) none of these

Ans : (c) the opposing force acts on the ball.

The opposing force of friction acts on the ball due to which ball comes to rest after travelling certain distance.

9. Which of the following statements is/are correct?

1. Mass of an object is the measure of its inertia.
2. Heavier the object smaller is the inertia.
3. The mass of an object is variable.

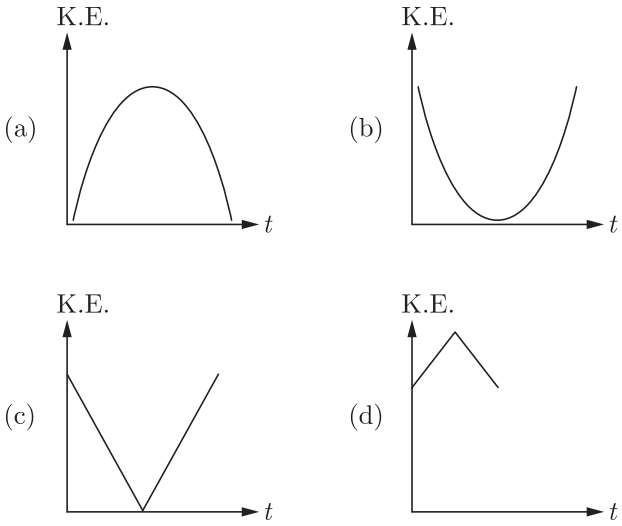
(a) Only 1 (b) 1 and 3

(c) 2 and 3 (d) 1 and 2

Ans : (a) Only 1

Heavier the object, greater is the inertia. The mass of an object is constant.

10. A cricket ball is projected vertically upward such that it returns back to the thrower. The variation in kinetic energy with time is best represented by



Ans : (a)

When the ball rises up its kinetic energy decreases, till it becomes zero. On falling down its kinetic energy increases. Therefore option (a) is correct.

11. The sound waves having a frequency more than 20,000 Hz are called

(a) infrasonic waves (b) supersonic waves

(c) ultrasonic waves (d) hypersonic waves

Ans : (c) ultrasonic waves

Waves of frequency above 20000 Hz cannot be heard by human beings and are called ultrasonic.

12. A waxy, water resistant layer is observed in the xerophytic plants. What is the layer called as?

(a) Endodermis (b) Cortex

(c) Phloem (d) Epidermis

Ans : (d) Epidermis

A xerophyte is an organism, which is able to survive in an ecosystem with little or no water (or moisture). To reduce transpiration the epidermal cells of xerophytes (plants) secrete a waxy (fatty) water resistant layer of cutin.

13. If the component of the substance can be separated by a chemical change only then it is

(a) element (b) compound

(c) mixture (d) both (a) and (b)

Ans : (b) compound

A compound can be separated into its components by chemical means while an element cannot be further separated. A mixture can be separated by physical means.

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14. The atomic mass of calcium (Ca) is 40 g. The number of moles in 60 g of calcium are

(a) 0.5 mol (b) 2.0 mol

(c) 1.5 mol (d) 0.75 mol

Ans : (c) 1.5 mol

$$\text{No. of moles} = \frac{\text{Given mass}}{\text{Molar mass}}$$
$$= \frac{60}{40} = 1.5$$

15. A cell loses water by osmosis when kept in a solution having a lower concentration of water than the cell. The given solution is

(a) hyper-tonic (b) hypo-tonic

(c) isotonic (d) dilute

Ans : (a) hyper-tonic

If a cell is a placed in a hyper-tonic solution which has higher concentration of solute and lower concentration of water as compared to the concentration of cell sap, the water molecules move from cell sap to the external solution so that the cell shrinks.

16. Which component of sclerenchyma tissues harden and thicken their secondary walls?

(a) Suberin (b) Calcium

(c) Lignin (d) Magnesium

Ans : (c) Lignin

Sclerenchyma consists of thick, hard secondary walls due to deposition of lignin. It provides mechanical strength to the cells.

Question no. 17 to 20 are Assertion-Reasoning based questions.

