CBSE Class 10 Science

Sample Paper 07 (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. Complete and balance the following chemical reaction.
   $NaOH + \_\_\_\_ \rightarrow Na_2SO_4 + H_2O$

   OR

   Is **Dilution of sulphuric acid** exothermic or endothermic in nature?
2. Name the brown coloured gas evolved when lead nitrate crystals are heated in a dry test tube.

3. CH_3 - CH_2 - OH $\xrightarrow{Alkaline\ KMnO_4+Heat}$ CH_3 - COOH

   In the above given reaction, alkaline $KMnO_4$ acts as

   a. A reducing agent
   b. dehydrating agent
   c. oxidising agent
   d. catalyst

4. An electric bulb is connected to a 220 V generator. The current is 0.50 A. What is the power of the bulb?
5. Write the chemical formula of plaster of Paris?
6. Which mirror-convex or concave has larger field of view?

OR

If an object is placed at the focus of a concave mirror, where is the image formed?

7. Name any two biodegradable pollutants.
8. A region 'A' has magnetic field lines relatively closer than another region 'B'. Which region has a stronger magnetic field? Give a reason to support your answer.
9. Draw a circuit diagram using a battery of two cells, two resistors of 3 Ω each connected in series, a plug key and a rheostat.

OR

What is the commercial unit of electrical energy? Represent it in terms of joules.

10. Name an alloy that contains a non-metal as one of its constituents.
11. During which part of the day plants respire?

OR

Name the precise parts of cell which contain ATP.

12. Write the expanded form of DNA.

OR

Mendel took tall pea plants and short pea plants and produced F_1 progeny through cross-fertilisation. What did Mendel observe in the F_1 progeny?

13. What causes movement of food inside the alimentary canal?

14. **Assertion:** The Plaster of Paris is stored in moisture.
    Reason: Plaster of Paris sets into a hard mass on wetting with water to form anhydrous calcium sulphate.
    a. Both A and R are true and R is the correct explanation of the assertion.
    b. Both A and R are true and R is the correct explanation of the assertion.
    c. A is false but R is true.
    d. A is true but R is false.
15. **Assertion:** The resistivity of conductor increases with the increasing of temperature.
    Reason : The resistivity is the reciprocal of the conductivity.
    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.

    OR

    Assertion (A): The strength of the magnetic field produced at the centre of a current-carrying circular coil increases on increasing the current flowing through the coil.
    Reason (R): Magnetic field strength is inversely proportional to the current flowing in the coil.

    a. A is true but R is false.
    b. Both A and R are true and R is correct explanation of the assertion.
    c. Both A and R are true but R is not the correct explanation of of the assertion
    d. A is false but R is true.
16. **Assertion (A):** Clones of offspring of an organism formed an asexual reproduction.
    Reason (R): Clones have exact copies of DNA as their parent.
    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:**
    A transparent material bound by 2 surfaces of which one or both surfaces are spherical,

forms a lens may have 2 spherical surfaces, bulging outward or curved inward. Such a lens is called the double concave or convex lens. A lens may be a convex lens or a concave lens. The centre of curvature usually represents by letter C_1 and C_2. If parallel rays are passed from the opposite surface of lens another principle focus on the opposite is observed.

i. A diverging lens is used in:
   a. a magnifying glass
   b. a car to see an object on the rear side
   c. spectacles for correction of short sight
   d. a simple camera

ii. When an object is kept at any distance in front of a concave lens, the image formed is always:
   a. virtual, erect and magnified
   b. virtual, erect and diminished
   c. virtual, inverted and diminished
   d. virtual, erect and same size of the object

iii. Which of the following can form a virtual image which is always smaller than the object?
   a. a concave lens
   b. a convex lens
   c. a plane mirror
   d. a concave mirror

iv. The distance of principle focus from the optical centre of the lens is called:
   a. centre of curvature
   b. focal length
   c. pole
   d. principle focus

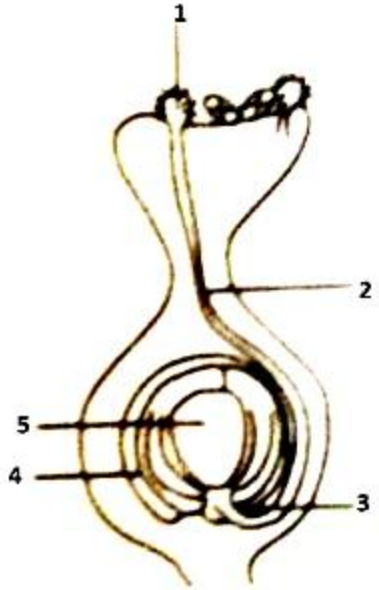
v. A convex lens _____ ray of light, while a concave lens is _____ ray of light.
   a. converges, diverges
   b. diverge in both
   c. converge in both
   d. diverges, converges

