Sample Question Paper - 1
Class- IX Session- 2021-22
TERM 2
Subject- Science

Time Allowed: 2 hour   **Maximum Marks: 40**

General Instructions :
(i)   *All questions are compulsory.*
(ii) *The question paper has **three sections** and **15 questions.** All questions are compulsory.*
(iii) *Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case based questions of 4 marks each.*
(iv) *Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.*

Section - A   **(2 Marks each)**

1. Atomic numbers of two elements A and B are given below.
Atomic number of element A: 18, Atomic number of element B: 17
   (a) Which element has zero valency?
   (b) What is the valency of other element ?   **AI 2**

2. Two students of class IX are discussing a law that states the mass of reactants is always equal to that of the products.   **2**
   (a) Identify the law.
   (b) Based on the above law find out if 12 g of carbon is burnt in the presence of 32 g of oxygen, how much carbon dioxide will be formed?

3. Ernest Rutherford was interested in knowing how the electrons are arranged within an atom. Rutherford designed an experiment for this. In this experiment, fast moving alpha (α)-particles were made to fall on a thin gold foil. State the observations in the experiment, which led Rutherford to make the following conclusions: **AI 2**
   (a) Most of the space in an atom is empty.
   (b) Whole mass of an atom is concentrated in its centre.

4. A person is suffering from an incurable disease. His reports say that he is infected with HIV.   **AI 2**
   (a) Identify the disease the person is suffering from.
   (b) State any two ways by which this disease spreads from an infected person to a healthy person.

5. Although Archana has been suffering from cold and cough she decided to appear for her class test. Classmates seated close to her had an exposure to the infection being carried by Archana. However, only one of them actually suffered from cold and cough. **AI 2**

(a) Which system is responsible for fighting with infection carrying microbes?

(b) What prevented the rest of those classmates from catching cold and cough in spite of their exposure to the infection.

OR

"Making antiviral medicines is harder than making antibacterial medicines". Justify this statement. **2**

6. A box of about 10 kg is placed at a point A on a horizontal surface. It is moved to a point B which is at a distance of 2 m from A by the action of force, 4N applied on the box at an angle of 60°. **2**

(a) Find the work done by the gravitational force on the box.

(b) Calculate the work done by the externally applied force.

Justify your answer. (Given, $g = 10 \text{ m/s}^2$)
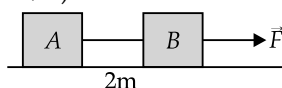
OR

You might have seen that when a blacksmith hits a sheet of iron by fast-moving hammer, the iron sheet heats up.

(a) Which type of energy does the fast-moving hammer possess?

(b) State the type of energy conversion that takes place in the above process.

7. An astronaut carried a pot containing soil weighing 60 N from the earth to the surface of moon. He kept it there and just before the return journey from moon to earth he weighed the soil on the surface of moon and found that it was only 10 N. Why did its weight decrease and how much was the loss in mass of the soil ? $(g_{earth} = 10 \text{ ms}^{-2})$ $(g_{moon} = g_{earth} / 6)$ **2**

OR

A stone and the Earth attract each other with an equal and opposite force. Then, why we see only the stone falling towards the earth but not the earth rising towards the stone?

Section - B
(3 Marks each)

8. Rahul took 5 moles of carbon atoms in a container and Sohan also took 5 moles of sodium atoms in another container of same weight. **3**

(a) Whose container is heavier?

(b) Both containers have same number of atoms. Explain by calculations.

(c) Which term is used to refer the exact number of atoms present in 12 gm of Carbon-12?

9. Show the formation of chemical formulae of the following compounds using their ions : **3**

(a) (i) Ammonium sulphate (ii) Magnesium nitrate

(b) Interpret the number of moles of oxygen atoms in PO_4^{3-}

OR

(a) Which postulate of Dalton's atomic theory is the basis of law of conservation of mass ?

(b) Write the name of compounds represented by the following formulae :

(i) KNO_3 **(ii)** $Al_2(SO_4)_3$ **(iii)** CCl_4 **(iv)** H_2S.