17. **Assertion :** Motion with uniform velocity is always along a straight line path.
Reason : In uniform velocity a motion, speed is the magnitude of the velocity and is equal to the instantaneous velocity.

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

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

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

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

The assertion is true and the reason is not the correct explanation of the assertion.
Uniform velocity means that speed and direction remain unchanged.

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18. **Assertion :** Linear momentum is conserved in both elastic and inelastic collisions.
Reason : Total energy is conserved in all collisions.

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

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

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

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

Both linear momentum and kinetic energy are conserved in elastic collisions. Linear momentum is conserved in inelastic collisions but kinetic energy is not conserved. The total energy is conserved in all collisions.

19. **Assertion :** A man is sitting in a boat which floats on a pond. If the man drinks some water from the pond, the level of water in the pond will decrease.
Reason : The weight of the liquid displaced by the body is greater than the weight of the body.

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

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

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

Ans : (d) Both assertion and reason are false.

Water level in the pond remains unchanged. When the man drinks water from the pond, a larger volume of water is displaced by the boat and hence or original water level is maintained.

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20. **Assertion :** A spring has potential energy, both when it is compressed or stretched.
Reason : In compressing or stretching, work is done on the spring against the restoring force.

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

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

(c) Assertion is true but reason is false.

(d) Assertion is false but reason is true.

Ans : (a) Both assertion and reason are true and reason is the correct explanation of assertion.

The work done on the spring against the restoring force is stored as potential energy in both cases, when it is compressed or stretched.

SECTION-B

Question no. 21 to 26 are very short answer questions.

21. Write down four properties of a Solution.

Ans :

The four properties of solution are as follows:

(i) It is a homogeneous mixture of solute and solvent.

(ii) Solute particles cannot be separated by filtration.

(iii) True solution is clear and transparent.

(iv) True solution does not scatter light.

or

State the principle of the process of centrifugation.

Ans :

Centrifugation is the process of separating suspended particles from a liquid like colloids by churning the liquid at a high speed. The principle is that denser particles are forced to the bottom and lighter stay at the top when spun rapidly.

22. Why the number of atoms in one mole of hydrogen gas is double the number of atoms in one mole of helium gas ? Explain.

Ans :

The number of atoms in one mole of hydrogen gas is double the number of atoms in one mole of helium gas because hydrogen molecule is diatomic, i.e., a molecule of hydrogen consists of two atoms of hydrogen, whereas helium is monatomic.

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23. Who discovered cells in living organisms? Give an example of unicellular organism.

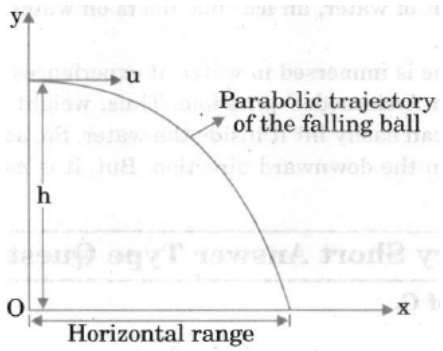
Ans :

Leeuwenhoek (1674) was the first to observe the free living cells in pond water. Example of unicellular organisms : Amoeba, Chlamydomonas, Paramoecium, Bacteria, etc.

24. A ball moving on a table reaches the edge and falls. Sketch the path it will follow while falling.

Ans :

As the ball falls, it has a horizontal velocity and a vertical downward acceleration due to gravity. Under the combined effect of these two motion the ball moves along a parabolic trajectory as shown in figure



25. What is the range of frequencies associated with :
(a) Infrasound
(b) Ultrasound

Ans :

(a) **Infrasound :** Sound waves between the frequencies 1 to 20 Hz.
(b) **Ultrasound :** Sound waves of the frequencies above 20,000 Hz.

or

What are longitudinal waves? Give two examples.

Ans :

A wave in which the particles of the medium vibrate back and forth along the same direction, in which the wave is moving, is called a longitudinal wave.
Examples :
(a) The sound waves in air.
(b) The waves produced in air when a sitar wire is plucked.

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26. What are the three advantages of shorter duration of the crop in between sowing and harvesting?