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

Flowering plants are called angiosperms. They bear the reproductive parts within the flower and their seeds are enclosed in a fruit. Most plants have both male and female reproductive organs in the same flower and are known as bisexual flowers. While others have either male or female reproductive parts in a flower known as a unisexual flower.

i. The correct sequence of reproductive stages seen in flowering plants is
   a. gametes, zygote, embryo, seedling
   b. seedling, zygote, embryo, gamete
   c. gametes, embryo, zygote, seedling
   d. zygote, gamete, embryo, seedling

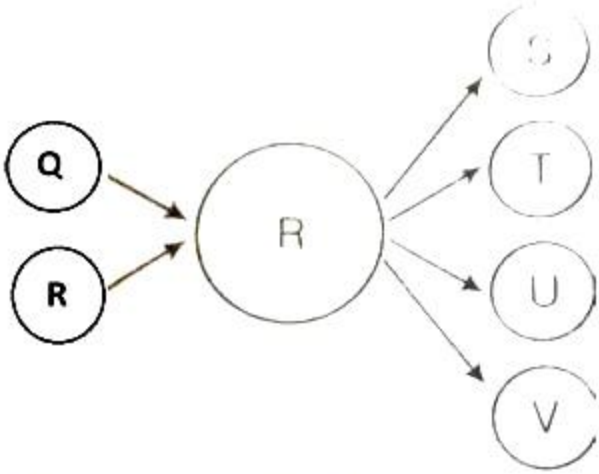
ii. The diagram shows the cross-section through the carpel of a flower just before fertilization.



Where will the male and female gametes be just before fertilization?

	Male gametes	Female gametes
(a)	1	5
(b)	1	4
(c)	2	4
(d)	3	5

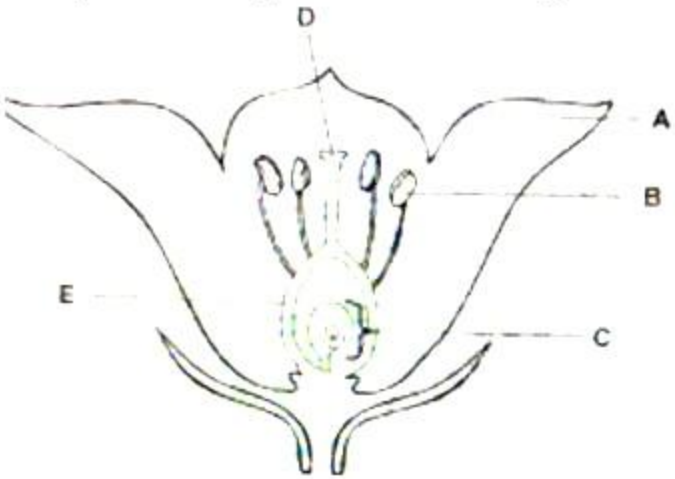
iii. The diagram represents gamete P and Q fusing to give R cell. This cell further produces gametes S, T, U, V:



Which statement about the number of chromosomes in the cells and gametes is correct.

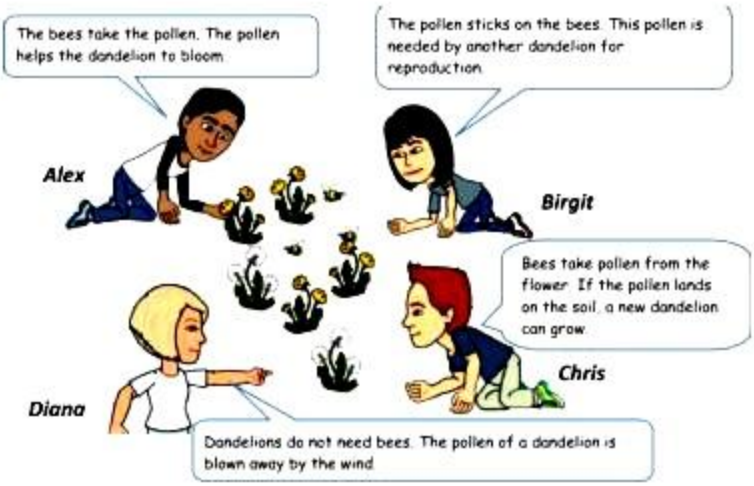
a. The number of chromosomes in P and Q are different.
b. The number of chromosomes in P and Q is the same.
c. The number of chromosomes in S is one-quarter of chromosomes in R.
d. The number of chromosomes in T is half the number of chromosomes in Q.