10. Atomic number and mass number of an element are 18 and 40 respectively. Identify the element and write the number of electrons and neutrons present in its atom. Show the schematic atomic structure of the atom.   **3**

11. Composition of the nuclei of two atoms 'X' and 'Y' are given below :   **3**

|	X	Y
Protons	4	4
Neutrons	4	6

(a) Give the mass number of X and Y. Mention the relationship between the two atoms.

(b) Write the formula for calculating the maximum number of electrons in an orbit.

12. State the law of conservation of energy. With the help of an example explain the law of conservation of energy.   **3**

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

An object thrown at a certain angle to the ground moves in a curved path and falls back to the ground. The initial and the final points of the path of the object lie on the same horizontal line. What is the total work done against the force of gravity and by the force of gravity on the object? Explain with proper mathematical expressions.
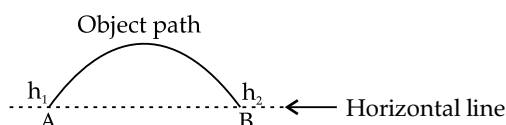
13. (a) Differentiate between mass and weight.   **3**

(b) The weight of a body at a height equal to be radius of the earth is 'N'. What will be its weight at a height equal to three times the radius of the earth?

<div align="center">## Section - C</div>   **(4 Marks each)**

14. Read the passage and answer the following questions.

Human beings live in societies. Our social environment is an important factor in our individual health. We live in villages, towns or cities. In such places, even our physical environment is decided by our social environment. At any place, our body may feel sickness. There are many tissues in the body which make up physiological systems to carry out functions. When there is a disease some changes give rise to symptoms and signs of disease.   **4**

(a) What is a disease?

(b) What are called the symptoms of a disease?

(c) What can be various causes for a person getting diseased?

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

Based on duration what are the two main types of diseases? Explain giving one example for each.

15. An experiment based on simple pendulum was conducted in a class. The following diagram shows the set up. It shows a simple pendulum consisting of a bob of mass 100 g. Initially the bob of the pendulum is at rest at 'O'. It is then displaced to one side at A. The height of 'A' above 'O' is 5 cm. (Take $g = 10 \text{ m/s}^2$)   **4**
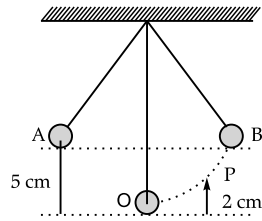
(a) What is the value of potential energy of bob at 'A' ?

(b) What is the value of kinetic energy of the bob at mean position 'O' ?

(c) What is the value of kinetic energy and potential energy of the bob at the position 'P' whose height above mean position is 2 cm ?

OR

The potential energy of a freely falling object decreases progressively. Does this violate the law of conservation of energy ? Why ?

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Solution

<div style="text-align:center">**Section - A**</div>

(2 Marks each)

1. (a) Element A has zero valency because electronic configuration of element A is 2, 8, 8 *i.e.*, a complete octet. **1**

(b) The atomic number of element B= 17, *i.e.*, it has 17 electrons. Hence, its electronic configuration will be 2, 8, 7.

Since it has 7 electrons in its valence shell, so, its valency = 8 – 7= 1 **1**

2. (a) Law of conservation of mass: The law states that matter can neither be created nor be destroyed or mass of reactants is always equal to that of product. **1**

(b) $C + O_2 \rightarrow CO_2$

Carbon + Oxygen → Carbon dioxide

Mass of reactants = 12 + 32 = 44g

Mass of product (CO_2) = 44 g

Thus, one mole of Carbon (C) reacts with one mole of Oxygen (O_2) to form one mole of CO_2. **1**

So, 1 mole of CO_2 is formed.

