CBSE Class 10 Science

Sample Paper 04 (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. Balance the chemical equation and identify the type of chemical reaction:
   $H_2O_2(l) \xrightarrow{UV} H_2O(l) + O_2(g)$

   OR

   Write the balanced equation for the following chemical reaction.
   Barium Chloride + Aluminium Sulphate $\rightarrow$ Barium Sulphate + Aluminium Chloride
2. Name the type of reaction : Hydrogen burns in oxygen in air to form water.

3. Which of the given statement is correct or wrong:

   Statement A: Detergent with less branching in the molecule is degraded more easily than branched-chain detergents.

   Statement B: Soaps are 100% biodegradable.

   a. Statement A is true; Statement B is false.
   b. Statement B is true; Statement A is false.
   c. Neither statement A nor statement B is true.
   d. Both the statements A and B are true.
4. Name a mirror that can give an erect and enlarged image of an object.
5. What would have been the colour of the sky, if the Earth had no atmosphere?
6. Write the chemical formula of plaster of Paris?

OR

Give two uses of chlorine.

7. Why is the tungsten used almost exclusively for filament of electric lamps? Explain.
8. Why are magnetic field lines closed curves?
9. What is the direction of electronic current?

OR

A wire of resistivity ρ is pulled to double its length. What will be its new resistivity?

10. List the precautions for the experiment "light is necessary for photosynthesis".
11. What are the functions of tongue?

OR

Name the process used by single-celled organisms for taking in food, exchange of gases or removal of wastes.

12. Name two non-biodegradable wastes.

OR

How much energy is passed from one trophic level to the next trophic level?

13. Where does the heart beat originate?
14. **Assertion:** Brown fumes are produced when lead nitrate is heated.

    Reason: Nitrogen dioxide gas is produced as a byproduct due to the decomposition of

lead nitrate.

a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
c. Assertion is CORRECT but, reason is INCORRECT.
d. Assertion is INCORRECT but, reason is CORRECT.

15. **Assertion (A):** Biotic components of ecosystem continuously require energy to carry on life processes.

Reason (R): Abiotic components are the non-living factors of the ecosystem.

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

OR

Assertion (A): In anaerobic respiration, one of the end product is alcohol.

Reason (R): There is an incomplete breakdown of glucose.

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

16. **Assertion (A):** Mutation is a sudden change in the genetic material.

Reason (R) : Variation is useful for the survival of species over time.

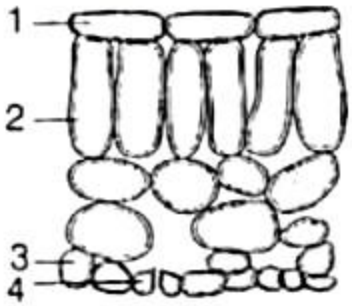
a. Both A and R are true and R is correct explanation of the assertion.
b. Both A and R are true but R is not the correct explanation of the assertion.
c. A is false but R is true.
d. A is true but R is false.

17. **Read the following and answer any four questions:**

Leena is a class X girl and actively participates in the Green School programme. She planted some trees as she needs to know and observe how plants grow by preparing their own food. She placed a potted plant in her room and observed after 3-4 weeks that leaves turned pale-yellow instead of green in colour. She realized her mistake and kept the plant

back in the sunlight.

i. The diagram shows the arrangement of cells inside the leaf of a green plant.



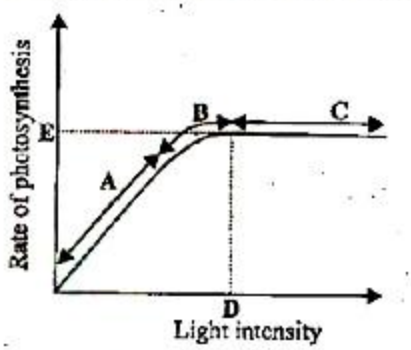
Which cells normally contain chloroplast?

a. 1 and 2
b. 1 and 4
c. 2 and 4
d. 2 and 3

ii. In photosynthesis which substances are used up, which are produced and which are necessary but remains unchanged after the reaction?

