CBSE Class 09

Science

Sample Paper 4 (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. i. Why chemical properties of all the isotopes of an element are same?
   ii. Name the isotopes used in the treatment of goitre and cancer.
   iii. An element 'X' has 2 electrons in its M shell. What is its atomic number?

2. State the law of constant Proportion?

3. **Manure & Fertilizer**

   To meet the requirement of plant nutrients and essential organic matter in the soil, manures and fertilizers are added to the soil.

   Manure

   i. It is a kind of natural fertilizer formed from the decomposition of animal excreta and plant waste.
   ii. It mainly contains organic matter and some nutrients in a small amount.
   iii. It helps in improving the soil structure by increasing the water holding capacity

soil.

Types of manures: Based on the kind of biological waste material used, the manures are classified as:

i. **Farmyard manure (FYM):** It is the decomposed mixture of cattle excreta (dung) and urine along with litter and leftover organic matter such as roughage or fodder. The waste materials are collected daily from the cattle shed and stored in a pit for decomposition by the microorganisms (bacteria and fungi etc.). FYM contains Nitrogen, Phosphorous and Potassium.
ii. **Compost:** It is a mixture of decomposed organic matter derived from garbage, sewage, vegetable waste etc. The mixture is decomposed in pits and the process is known as composting.
iii. **Vermicompost:** The degradation of organic waste through consumption by the earthworms is called vermicomposting. Earthworms used in vermicomposting are *Dichogaster bolani* and *Drawida willisi*.
iv. **Green manure:** It is prepared by cultivating fast-growing green manure crops like Sunhemp, Horse gram, Guar, Cowpea before sowing of seeds. The fast-growing crop is then ploughed back under the soil. Green manure enriches the soil with nitrogen, phosphorous as well as organic matter and provides protection against erosion and leaching.

Fertilizers

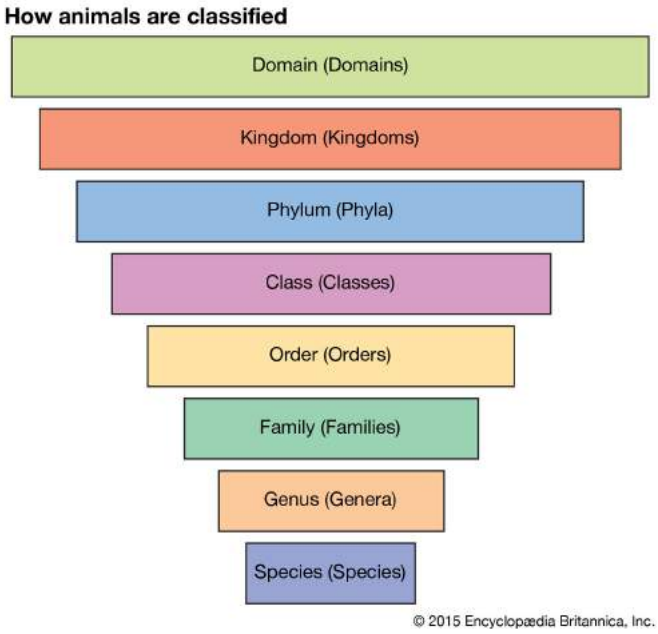
i. Fertilizers are chemicals manufactured in factories and are highly rich in nutrients like nitrogen, phosphorus and potassium.
ii. They provide a large number of nutrients and thus ensure better growth of plants.
iii. Excessive use of fertilizers for a long period of time can damage soil fertility.

Answer the following questions:

i. Differentiate between manures and fertilizers.
ii. Excess use of _____ can reduce the fertility of the soil.
iii. In Green manure, which types of nutrients are present? What is the main purpose of using green manure in agriculture?
iv. Out of manures and fertilizers, which one has better water holding capacity? Give the reason for your answer.