Ans :

Short durations allow farmers to grow multiple rounds of crops in a year. Short duration also reduces the cost of crop production. Uniform maturity makes the harvesting process easy and reduces losses during harvesting.

SECTION-C

Question no. 27 to 33 are short answer questions.

27. A karate expert can easily move his hand through a solid block of wood but we cannot. Why ?

Ans :

In a solid block of wood, the inter-particle forces are very strong and hence, it is not easy to separate the particles. Therefore, it is not easy to move our hand through a solid block of wood, only a karate expert can do it as he has expertise in this.

28. Write characteristics of compounds.

Ans :

Characteristics of compounds are as follows :
(i) Compounds are the substances formed by chemical combination of two or more elements.
(ii) The constituent elements are present in a fixed ratio.
(iii) A chemical reaction takes place during the formation of a compound.
(iv) Properties of a compound are different to those of its elements.
(v) Constituent elements cannot be separated by physical processes.

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29. What would happen if when we put an animal cell into a solution of sugar or salt in water?

Ans :

The following three things could happen :
(i) If the solution surrounding the cell is very dilute than cytoplasm, the water will move into the cell, i.e., the cell will gain water.
(ii) If the solution has exactly similar water concentration as that of cytoplasm of cell, there will be no net movement of water across the cell membrane, i.e., no gain or loss of water from the cell.
(iii) If the medium (solution) has a lower concentration of water than the cell, i.e., the solution is concentrated, the cell will lose water by osmosis.

or

What is the function of plastids?

Ans :

Plastids are present only in plant cells. There are two types of plastids chromoplasts (coloured plastids) and leucoplasts (white or colourless).
Chromoplast : Consists of coloured pigments and given different colours to flowers, fruits and leaves. The green colour pigment present in leaf is called chlorophyll which helps in the photosynthesis and a plastid with chlorophyll is called chloroplast.
Leucoplast : It stores starch, oil and protein granules in it.

30. What are the four main functions of epithelial tissue?

Ans :

The main functions of epithelial tissue are :
(i) It forms the outer layer of skin and hence it protects the underlying cells from drying, injury, bacterial and chemical effects.
(ii) It forms lining of mouth, alimentary canal and other internal organs and thus protects these organs.
(iii) It helps in absorption of water and other nutrients in alimentary canal.
Some of them are greatly specialized and perform secretary function.

31. In a long distance race, the athletes were expected to take four rounds of the track such that the line of finish was same as the track was 200 m.
(i) What is the total distance to be covered by the athletes?
(ii) What is the displacement of the athletes when they touch the finish line?
(iii) Is the motion of the athletes uniform or non-uniform?
(iv) Is the distance moved by and displacement of athletes at the end of the race equal?

Ans :

(i) Total distance covered by the athletes = $4 \times 200 = 800$ m.
(ii) The line of start and the line of finish are the same so, Displacement = 0
(iii) The motion of the athletes is non-uniform.
(iv) The distance and displacement of an athlete at the end of the race are not equal.

32. (a) What is meant by potential energy? Is potential energy vector or scalar quantity?
(b) Give one example of a body having potential energy.

Ans :

(a) The energy possessed by a body by virtue of its position or configuration. It is a scalar quantity.
(b) Stretched string of a bow.

or

Define : (a) power (b) work done (c) kinetic energy. Give SI unit of each.

Ans :

(a) The rate of doing work is called power. Its SI unit is watt.
(b) Work is the product of force and displacement. Its SI unit is joule.
(c) It is the energy possessed by a body by virtue of its motion. Its SI unit is joule.

33. Distinguish between transverse and longitudinal waves (three points).

Ans :

	Transverse waves	Longitudinal waves
1.	Particles the medium vibrate at right angles.	Particles vibrate parallel to the direction of waves.
2.	Alternate crests and troughs formed.	Alternate compressions, rarefaction formed.
3.	e.g., water waves.	e.g., sound waves.

SECTION-D

Question no. 34 to 36 are Long answer questions.