3. (a) Most of the alpha-particles passed through the gold foil without getting deflected. **1**

(b) Very few particles were deflected from their path by 180°, indicating that whole mass of the atom is present at its centre. **1**

4. (a) The person is suffering from the disease called AIDS (Acquired immunodeficiency syndrome). **1**

(b) (i) Sexual contact with infected person.
(ii) From a pregnant mother to her foetus.
(iii) Blood contact with infected person.
(iv) Using needle or syringe of infected person. **(Any two) ½ × 2**

5. (a) Immune system of an individual fight from infection carrying microbes. **1**

(b) Immune system of those who does not suffer with cold and cough successfully fought against the microbes to which they were exposed. **1**

OR

Viruses have very few biochemical mechanisms of their own. They depend on their host to complete all the biochemical reaction. Thus, it is very difficult to find the targets where these drugs get interfered by not making any harm to the host. **2**

6. (a) Work done is zero because force due to gravity is perpendicular to the displacement that occurred due to applied external force.

$$W = F_g d \cos 90° = 0 \text{ J}$$

[∴ cos 90° = 0, F_g= Force due to gravity] **1**

(b) Given, m= 10 kg

Work done = F.d cos 60°
= 4 × 2 × ½
=4 J

OR

(a) Kinetic energy **1**

(b) The kinetic energy get converted into heat energy during hitting a metal by a fast moving hammer due to which metal gets heated. **1**

7. Given, the weight of the soil on earth is 60 N.

g_{earth} = 10 ms^{-2}

Mass on the earth, $m_1 = \dfrac{60}{10} = 6$ kg

Weight of the soil on the moon = 10 N

$g_{moon} = \dfrac{g_{earth}}{6} = \dfrac{10}{6}$ ms^{-2}

Mass on the moon $m_2 = \dfrac{10 \times 6}{10} = 6$ kg

Because $m_1 = m_2$, hence there has been no loss in mass of the soil on the surface of moon and decrease in weight was due to difference in the gravity.

[CBSE Marking Scheme, 2014]2

OR

From Newtons second law of motion,

$$F = ma \Rightarrow a = \frac{F}{m}$$

The mass of a stone is very small due to which the gravitational force produces a large acceleration in it. Due to very large mass of earth, the same gravitational force produces very small acceleration in the earth. **2**

Section - B   (3 Marks each)

8. (a) Sohan's container is heavier.

Explanation: Mass of container containing 5 moles of C atoms $= 5 \times 12 = 60$ g

Mass of container containing 5 moles of Na atoms $= 5 \times 23 = 115$ g

Hence, container containing 5 moles of sodium is heavier. **1**

(b) Yes, it is correct. Both containers have same number of atoms since they contain same number of moles of each carbon and sodium.
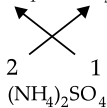
No. of moles of Sohan $= 5$ mol
No. of atoms $= 5 \times 6.023 \times 10^{23}$
$\qquad\qquad = 30.115 \times 10^{23}$ atoms
No. of moles of Rohan $= 5$ mol
No. of atoms $= 5 \times 6.023 \times 10^{23}$
$\qquad\qquad = 30.115 \times 10^{23}$ atoms. **1**

(c) The exact number of atoms present in 12 gm of Carbon-12 is called Avogadro's constant. **1**

9. (a) (i) NH_4^{+} SO_4^{2-}

(crossover diagram)

2   1
$(NH_4)_2SO_4$

(ii) Mg^{2+} NO_3^{-}

(crossover diagram)

1   2
$Mg(NO_3)_2$ **2**

(b) Each mole of phosphate ion possesses 4 moles of oxygen atoms as represented by the formula. **1**

Commonly Made Error

- Students often get confused on structural formula and molecular formula.