	Substance used up	Produced	Remain unchanged
(a)	Carbon dioxide	Water	Oxygen
(b)	Chlorophyll	Carbon dioxide	Water
(c)	Oxygen	Starch	Cellulose
(d)	Water	Oxygen	Chlorophyll

iii. The following graph shows the effect of light intensity on the rate of photosynthesis which of the following statement/statements is correct?

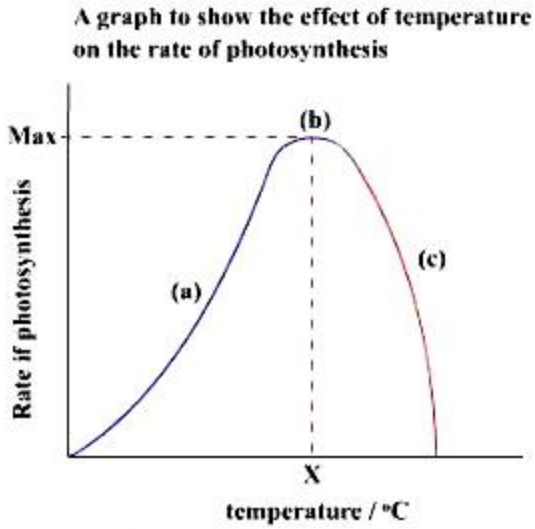


a. Light is a limiting factor in the region A
b. Region C represents that rate of photosynthesis is not increased further by increasing light intensity because some other factors become limiting
c. Point D represents the intensity of light at which some other factors becomes

limiting

d. All of these

iv.



At what point is optimum temperature reached?

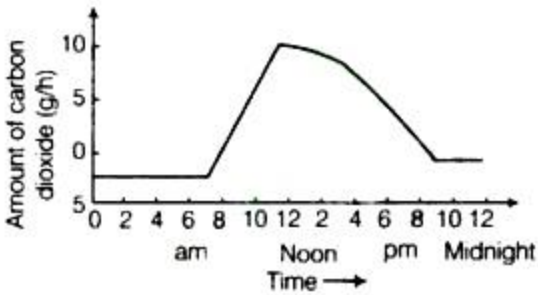
a. Region (a)

b. Point (b)

c. Region (c)

d. None of these

v. The graph shows how the amount of CO_2 taken in by a plant varies through a 24 hour period.



At what time of the day was the rate of photosynthesis the greatest?

a. At 7 am

b. At 12 (noon)

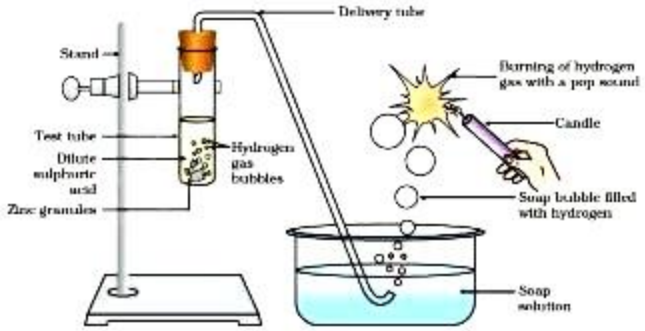
c. At 10 pm

d. At 6 am

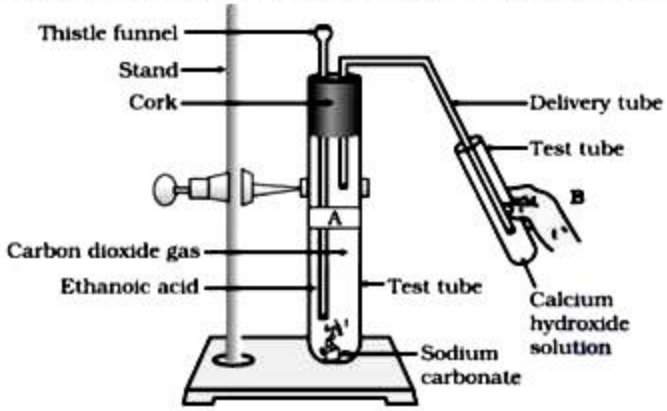
18. **Read the following and answer any four questions:**

Experiment-1 to show the reaction of dilute sulphuric acid with zinc a few pieces of zinc granules in the boiling tube is taken and 5ml of dil. H_2SO_4 added to it and the gas bubble

is formed.