34. Explain Rutherford's atomic model.

Ans :

Rutherford purposed a model of an atom on the basis of α-particles scattering experiment. This is known as Rutherford's nuclear model of atom.

(i) An atom consist, a heavy positively charged core called nucleus.
(ii) Nucleus is surrounded by electrons.
(iii) Electrons and nucleus are held together by electrostatic force of attraction.
(iv) Size of nucleus is very small as compared to the size of atom.
(v) Almost the entire mass of the atom is concentrated in the nucleus.

or

Define isotopes. Why do isotopes have same atomic number but different mass number ? Explain with the help of an example.

Ans :

Isotopes : Atoms of the same element, having the same atomic number but different mass numbers are called isotopes.

Isotopes have same atomic number but different mass number because they contain different number of neutrons.

For example : In nature chlorine occurs in two isotopic forms; ${}_{17}Cl^{35}$ and ${}_{17}Cl^{37}$.

Here atomic number of both the atoms is same but due to the difference in the number of neutrons, their mass number is different.

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35. Explain the structure of three types of muscle fibres. Also write the locations where they are found in the body.

Ans :

The followings are the three types of muscle cells :

1. **Unstriated muscles (also known as smooth, involuntary muscles) :** This type of muscular tissue consists of spindle-shaped, long uninucleated cells. This type of muscles are present in alimentary canal, blood vessels, iris of eye, in ureters and bronchi of lungs, etc.
2. **Striated muscles (also known as voluntary muscles because of their function being in our control or will) :** This type of muscular cells are long multi-nucleated and enclosed in a membrane called sarcolemma. Each fibre has several longitudinal filaments embedded in cytoplasm. These filaments give these muscles striated appearance. These muscles are attached to the skeleton; so they are called skeletal muscles.
3. **Cardiac muscles :** These muscles are found in heart. They are not under the control of the will. They contract rhythmically and involuntarily throughout life without the sign of fatigue. Structurally they show the characters of both unstriated and striated muscles. They are made up of branched fibres. These fibres are uninucleated and show alternate light and dark bands (striation).

or

How many types of meristems are present in plants, on the basis of position?

Ans :

On the basis of location of meristem, it is classified into three types :

1. Apical meristem is present at the tip of stem, roots and their branches.
2. Intercalary meristem is found at the leaf base, above the nodes (i.e. at the base of internodes as in grasses) or below the nodes (i.e. at the uppermost region of internode as in mint).
3. Lateral meristem
4. Vascular cambium and cork cambium are the examples of lateral meristem.
5. Vascular cambium is found in vascular bundles while cork cambium is found underneath the bark of trees. Both of these cause increase in girth of plants.

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36. Give brief sketch on advantages and disadvantages on manure and fertilizers.

Ans :

Advantages of manure :

(i) It increases the number of friendly microbes.
(ii) It improves the texture of soil by adding organic matter (humus).
(iii) It increases soil fertility, water holding capacity and aeration.
(iv) It reduces soil erosion.
(v) It is cheap.

Disadvantages of manure :

(i) They have fewer amounts of nutrients as compared to fertilizers.
(ii) Manures are bulky and not easy to store and transport.

Fertilizers : These are commercially manufactured inorganic salts containing one or more essential plant nutrients like NPK, which are used to increase soil fertility.

Advantages of fertilizers :

(i) They are nutrient specific and required in small amounts.
(ii) They are water soluble and absorbed by the plant easily.
(iii) They are easy to store and transport.

Disadvantages of fertilizers :

(i) Fertilizers can change the soil structure by killing the soil microbes.
(ii) Fertilizers can change the chemical composition of soil.
(iii) Accumulation of fertilizers in water bodies causes eutrophication.

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SECTION-E

Question no. 37 to 39 are case-based/data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. The nucleus of atom contains positively charged particles called protons and neutral particles called neutrons. The number of protons in an atom is called the atomic number and is denoted by the symbol 'Z'. All atoms of an element have the same atomic number. The electrons occupy the space outside the nucleus. In order to account for the electrically neutral nature of the atom, the number of protons in the nucleus is exactly equal to the number of electrons.