Answering Tip

- Be careful. Please check the structures again, once you are done with the answer.
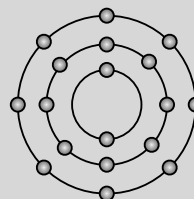
OR

(a) Atom can neither be created nor destroyed. **1**

(b) (i) Potassium nitrate
(ii) Aluminium sulphate
(iii) Carbon tetrachloride
(iv) Hydrogen sulphide **2**

10. Name of element : Argon **1**
Number of electrons $= 18$ ½
Number of neutrons $= 22$ ½
Structure : 2, 8, 8

1

[CBSE Marking Scheme, 2012]

11. (a) (i) Mass number *i.e.*, Atomic mass of element X = Number of protons + Number of neutrons
$= 4 + 4 = 8$ u ½
(ii) Mass number *i.e.*, atomic mass of element Y = Number of protons + Number of neutrons
$= 4 + 6 = 10$ u ½
Relationship between X and Y: Isotope.
The atomic number of both the elements is same, but their atomic masses are different. **1**

(b) The formula for calculating the maximum number of electrons in an orbit is $2n^2$. **1**

12. Energy can neither be created nor destroyed but it can be transformed from one form to the another.

Explanation of law of conservation of energy : Let us take the example of simple pendulum. We draw a pendulum bob to one side and allow it to oscillate.

The pendulum bob has P. E. at the extreme positions. Then, it is converted to K.E. at the mean position and so on.

It comes to rest due to air resistance and friction with the hook.

Energy is lost in overcoming friction and air resistance. But total energy remains constant. **2**

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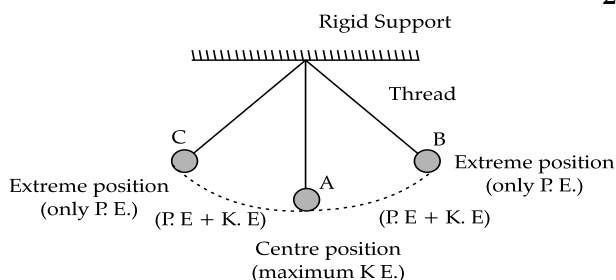
OR

(i) Work done = mgh **1**

Difference in height of initial and final position is zero. **1**

Therefore, Work done = $mg(h_2 - h_1)$
$= mg(0) = 0$ J **1**

13. (i) Mass is the matter content of a body, while weight is the force with which the body is attracted by the earth.

Mass is constant at all places because it is a scalar quantity.

Weight keeps on changing from place to place because it is a vector quantity. **1**

(ii) By universal law of gravitation,

$$F = G\frac{Mm}{d^2}$$ **1**

$\therefore$ when $d = 3d$

Then, $F' = G \times \dfrac{Mm}{(3d^2)} = \dfrac{GMm}{9d^2} = \dfrac{F}{9}$ **1**

Section - C

(4 Marks each)

14. (a) Any condition which impairs the health, or interferes with the normal functioning of the body is called disease. **1**

(b) A symptom is a phenomenon that is experienced by the individual affected by the disease. **1**

(c) Causes :

(i) Extrinsic factor : Water, food.

(ii) Intrinsic factor : Poor eating habits, poor nourishment.

(iii) Genetic constitution : Weak immune system.

(iv) Social reason : Poor public services.

½×4

OR

Types of diseases:

(i) Acute diseases: Last for short period of time. E.g., common cold.

(ii) Chronic diseases: Lasts for long time even for lifetime. E.g., diabetes. **1+1**

15. (a) Given, $m = 100$ g $= 0.1$ kg; $g = 10$ m/s^2

The value of potential energy of the bob at 'A' = $m \times g \times h$

$= 0.1 \times 10 \times 0.05 = 0.05$ J **1**

(b) At mean position , total P.E. change to

K.E. So, kinetic energy of the bob at mean position = 0.05 J. **1**

(c) P.E. at 2 m height $= m \times g \times h$
$= 0.1 \times 10 \times 0.02$
$= 0.02$ J

K.E. at 2 m height = Total energy
$-$ P.E. at 2 m height
$= 0.05 - 0.02 = 0.03$ J **2**

Commonly Made Error

- Calculation error is commonly seen. Sign convention is often forgotten for declaration. In many answers formula is missing and no unit is seen in final answer.

Answering Tip

- Essential steps need to be shown and final answer needs to be expressed along with a proper unit.

OR

The law of conservation of energy states that energy can neither be created nor be destroyed, but can be converted from one form to another.

The given condition does not violate the law. This is because potential energy is converted into kinetic energy. **2**

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