4. Hierarchy of categories

The various categories used in classification can be arranged in a hierarchy. The hierarchy indicates the various levels of kinship. Nearer the categories in the hierarchy, the greater is the similarity between the organisms. This classification was introduced by Linnaeus. The hierarchy of major categories is given below-



Answer the following questions:

i. The Hierarchy was introduced in taxonomy by whom?
ii. The taxonomic category family is between_____ and _____.
iii. The taxonomic hierarchy consists of _____ obligatory categories.
iv. Which of the following includes the most closely linked organisms?

5. A gun recoiled to _____ the momentum.

   a. decrease

   b. conserve

   c. increase

   d. change

OR

Statement A: Gravitational force is the weakest force in nature.
Statement B: Electrostatic force is an example of non – contact forces.
Which of the above two statements is true?

a. Statement B is true

b. Neither statement A nor B are true

c. Both the statement a and b are true.

d. Statement A is true

6. For what value of θ is work done maximum?

a. 0^0
b. 60^0
c. 90^0
d. 45^0

7. If the cuboid is mounted on the top of an inverted pointed object, the pressure exerted by the set-up on the sand

a. decreases

b. increases

c. can't say

d. remains same

8. In the experiment of verification of reflection of sound, the incident sound is directed along :

a. axis of tube

b. at an angle of 45^o from the axis of the tube

c. normal to the axis of tube

d. at an angle of 30^o from the axis of the tube

OR

A man's weight when taken at the poles is 600N. Will is weight remain the same when measured at the equator? Will there be an increase or decrease is his weight? Explain.

9. Match the following with correct response.
(1) Fresh water fish

(2) Indigenous breed of fowl
(3) Exotic breed of hen
(4) Breed of cattle

(A) Basara
(B) Jersey
(C) White leghorn
(D) Mrigal

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

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

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

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

10. Metanil yellow, an adulterant used in Arhar dal is basically :

a. a dye

b. an acid

c. a detergent

d. a base

11. After vaccination, the body build-up

a. weakness
b. antibodies
c. toxins
d. pathogens

12. What is the valency of the given atom?

a. 2

b. 3

c. 1

d. 0

OR

In which one of the following sets, is each one a solid under ordinary conditions?

a. Oxygen, Nitrogen, Sulphur

b. Mercury, Iron, gold

c. Stone, water, ice

d. Salt, sugar, chalk

13. **Assertion:** A gas fills completely the vessel in which it is kept.

Reason: Intermolecular force of attraction between the particles of gas is negligible.

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:** 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.

15. i. Identify two crops from the following, which provide us carbohydrates for energy requirement.
    Black gram, wheat, lentil and rice.
    ii. Name two protein-containing rabi crops.
    iii. Name the type of nutrient that we get from mustard seeds and linseed.

16. i. An element X has a valency of 2. Write the chemical formula for
        a. Bromide of the element
        b. Oxide of the element.
    ii. Define the formula unit mass of a substance.

OR

On the basis of Thomson's model of an atom, explain how the atom is neutral as a whole.

17. A stone is thrown vertically upwards with a velocity of 40 m/s.

    i. At what height will its kinetic energy and potential energy be equal
    ii. Calculate the P. E. of the body if its mass = 10 Kg

18. A priest of a temple collected dried garlands, old holy books and some statues. He asked his son to throw them in the river. But instead of throwing, he buried them in

the soil.

i. In the situation above, who wins your support: the priest or the son? Justify your answer by giving two reasons.
ii. What are the values reflected in the behavior of son?

OR

A gardener was seen burning dry leaves in the garden daily by a bunch of school kids. The kids went to him and advised not to burn those leaves and told about this practice's ill effects.

i. What ill-effects were the kids talking of?
ii. What do you suggest the gardener to do with the leaves instead of burning?
iii. Write any two values shown by the kids.

19. Differentiate between hypertonic and hypotonic solution.

20. Explain why animals of colder regions and fishes of cold water have thick layer of subcutaneous fat.

21. A solution contains 35 g of common salt in 300 g of water. Calculate the concentration of the solution.

22. The radius of the earth is about 6370Km. An object of mass 30Kg is taken to a height of 230Km above the surface of the earth.