iv. Complete the diagram with labelling A-E:



a. A-petal, B-anther, C-ovule, D-stigma, E-ovary
b. A-ovary, B-anther, C-ovule, D-stigma, E-petal
c. A-ovule, B-anther, C-petal, D-stigma, E-ovary
d. A-stigma, B-petal, C-ovule, D-anther, E-ovary

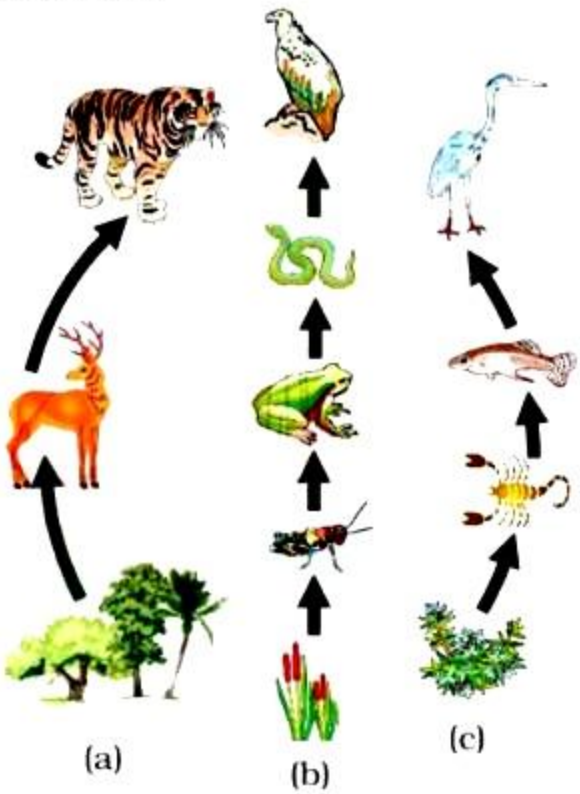
v. Four children watch dandelions in the garden and record their observations. Based on your concept of reproduction in plants. Comment on whose observations are accurate:



a. Alex
b. Diana
c. Birgit
d. Chris

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

The food chain generally consists of only 3 or 4 steps. Each step of the food chain forms a trophic level. The loss of energy at each level is so great that very little usable energy remains. The food web consists of many food chains in which each organism are generally eaten by 2 or more other kinds of organism which further eaten by several organisms



i. Which of the following gets the minimum energy through the food chain in an ecosystem?
   a. Carnivorous
   b. Large carnivore
   c. Producers
   d. Herbivores

ii. The flow of energy in an ecosystem is always:
   a. unidirectional
   b. bidirectional
   c. cyclic
   d. multi-directional

iii. In the food chain, the initial organism is usually:
   a. photosynthetic
   b. herbivore
   c. saprophytic
   d. parasitic

iv. In the food chain compromising of snake, grass, insect and frog the secondary consumer is:
   a. insect
   b. snake
   c. frog
   d. grass

v. What will happen if deer is missing in the food chain given: grass→ deer → tiger?
   a. The population of tiger increase
   b. The population of grass decrease
   c. Tigers will start eating grass
   d. The population of tiger decreases and the population of grass increase

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

When a more reactive element displaces a less reactive element from its compound, it is called a displacement reaction. The reaction is of two types. Single displacement reaction and double displacement reaction.

Iron being more reactive than copper displaces copper from an aqueous solution of copper sulphate. This is an example of a single displacement reaction.

On adding silver nitrate solution to sodium bromide, a yellow ppt of silver bromide and solution of sodium nitrate is formed. This is an example of a double displacement reaction.

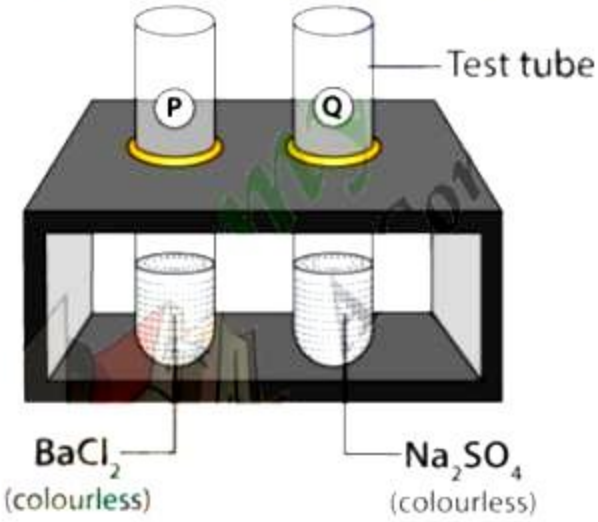
i. When Dil. sulphuric acid is added to pieces of iron sulphide, hydrogen sulphide gas is produced and soluble ferrous sulphate is formed. The type of chemical reaction involved is:
   a. decomposition reaction
   b. combination reaction
   c. displacement reaction
   d. double displacement reaction