Experiment-2 of passing CO_2 gas through calcium hydroxide solution. On passing the carbon dioxide gas evolved through lime water.



i. In **experiment 1** which gas evolved which produce the pop sound:
   a. Oxygen
   b. Hydrogen
   c. Nitrogen
   d. CO_2

ii. The reaction that takes place in experiment 1 is:
   a. $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$
   b. $2NaOH + Fe \rightarrow Na_2FeO_2 + H_2$
   c. $2KOH + Zn \rightarrow K_2ZnO_2 + H_2$
   d. $2NaOH + Sn \rightarrow Na_2SnO_2 + H_2$

iii. In experiment-2 neutralization reaction can be written as:
   a. Base + Acid $\rightarrow$ salt + water
   b. Base + Base $\rightarrow$ Strong base
   c. Acid + Acid $\rightarrow$ Strong acid
   d. None of the above

iv. The chemical formula of sodium zincate:

a. Na_2ZnO_4

b. Na_3ZnO_3

c. Na_6ZnO_3

d. Na_4ZnO_3

v. In experiment - 2 the product which is formed on passing excess of CO_2 in $CaCO_3$:

a. $Ca(CO_3)$

b. $Ca_2(HCO_3)$

c. Ca_2CO_3

d. $Ca(HCO_3)$

19. **Read the following and answer any four questions:**

Electric power is the rate of doing work or consumption of energy. Power is given by the rate at which electric energy is dissipated or consumed in an electric circuit. It is also term as electric power. The commercial unit of electric energy is kilo-watt-hours commonly known as a unit.

i. The S.I unit of electric power is

a. Volt

b. Joule

c. Watt

d. Coulomb

ii. An electric heater is rated at 2 KW electrical energy cost 4 per kWh. What is the cost of using the heater

a. ₹ 12

b. ₹ 24

c. ₹ 36

d. ₹ 48

iii. Power may be given by

a. P = VI

b. P = $\frac{I^2}{R}$

c. P = $\frac{V^2}{R}$

d. all of these

iv. 1 Kilowatt is equal to

a. 1000 watts
b. 100 watts
c. 10000 watts
d. 10 watts

v. An electric bulb is connected to a 220V generator. The current is 0.50 A, what is the power of the bulb?
a. 50W
b. 110W
c. 550W
d. 220W

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

Metal has various physical properties which include metallic lustre that they have shining surfaces in their pure state. Metal can be easily beaten into thin sheets. They are ductile can drown into wire due to which metal can be given different shapes according to their needs. Metal is a good conductor of heats and has high melting and boiling point.

i. Which of the following is the least reactive metal?
a. Sodium
b. Silver
c. Copper
d. Lead

ii. The metal which is most ductile _____.
a. gold
b. aluminium
c. copper
d. magnesium

iii. Which of the following metal exist in a liquid state?
a. Calcium
b. Potassium
c. Mercury
d. Sodium

iv. Which of the following metal is a poor conductor of heat?
a. Silver
b. Copper

c. Lead

d. All of these

v. The property of metal can be beaten in thin sheets is called _____.

a. ductility

b. malleability

c. metallic lustre

d. none of these

Section B

21. What are the functions of gastric glands present in the wall of the stomach?

OR

What is osmosis?