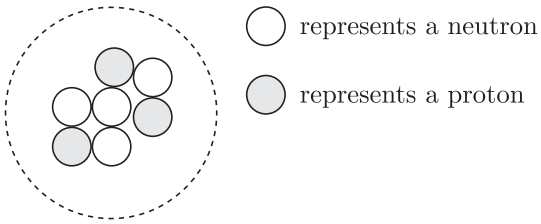
Thus, Atomic number = Number of protons = Number of electrons

You would remember that according to Dalton's theory, the atoms of different elements are different from each other. We can now say that this difference is due to difference in the numbers of protons present in the nucleus of the element. In other words, different elements differ in terms of their atomic number.

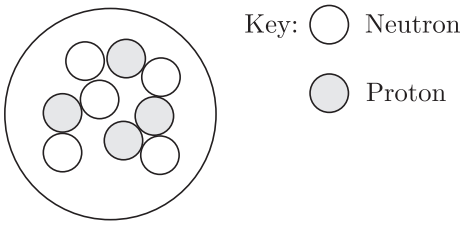
For example, the atoms of hydrogen and helium are different because hydrogen has one proton in its nucleus whereas the nucleus of helium atom contains two protons. Their atomic numbers are 1 and 2, respectively. You have learnt in the Rutherford's model that the mass of the atom is concentrated in its nucleus. This is due to the presence of two heavy particles namely protons and neutrons in the nucleus. These particles are called nucleons. The number of nucleons in the nucleus of an atom is called its mass number. It is denoted by 'A' and is equal to the total number of protons and neutrons present in the nucleus of an element.

Thus, Mass number (A) = Number of protons (Z) + Number of neutrons (n) Atomic number and mass number are represented on the symbol of an element.

(i) The diagram shows the nucleus of an atom of X. What is the X in the given diagram?



(ii) The diagram given below shows the sub-atomic particles present in the nucleus of atom X.



What is the symbol for atom X ?

(iii) The formula of a molecule is X_2. One molecule of X_2, contains 18 protons. If the nucleon number of X is 19, how many neutrons are there in one atom of X ?

or

(iv) Find the number of neutrons in $^{31}X_{15}$?

Ans :

(i)

X has 3 protons and 4 neutrons.

Hence, atomic number of X is 3 and mass number of X is $(3 + 4) = 7$.

X is represented as $^{7}_{3}X$.

(ii) Nucleon number = Number of neutrons + Number of protons $= 5 + 4 = 9$

Thus, the symbol for atom X is

nucleon number → ^{9}
proton number → $_{4}X$

(iii) Number of protons in one X_2 is 18.

Number of protons in $X = 18 \div 2 = 9$

$$\text{Nucleon number} = p + n$$
$$19 = 9 + n$$
$$n = 19 - 9 = 10$$

or

(iv) $^{31}X_{15}$ indicate that no. of proton

= 15 and mass number = 31

Mass number = No. of protons + No. of neutrons = 31

Number of neutrons

= 31 – number of protons

= 31 – 15 = 16

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38. Fish is one of the easily available, highly affordable and nutritious food for people, especially in coastal regions. Fish is a rich source of proteins. Fish liver oil is obtained for vitamin A and vitamin D.

The different type of fish obtained for food are :

(i) Agnatha (jawless fish)

(ii) Chondrichthyes (cartilagenous fish)

(iii) Osteichthyes (bony fish)

Other fish include Jelly fish (Aurelia), Star fish, shell fish (prawns and molluscs), cattle fish etc.

The establishments which are associated with production, preservation, capture and exploitation of fishes, crabs, lobsters, prawns etc. are called fisheries. Both true fish (gill containing finned vertebrates which contain scales on their skin) and shelled fish are produced in fisheries. Fisheries are of following types, based on mode of obtaining fish.

(i) What do you mean by mariculture.?

(ii) What is the common name of Penaeus monodon?

(iii) Which of the marine fish of high economic value?

(iv) What is the correct function of the figure given below?

or

(v) What is fresh water prawn called?

Ans :

(i) Culture of marine finned fish, shellfish and seaweeds is called mariculture.