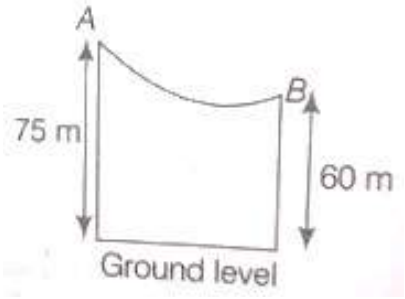
i. What is the mass of the body?
ii. What is the acceleration to gravity at this height?
iii. What is the weight of the body at this height?

23. On what factors do the following physical quantities depend?

i. Inertia
ii. Momentum
iii. Force

24. i. Define potential energy.
ii. Give an example where potential energy is acquired by a body due to change in its

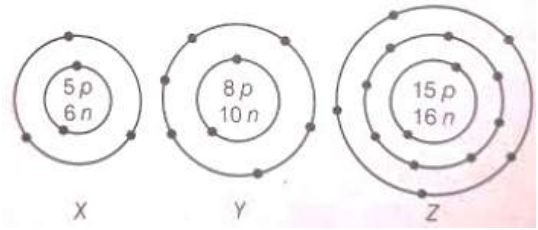
shape.



iii. A skier of mass 50 kg stands at A, at the top of a ski jump. He takes off from A for his jump to B. Calculate the change in his gravitational potential energy between A and B.

OR

What information do you get from the figure about the atomic number, mass number and valency of atoms X, Y and Z?
Give your answer in a tabular form.



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.

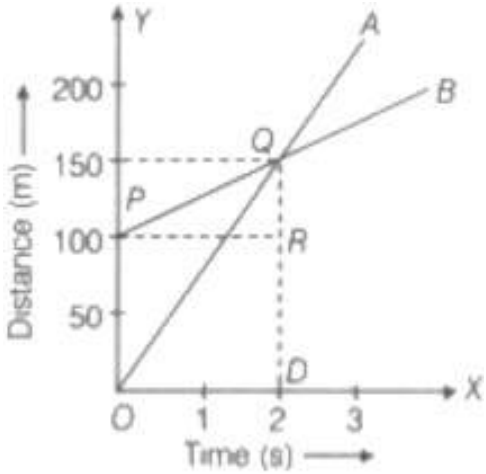
OR

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. The distance-time graph of the two trains is shown in the figure. The trains start simultaneously in the same direction.

i. How much A is ahead of B when the motion starts?
ii. What is the speed of B?
iii. When and where will A catch B?



iv. What is the difference between speeds of A and B?
v. Is the speed of both the trains uniform or non-uniform? Justify your answer.

27. Differentiate between bone and cartilage with respect to structure, function and location.

28. Explain the following statements:

i. Being disease-free is not the same as being healthy.
ii. Community health is essential for good individual health.
iii. Villagers suffer from cholera more than urban people.

OR

i. State two characteristic features of amphibians.

ii. Identify the following organisms.

a. Cold-blooded animals that lay eggs in water and have a three-chambered heart

b. A spiny skinned organism which has a peculiar water-driven tube system that they use for moving around.

c. Organisms that have an open circulatory system having a blood-filled coelomic cavity.

29. i. A steel needle sinks in water but a steel ship floats. Explain, how?

ii. Why do you prefer a broad and thick handle of your suitcase?

30. i. What is an octet? How do elements attain an octet?

ii. Make a schematic atomic structure of magnesium and phosphorus.
[Given number of protons of magnesium =12 and that of phosphorus = 15]

OR

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?

CBSE Class 09

Science

Sample Paper 4 (2019-20)

Solution

Section A

1. i. This is because isotopes have same atomic number, so the number of valence electrons present in them are same and it is the valence electrons which take part in chemical reactions. So the isotopes of an element have same chemical properties.
   ii. Goitre - Isotope of iodine
   Cancer - Isotope of cobalt
   iii. Atomic number of X = 12

2. According to the law of constant proportions: A chemical compound always consists of the same element combined together in the same proportion by mass. This law means that whatever be the source from which it is obtained (or the method by which it is prepared), a pure chemical compound is always made up of the same elements in the same mass percentage.