22. Differentiate between single and double circulation found in vertebrates.
23. What is covalent bond? What type of bond exists in

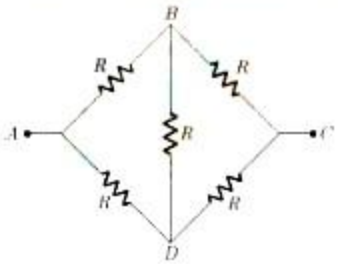
i. CCl_4

ii. $Cacl_2$

iii. CH_4

iv. NH_3

24. Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid (HCl) is added to test tube A, while acetic acid (CH_3COOH) is added to test tube B. Amount and concentration taken for both the acids are same. In which test tube will the fizzing occur more vigorously and why?
25. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. where should be the position of object ?Justify your answer .
26. Consider a network of resistance each of value of R as shown if figure:



i. What is the equivalent of net work between A and C?

ii. What is the potential of B and D when the voltage source is applied across A and C?

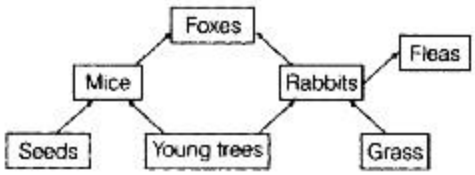
iii. What is the potential of B and D when the voltage source is applied across A and B?

27. Differentiate primitive atmosphere and present day atmosphere.

OR

How do Mendel's experiments proved that traits are inherited independently?

28. A food web is given below, observe the figure and answer the questions given below.



i. Identify the primary consumer in the food web.

ii. If all the foxes are killed due to a disease, what will your observations about food web be?

29. Mention the two main components of the transport system in plants. State one function of each one of these components?

30. Write chemical equations for the reactions taking place when

i. Magnesium reacts with dilute HNO_3

ii. Sodium reacts with Water.

iii. Zinc reacts with dilute hydrochloric acid.

31. Two elements A and B belong to the 3rd period of modern periodic table and are in group 2 and 13 respectively. Compare their following characteristics in tabular form:

i. Number of electrons in their atoms

ii. Size of their atoms

iii. Their tendencies to lose electrons

iv. The formula of their oxides

v. Their metallic character

vi. The formula of their chlorides

32. Why does the size of the atom increase down the group?

33. Explain why the planets do not twinkle.

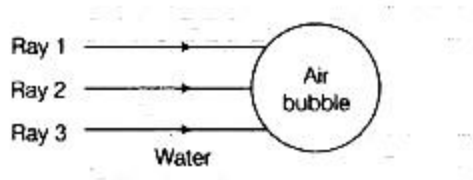
34. An object 2 cm high is placed at a distance of 16 cm from a concave mirror which produce a real image 3 cm high.

i. What is the focal length of the mirror?

ii. Find the position of the image.

OR

An air bubble in water is shown in the figure. Three rays of light are incident on the air bubble.



The angle of incidence of ray 1 on the air bubble is greater than the critical angle. The angle of incidence of ray 2 on the air bubble is less than the critical angle. Ray 3 is perpendicular to the surface of the bubble.

i. In figure at the point where ray 1 meets the air bubble, mark
   a. the normal to the surface
   b. the angle of incidence

ii. Complete the ray diagram to show how all three rays continue after they meet the air bubble.

iii. Define refractive index of water. If the speed of light in air is 3×10^{8} ms^{-1} and the speed of light in water is 2.2×10^{8} ms^{-1}. Calculate the refractive index of water.

35. Distinguish between pollination and fertilisation. Mention the site and product of fertilisation in a flower.

Draw a neat, labelled diagram of a pistil showing pollen tube growth and its entry into the ovule.

36. a. Name and state the rule to find the direction of force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it.
    b. Draw a well labelled diagram of an electric motor.

OR

i. Draw the magnetic field lines through and around a single loop of wire carrying electric current.

ii. State whether an alpha particle will experience any force in a magnetic field, if :
   a. It is placed in the field at rest.
   b. It moves in the magnetic field parallel to field lines.
   c. It moves in the magnetic field perpendicular to field lines.