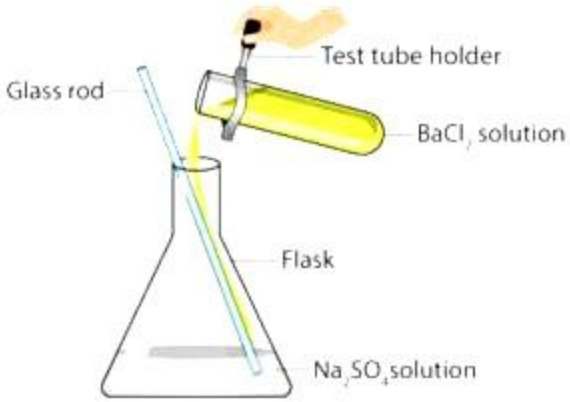
ii. Following reaction is used for the preparation of oxygen gas in the laboratory

$$2KClO_3 \xrightarrow[Catalyst]{Heat} 2KCl\,(s) + 3O_2\,(g)$$

Which of the following statement is correct?
   a. It is a decomposition reaction and endothermic in nature
   b. It is a combination reaction
   c. It is a decomposition reaction accompanied by the release of heat
   d. It is a photochemical reaction and exothermic in nature.

iii. What are the products formed in the double displacement reaction discussed below?





a. Barium Sulphate, Sodium Chloride
b. Barium Nitrate, Sodium Chloride
c. Barium Chloride, Sodium sulphate
d. Barium Sulphate, Sodium Hydroxide

iv. Which of the following elements displaces aluminium from its salt?
a. Zn
b. Fe
c. Ni
d. Ca

v. Select the double displacement reaction.
a. $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$
b. $NH_3 + HCl \longrightarrow NH_4Cl$
c. $AgNO_3 + NaBr \longrightarrow AgBr + NaNO_3$
d. $2KClO_{3} \longrightarrow 2KCl + 3O_2$

Section B

21. What criteria do we use to decide whether something is alive?

OR

Which substances are found in the glomerular filtrate in the kidneys of a mammal? Also name the substance that fails to pass the glomerulus.

22. Describe the structure of a pollen grain.
23. Diamond and graphite show different physical properties although they are made up of carbon. Name this relationship between diamond and graphite. Give the basis of this relationship also.
24. A compound X of sodium is commonly used in kitchen for making crispy pakoras. It is

also used for curing acidity in the stomach. Identify X. What is its chemical formula? State the reaction which takes place when it is heated during cooking.

25. A pencil when dipped in water in a glass tumbler appears to be bent at the interface of air and water. Will the pencil to be bent to the same extent, if instead of water we use liquids like, kerosene or turpentine? Support your answer with reasons.
26. Two cells of 3V each are connected in parallel. An external resistance of 0.5 Ω is connected in series to the junction of two parallel resistors of 4 Ω and 2 Ω and then to the common terminal of the battery through each resistor. Draw the circuit diagram. What is the current flowing through 4 Ω resistors?
27. i. In humans, if gene B gives brown eyes and gene b gives blue eyes, what will be the colour of eyes of the persons having the following combination of genes? (a) Bb (b) bb (c) BB

    ii. What do you class this trait of eye colour in human? Explain.