3. i. **Manure** is a kind of natural fertilizer formed from the decomposition of animal excreta and plant waste. It mainly contains organic matter and some nutrients in a small amount.
   Fertilizers are chemicals manufactured in factories and are highly rich in nutrients like nitrogen, phosphorus and potassium. They provide a large number of nutrients and thus ensure better growth of plants.
   ii. Fertilizer
   iii. In Green manure nitrogen, phosphorous, and organic matter are present. The main purpose of using green manure in agriculture is to provide protection against soil erosion and leaching.
   iv. Manure has better water holding capacity by improving the soil structure.

4. 1. The Hierarchy was introduced in taxonomy by Linnaeus.
   2. The family is placed between Order and genus.
   3. There are 8 obligatory categories.

4. Species include the most closely linked organisms.

5. (b) conserve

   Explanation: Gun recoil results from conservation of total momentum of the bullet-gun system: the backward recoil gun momentum balances the forward bullet momentum to maintain zero total momentum.

OR

(c) Both the statement a and b are true.

Explanation: Gravitational force is very weak force as it depends upon mass of the body and distance between two objects. Electrostatic force is non-contact force as it acts even if there is no contact between the objects.

6. (a) 0^0 **Explanation:** Work done when a body moves at an angle to the direction of force is W= F x S cos θ.

   W= F x S cos θ (cos 0^0 = 1); So, w = F x S means maximum work is done.

7. (b) increases

   Explanation:

   $P \propto \frac{1}{A}$

8. (a) axis of tube

   Explanation: Because if it is normal to the axis of tube then it will not form a proper angle for the . The angle between the incident ray and reflected ray may vary but the angle between the incident ray and normal ray have to be equal to the angle between the normal ray and the reflected ray.

OR

No, his weight will not remain same as that at the poles. There will be a decrease in his weight at the equator. As the radius of the earth increase from the poles to the equator, the value of 'g' becomes greater at poles decreasing towards equator. Also, the force of gravity decrease from poles to the equator.

9. (c) 1-D, 2-A, 3-C, 4-B

   Explanation:

- The mrigal carp also known as the mrigal and the white carp, is a species of ray-finned fish in the carp family. Native to streams and rivers in India, the only surviving wild population is in the Cauvery River.
- It is fowl breed used for chicken, small in size, growth is slow and hardy. These birds naturally resist against diseases.
- The Leghorn is a breed of chicken originating in Central Italy. Leghorns are good layers of white eggs. The white leghorn chicken breed is one of many great chicken breeds for eggs and heritage chicken.
- Jersey cattle are a small breed of dairy cattle. Originally bred in the Channel Island of Jersey , the breed is popular for the high butterfat content of its milk and the lower maintenance costs attending its lower bodyweight, as well as its genial disposition.

10. (a) a dye
    Explanation: Metanil yellow is a yellow colour dye, generally used colouring food material, for e.g. starch when dyed with metanil yellow looks like turmeric. Poor quality dal when dyed with meranil yellow looks superior quality dal.
11. (b) antibodies Explanation:

    After vaccination, the body learns to fight with that microbe. And the body build up antibodies.

12. (c) 1
    Explanation: Outermost orbit of given atom is 7. So, its accept one electron complete its octet. Therefore, the valency of given atom is one.

    OR

    (d) Salt, sugar, chalk
    Explanation: Out of the given sets of substances, salt, sugar and chalk are solids under ordinary temperature. Mercury, water, oxygen and nitrogen are not solids. Mercury and water are liquid at room temperature. Oxygen and nitrogen are gases.
13. (a) Both assertion(A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
    Explanation: The intermolecular force of attraction between the particles of gas is negligible and is free to move in any direction. Hence it fills completely the vessel in

which it is kept.

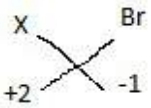
14. (a) Both assertion(A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

    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.