Justify your answer in each case.

CBSE Class 10 Science

Sample Paper 04 (2020-21)

Solution

Section A

1. The balanced chemical equation is given as

   $2H_2O_2(l) \xrightarrow{UV} 2H_2O(l) + O_2(g)$

   This is a decomposition reaction.

   OR

   Aluminium Sulphate + Barium Chloride → Aluminium Chloride + Barium Sulphate

   $Al_2(SO_4)_3 + 3BaCl_2 \rightarrow 2AlCl_3 + 3BaSO_4$
2. Reactions in which two or more reactants combine to form one product are called combination reaction.

   Hydrogen burns in oxygen to form water.

   hydrogen + oxygen → water

   $2H_2 + O_2 \rightarrow 2H_2O$

   Hydrogen burns in oxygen in air to form water, it is a combination reaction.
3. (d) Both the statements A and B are true.

   Explanation: All soaps are biodegradable i.e. they can be decomposed by micro-organisms like the bacteria. Branched-chain synthetic detergents are far less degradable than unbranched detergents.
4. Only a concave mirror can give a erect and enlarged image of an object.
5. If the earth has no atmosphere, the sky would have appeared black because of no refraction.
6. The chemical name of plaster of Paris is calcium sulphate hemihydrate because half molecule of water is attached with calcium sulphate. The chemical formula of plaster of Paris is $2CaSO_4.H_2O$.

   OR

   Uses of chlorine:

i. For disinfecting water.
ii. To prepare polyvinyl chloride (PVC).

7. For filament of electric lamp we require a strong metal with high melting point. Tungsten is used exclusively for filament of electric lamps because its melting point is extremely high ($3410^{o}C$)
8. The magnetic field lines are closed curves because magnetic field lines originate from the north pole of a magnet and end at its south pole and inside the magnet, it is directed from south pole to north pole.
9. Electrons flow from negative to positive i.e. in the direction opposite to that of conventional current.

OR

When a wire of resistivity rho is pulled to double it's length then new resistivity of conducting wire will not change as resistivity depends on the nature of material not on the length of conductor.

1. Before starting the experiment, the leaf must be distracted.
2. The leaf must be covered with black paper properly to prevent the entry of light.
3. Boiling the leaf in alcohol should be done in the water bath.

10. **Functions of tongue**
    i. It helps in mastication of food.
    ii. It bears taste buds and helps in the sensation of taste of food.
    iii. It takes part in the modification of sound production.
    iv. It acts as brush and cleans the teeth.
    v. It aids in deglutition of food.
11. Diffusion is the mechanism used by single cell organism for carrying out their all vital activities. Diffusion from the body surface helps various vital life processes, e.g. nutrition, respiration, excretion, etc.
12. Plastic, metals, rubber tires, man-made fibers like nylon etc.

OR

10% energy is passed from one trophic level to the next trophic level.

13. The heart beat originates in a special muscular area called the sinuauricular node (SAN) which is situated in the right auricle.

14. (a) Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
15. (a) Both A and R are true but R is not the correct explanation of of the assertion

OR

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

16. (b) Both A and R are true but R is not the correct explanation of the assertion.
17. i. (c) 2 and 4

ii.

	Substance used up	Produced	Remain unchanged
(d)	Water	Oxygen	Chlorophyll

iii. (d) All of these

iv. (b) Point b

v. (b) At noon

18. i. (b) Hydrogen

ii. (a) $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

iii. (a) Base + Acid $\rightarrow$ salt + water

iv. (b) Na_3ZnO_3

v. (d) $Ca(HCO_3)$

19. i. (c) - Watt

ii. (b) - ₹ 24

iii. (d) - all of these

iv. (a) - 1000 watts

v. (b) - 110 W

20. i. (b) Silver

ii. (a) Gold

iii. (c) Mercury

iv. (c) Lead

v. (b) Melleability

Section B

21. Gastric glands secrete hydrochloric acid, pepsin and mucus. They have following functions:

a. Hydrochloric acid is secreted by oxyntic cells or parietal cells present in gastric gland. It kills any germ which may be present in food. It makes the environment in the stomach acidic; which is essential for functioning of gastric enzyme.
b. Pepsinogen converts to pepsin and digests protein.
c. Mucus prevents the inner lining of stomach from getting damaged by hydrochloric acid. And also facilitates the movement of food.