(ii) giant tiger prawn

(iii) Mullet, Bhetki, Oyster

(iv) The given figure is of a honey extractor. It is used for extracting honey from the comb.

or

(v) Macrobrachium rosenbergii.

39. Newton's first law of motion states that a body continues to remain in state of rest or of uniform motion along a straight line unless an external unbalanced force acts on it. Thus, a body cannot change its state of rest or motion unless compelled by an external force. In other words, every body possesses a property by virtue of which it resists any change in its state of rest or of uniform motion. This property is known as inertia of that body.

Inertia is an inherent property or the tendency of a body to oppose any change in its state of rest or of uniform motion in a particular direction. Thus, Newton's first law of motion is also called law of inertia as it defines inertia in its statement.

To change the state of rest or motion of the body, force is required. If greater force is required to do so, it means the body has more inertia. Since more force is required to change the state of heavier objects than light objects, we conclude that greater the mass of a body, more is the inertia possessed by it. We can also state that mass is a measure of inertia of the body.

(i) A hockey player pushes the ball on the ground. Why it comes to rest after travelling certain distance?

(ii) What is velocity-time graph of a moving particle on which net external force is zero?

(iii) On what factor does the inertia of a body depend?

(iv) Which has more inertia, a cricket ball or rubber of the same size?

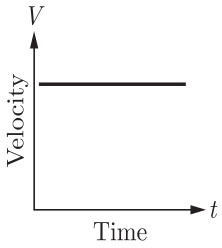
or

(v) Does inertia change with velocity?

Ans :

(i) the opposing force acts on the ball.

(ii) Net external force is zero, it means, particle is moving with constant velocity. Velocity-time graph of such a particle is represented by a straight line parallel to time-axis.

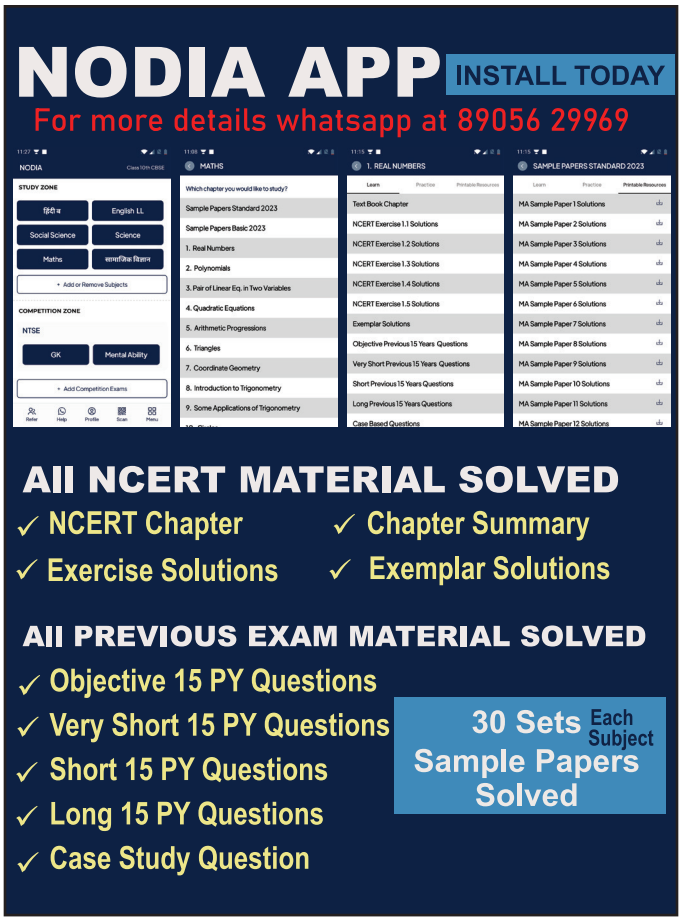


(iii) The inertia of a body depends on its mass.

(iv) A cricket ball has more inertia than a rubber ball of the same size because it has more mass than the rubber ball.

or

(v) Inertia doesn't depend on velocity. Inertia is a tendency of an object to stay in motion or rest unless external forces are applied.



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