15. i. Wheat and rice are the two crops that provide us carbohydrates for energy requirements.
    ii. Gram and peas are two protein-containing rabi crops.
    iii. Mustard seeds and linseed provide us fats.

16. i. Valency of X =2
        a. Valency of bromine = 1

           ∴ The formula of the compound

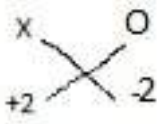
           = 

           = XBr_2

        b. Valency of X =2

           Valency of bromine = 2

           ∴ The formula of the compound

           = 

           = X_2O_2 or XO

    ii. Formula unit mass is the sum of atomic masses of all atoms present in a formula unit of the compound. It is calculated by adding the atomic masses of all atoms present in one formula unit.

OR

As per **Thomson's model of an atom**, the number of electrons (negatively-charged particles) inside an atom is equal to the number of protons (positively-charged particles). The amount of charge on an electron and that on a proton is equal in magnitude. Hence, the positive and negative charges are balanced by each other. The balancing of equal and opposite charges makes the **atom neutral as a whole**.

17. Initial velocity = u = o
    Final velocity = v = 40 m/s
    M = Mass of the body

    i. Kinetic energy = K. E. = $\frac{1}{2}mv^2$ and Potential energy = P.E= mgh
    Now, K. E = P.E
    $\frac{1}{2}mv^2$ =mgh
    $\frac{1}{2}m \times (40)^2 = m \times g \times h$
    $\frac{1600}{2} = gh$
    800 = gh
    $\frac{800}{10} = h$
    80 m=h

    ii. PE = mgh
    PE =$10 \times 10 \times 80$
    P.E. = 8000 J

18. i. The son, as he does not want to pollute the river and he was very well aware of damage caused by these pollutants.
    ii. Awareness and concern towards environment.

OR

    i. Burning of leaves causes air pollution as the smoke contains carbon dioxide content in the atmosphere would cause more heat to be retained by atmosphere and lead to global warming.
    ii. He can burry the leaves in compost pit instead of burning.
    iii. Awareness towards the love to save mother planet earth, imparting of knowledge.

19. Hypertonic solution – If the medium surrounding the cell has higher solute concentration than the cell, then the solution in called hypertonic solution.
    Hypotonic solution – If the medium surrounding the cell has lower solute concentration than the cell, then the solution in called hypotonic solution.

20. Thick layer of subcutaneous fat present in animals of colder regions and fishes of cold water acts as an insulator. It prevents the body heat from escaping. Hence, the fat keeps their bodies warm.

21. Concentration of solution = $\frac{\text{Mas 5 of solute}}{\text{Mass of solution}} \times 100$

Mass of common salt = 35 g

Mass of water = 300 g

Mass of solution = (300 + 35) = 335 g

Concentration of solution = $\frac{(35\text{g})}{(335\text{g})} \times 100 = 10.45\%$

22. i. The mass of the body will be 30Kg because mass remains the same as it is constant.

ii. The distance of the body from the centre of the earth = 6370 + 230 Km

= 6600Km = 6.6×10^6 m

Acceleration due to gravity = g = $\frac{Gme}{r^2}$

$g = \frac{6.673\times10^{-11}\times5.98\times10^{24}}{\left(6.6\times10^6\right)^2}$

$g = 9.16m/s^2$

iii. Weight at that height = mg

= 30×9.16

= 274.8 N

23. i. Inertia depends on the mass of a body.

ii. Momentum depends on mass and velocity of the body.

iii. Force depends on the mass and acceleration of the body.