OR

Osmosis is special type of diffusion of a liquid, when solvent moves through a semipermeable membrane from a place of higher diffusion pressure to a place of lower diffusion pressure.

22.

Single Circulation	**Double Circulation**
1. In this type of blood circulation which the blood passes through the heart only once during a complete circulation of the body.	1. In this type of blood circulation in which the blood passes through the heart two times during a complete circulation of the body.
2. Occurence: Only in fishes.	2. Occurence: Only inamphibians, reptiles, birds and mammals.
3. Nature of the blood: only venous blood passes through the heart.	3. Nature of the blood: Mixed or oxygenated blood passes through the heart.
4. It is less efficient mode of circulation.	4. It is more efficient mode of circulation.

23. The chemical bonds formed between two atoms by the sharing of electrons between them is known as covalent bond.
The sharing of electrons between the two atoms take place in such a way that both the atoms acquire stable electronic configuration of their nearest noble gas.
i. CCl_4 : Covalent bond
ii. $CaCl_2$: Ionic bond
iii. CH_4 : Covalent bond
iv. NH_3 : Covalent bond
24. Fizzing will occur more vigorously in test tube A.

Hydrochloric acid (HCl) is a strong acid whereas acetic acid (CH_3COOH) is a weak acid. Being strong acid, the hydrochloric acid solution contains a much greater amount of hydrogen ions in it due to which the fizzing will occur more vigorously in test tube A (containing hydrochloric acid). The fizzing is due to the evolution of hydrogen gas which is formed by the action of acid on the magnesium metal of magnesium ribbon.

25. When the image formed is virtual, erect and enlarged then object should be placed between focus and pole of the concave mirror.

26. i. $R_{AC} = R$
    ii. The potential of B and D when the voltage source is applied across A and C remains the same.
    iii. The potential of B and D when the voltage source is applied across A and B is different.

27. Differences between primitive atmosphere and present day atmosphere

Primitive atmosphere	Present day atmosphere
1) It was reducing atmosphere.	1) It is an oxidizing atmosphere.
2) Gases present were, Hydrogen, Ammonia. Water vapours, HCN, CO and CO_2	2) Gases present are free Nitrogen, Oxygen, CO_2. Water vapours and various suspended particles.
3) The Ozone was absent and UV rays were potent.	3) The Ozone is present in outer space of earth.
4) The temperature was very high.	4) Comparatively temperature is low.
5) There was no life.	5) Life exists on earth.

OR

Mendel proposed Law of Independent Assortment on the basis of a dihybrid cross between two homozygous parents. He selected a dominant plant with round and yellow

seeds and a recessive plant with wrinkled and green seeds, yields F1 offspring showing the dominant form of both traits, viz. round and yellow F1 plants, on selfing, produce F2 progeny with two parental and two new recombinant phenotypes, that is round yellow: round green : wrinkled yellow: wrinkled green in the ratio of 9 : 3 : 3 : 1. This ratio is called Mendel's dihybrid phenotypic ratio. The factors (genes) of different traits are independent of each other in their distribution into the gametes and in the progeny. This is Mendels law of independent assortment.

28. i. The primary consumers are the organisms who directly feed on the producers. In the given food web, rabbits and mice are the primary consumers.
    ii. The foxes feed on the rabbits and mice. If all the foxes are killed then there will be no direct predator of rabbits and mice, hence the number of rabbits and mice will increase in the given ecosystem and with increasing number of primary consumers the producers will decline as more consumers will feed on more producers, which will disturb the ecological balance.
29. The main components of the transport system in plants are xylem and phloem both of which are complex permanent tissue. Xylem conducts water to all parts from roots whereas, phloem helps to transport food from leaf to all parts of the plant. Xylem is unidirectional but phloem is bidirectional.
30. i. When magnesium reacts with dilute nitric acid following reaction take place: **$Mg(s) + 2HNO_3(aq) \rightarrow Mg(NO_3)_2(aq) + H_2(g)$**
    ii. When sodium reacts with water following reaction take place: **$2Na(s) + 2H_2O(l) \rightarrow H_2(g) + 2NaOH(aq)$**
    iii. When zinc reacts with dilute hydrochloric acid then following reaction take place: **$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$**
31.

Characteristics	A	B
(i) The number of electrons	12	13
(ii) Sizes of their atoms	Larger	Smaller
(iii) Tendencies to lose electrons	Higher	Lesser
(iv) Formula of their oxides	AO	B_2O_3
(v) Metallic character	Higher	Lesser

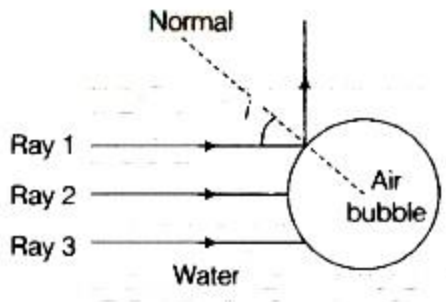
(vi) Formula of their chlorides	ACl_2	BCl_3

Thus, we can also guess the name of the element A and B. A is magnesium (Mg) and B is aluminium (Al) they both are metal and belong to same period in the periodic table.

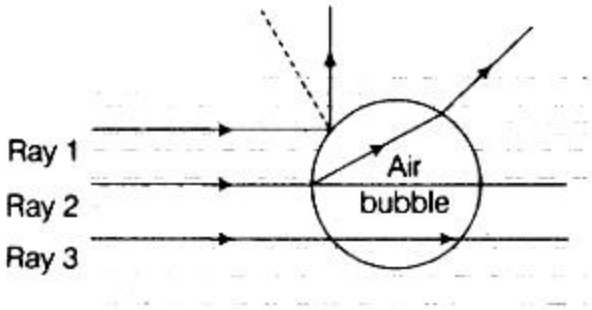
32. In moving down a group, the charge on the nucleus increases with increase in atomic number, but at the same time, there is an increase in the energy levels The number of electrons in the outermost shell, however, remains the same . Since the effect of additional energy levels outweighs the effect of increase nuclear charge and thus the distance of the outermost electron from the nucleus increases on going down the group.
33. Planets are much closer to the earth and are seen as extended source of light. So, a planet may be considered as a collection of a large number of point-sized light sources. Although light coming from individual point-sized sources flickers but the total amount of light entering our eye from all the individual point-sized sources average out to be constant. Thereby making the planets appear equally brighter and there is no twinkling of planets.
34. Since the image formed is real, hence an inverted image is formed.
    size of image, h_2 = - 3 cm, size of object h_1 = +2 cm.
    Magnification $m = \frac{h_2}{h_1} = \frac{-3}{2} = -1.5$. Also $m = \frac{-v}{u}$ or $v = -mu$ ..... (i)
    Here v = - 16 cm (u is always negative)
    Substituting in (i), we have v = - (-1.5) (-16) = - 24 cm. or v = - 24 cm.
    Image is formed 24 cm to the left of the mirror (Negative sign – Image is towards left of mirror)
    To calculate focal length. Here u = = 16 cm, v = - 24 cm, f = ?
    Using $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ or $\frac{1}{f} = -\frac{1}{24} - \frac{1}{16} = \frac{-2-3}{48} = -\frac{5}{48}$ or $f = -\frac{48}{5} = -9.6\ cm$
    Negative focal length indicates that the mirror is concave.