24. i. **Potential Energy-** It is the energy possessed by a body by virtue of its position or shape.

ii. In a toy car, the wound spring possesses potential energy. When spring is released, its potential energy changes into kinetic energy due to which the toy car moves.

iii. Given, m = 50 kg, h_1 = 75 m, h_2 = 60 m

At point A, $PE_1 = mgh_1 = 50 \times 10 \times 75$

= 37500 J

At point B, $PE_2 = mgh_2 = 50 \times 10 \times 60$

= 30000 J

Change in PE = PE_1 - PE_2 = 37500 - 30000 = 7500 J

OR

The tabular form is as below:

Element	Atomic Number (= no. of p)	Mass Number {= no. of (p+n)}	Number of Electrons (= no. of p)	Electronic Configuration	Valency
X	5	5 + 6 = 11	5	2, 3	3
Y	8	8 + 10 = 18	8	2, 6	2
Z	15	15 + 16 = 31	15	2, 8, 5	3, 5

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. According to given graph, B is 100 m ahead of A.
    ii. Speed of B = Slope of PQ $= \frac{150-100}{2-0} = 25m/s$
    iii. A and B meet at Q, i.e. 150 m from the origin and 2 s after the starting.
    iv. Speed of A = Slope of OQ $= \frac{150}{2} = 75\mathrm{m/s}$

Difference between speeds = 75 - 25 = 50 m/s

v. The speed of both the trains is uniform as s-t graph is a straight line.

27. Differences between bone and cartilage are as follows:

Point of Difference	Bone	Cartilage
Structure	It is strong and non-flexible tissue, whose cells are embedded in a hard matrix, which is composed of calcium and phosphorus compounds.	It is soft and flexible tissue, whose solid matrix is composed of proteins and sugars. Also, it has widely spaced cells.
Function	It forms the framework that supports the body and anchors the muscles that support the main organs of the body.	It smoothens bone surfaces at the joints.
Location	It is present in the skeletal system of vertebrates.	It is present in nose, ear, trachea, and larynx.

28. i. Essential conditions for maintaining good health and being free of diseases are different but interconnected. If the conditions that are essential for good health are maintained, then the chances of getting a disease will be minimized automatically. But, being disease-free does not mean being healthy. The former means not suffering from any disease while, the latter means complete physical, mental and social well-being.

ii. There are many factors that are essential for good health, e.g. clean environment, proper sanitation, etc. The community takes preventive measures for ensuring the maintenance of these factors, e.g. if the water is left stagnant, mosquitoes breed there and cause diseases like malaria. Community people keep a check on it. Hence, for good individual health, community health is essential.

iii. In villages, people often defecate in open and the water is also taken from handpumps, etc., for use. This increases the chances of water getting contaminated. As cholera is transmitted by water, the villagers are more likely to

suffer from the disease.

OR

i. Characteristic features of amphibians are:
   a. Respiration either through gills or lungs or skin.
   b. The skin has mucous glands.

ii.
   a. Amphibians
   b. Echinoderms
   c. Arthropods

29. i. Ship displaces more water than needle as the volume of the ship is more than that of the needle. Since upthrust depends on the volume of the object (U= Vdg), so more the volume of the object, more upthrust act on it and object floats.

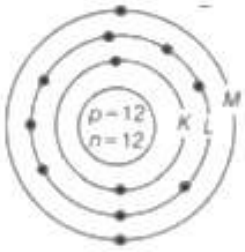
ii. Since, pressure act on the body is inversely proportional to the surface area of contact, i.e.

$P \propto \frac{1}{A}$

It means that more the area of contact, less pressure will act on the body. As the broad and the thick handle of our suitcase has a large area, due to which less pressure acts on our hand and it is very easy to take from one place to another.

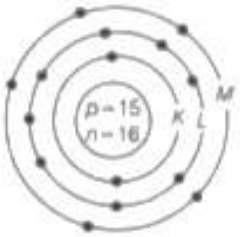
30. i. An outermost shell, which has eight electrons is said to possess an octet. Elements attain their octet by sharing, gaining or losing electrons.

ii. Atomic structure of Mg



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

Atomic structure of P



K L M
$_{15}P = 2, 8, 5$

OR

1Mole of H_2SO_4 = gram molecular Mass of H_2SO_4 = 6.023×10^{23} molecules/atoms

a) In H_2SO_4 → 2 gram of hydrogen atoms are present

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

So, 2 gram of hydrogen = $2 \times 6.023 \times 10^{23}$

= 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.