OR

i. Diagram for first part is shown as:



ii. The three rays continue after they meet the air bubble are shown as:



iii. Refractive index of water is defined as the ratio of the speed of light in a vacuum to the speed of light in water.

Speed of light in air, $v_a = 3 \times 10^8$ ms^{-1}

Speed of light in water, $v_w = 2.2 \times 10^8$ ms^{-1}

Therefore, Refractive index,

$n = \frac{v_a}{v_w}$

$= \frac{3 \times 10^8}{2.2 \times 10^8}$

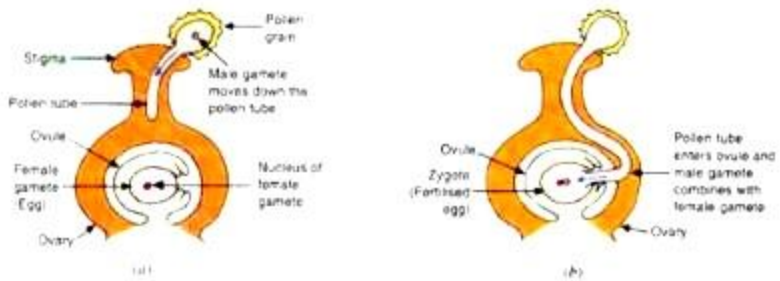
= 1.4

35. Difference between pollination and fertilization:

Pollination	Fertilization
i. The transfer of pollen grains from the anther of a flower to the stigma of the same or another flower is known as pollination.	i. The fusion of male and female gametes to form zygote is known as fertilization.
ii. It is a physical process; no new substance is formed.	ii. It is a biological process in which a new structure called zygote is formed.
iii. It is two types-self-pollination and cross-pollination.	iii. The modes of fertilization in nature and external fertilization.

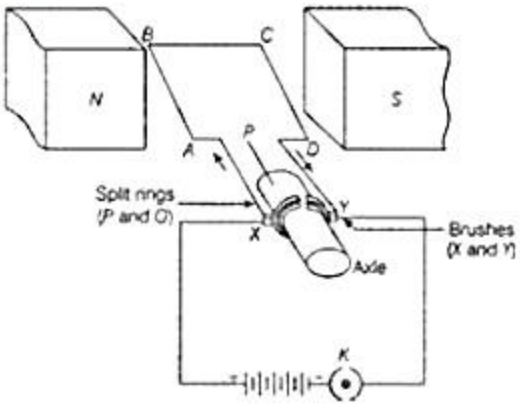
The ovary is the site of fertilization and embryo is the product of fertilization.

The following figure shows fertilization in the plant:



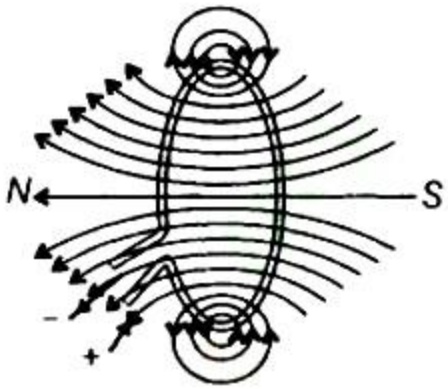
36. a.
- Fleming's left-hand rule.
- Adjust your hand in such a way that the forefinger points in the direction of magnetic field and the centre finger points in the direction of current, then thumb gives the direction of force acting on the conductor

b. Electric motor.



OR

i. The magnetic fields lines due to a circular coil are shown in the figure given below. At every point on a current carrying circular loop, the magnetic field is in the form of concentric circles around it. As we move away from it, the radii of the circle tend to increase. When we reach the center of the loop, the field appears to be a straight line.



ii. a. No, it will not experience any force. As, magnetic field exerts force on a moving charged particle only.

b. No, it will not experience any force because magnetic field exerts a force in perpendicular direction to motion of the particle.

c. Yes, it will experience a force in a direction perpendicular to the direction of its own motion and the direction of magnetic field can be determined by Fleming s left hand rule.