    OR

    How do Mendel's experiments show that traits are inherited independently?
28. i. Distinguish between the terms electrical resistance and resistivity of conductor.

    ii. A copper wire of resistivity $1.63 \times 10^{-8} \pi - m$ has cross-section area of 10.3×10^{-4} cm^2. Calculate the length of the wire required to make a 20 Ω coil.
29. Differentiate between excretion and defaecation.
30. Consider the following three equations:

    $A_2O_3 + 2B \rightarrow B_2O_3 + 2A$

    $3CSO_4 + 2B \rightarrow B_2 (SO_4)_3 + 3C$

    $3CO + 2A \rightarrow A_2O_3 + 3C$

    Answer the following questions by using the given information:

    i. Which element is the most reactive?

    ii. Which element is the least reactive?

    iii. What type of reaction is involved in the given equations?
31. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.

    i. Where in the periodic table are elements X and Y placed?

    ii. Classify X and Y as metal (s), non-metal (s) or metalloid (s)

iii. What will be the nature of oxide of element Y? Identify the nature of bonding in the compound formed

iv. Draw the electron dot structure of the divalent halide

32. Lithium is an alkali metal with atomic number = 3 and number of valence electron is 1. The formula of the hydride of lithium is LiH. Boron and carbon are placed in group 13 and 14 respectively with valence electrons 3 and 4. Write the formulae of the hydrides of boron and carbon giving reason for your answer.

33. What property is made use of in the concentration of ore by:

    1. (i) gravity separation

       (ii) froth floatation process?

34. i. Draw a well labeled diagram of the human digestive system

    ii. Describe the role of following in digestion.

        a. Bile

        b. Salivary amylase

        c. HCl

OR

Describe transportation of water and mineral in plants.

35. What is atmospheric refraction? Use this phenomenon to explain the following natural events.

    i. Twinkling of stars.

    ii. Advanced sunrise and delayed sunset.

    Draw diagrams to illustrate your answers.

36. Draw a well labelled circuit diagram of a simple electric motor and explain its working. In what way these simple electric motors are different from commercial motors?

OR

Explain the principle, construction and working of an electric motor with a help of labelled diagram?

CBSE Class 10 Science

Sample Paper 07 (2020-21)

Solution

Section A

1. $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

   Sodium Hydroxide *hydrogen sulfate* *Salt cake* *water*

OR

The sulphuric acid is one of the strongest acids. So, when we dilute the sulphuric acid, it evolves a huge amount of heat. Hence, the dilution of sulphuric acid is an **exothermic** reaction.

2. **Nitrogen dioxide (NO_2)** is the brown colored gas evolved when lead nitrate crystals are heated in a dry test tube.
3. (c) oxidising agent

   Explanation: Dilute alkaline $KMnO_4$ (potassium permanganate) solution is **an oxidising agent**. It is a very useful chemical compound.
4. P = VI

   = 220V $\times$ 0.50 A

   = 110 J/s

   = 110 W

   The power of the bulb is 110W.
5. 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 $2CaSO_4.H_2O$.
6. Convex mirror as it is diverging in nature.

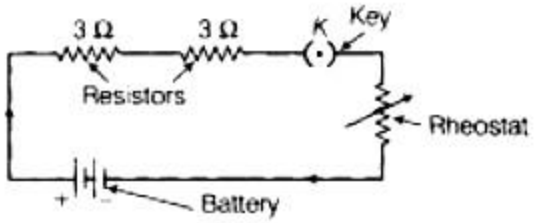
OR

At infinity.

7. Domestic sewage and Rotten vegetables are biodegradable pollutants.
8. The strength of the magnetic field is directly proportional to the relative closeness of field

lines, therefore, region A has a stronger magnetic field.

9. When we connect rheostat, key, battery of two cells and two resistors of three ohm each then required circuit diagram will be:



OR

The commercial unit of electrical energy is Kilowatt-hour (kWh). It can be converted into joules as follows:

1 kWh = 1000 watt $\times$ 3600 seconds

1 kWh = 3.6×10^6 watt-second

1 kWh = 3.6×10^6 Joule

Hence, 1 kWh is equivalent to 3.6×10^6 Joule.

10. Steel (iron + carbon) is an alloy that contains carbon (c) a non-metal as one of its constituents.
11. Throughout the day.

OR

Mitochondria contain ATP.

12. Deoxyribonucleic acid.

OR

He obseved that all the pea plants produced in F_1 progeny were tall due to the dominant characterstics of tall gene.

13. Peristalsis mainly causes the movement of food inside the alimentary canal.
14. (c) A is false but R is true.
15. (b) Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.

OR

(a) A is true but R is false.

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

17. i. (c) spectacles for the correction of short sight

ii. (c) virtual, inverted and diminished

iii. (a) concave lens

iv. (b) focal length

v. (a) converges, diverges

18. i. (a) gametes, zygote, embryo, seedling

ii.

	Male gametes	Female gametes
(d)	3	5

iii. (b) The number of chromosomes in Pand Q is the same.

iv. (a) A-petal, B-anther, C-ovule, D-stigma, E-ovary

v. (b) Diana

19. i. (b) large carnivore

ii. (a) unidirectional

iii. (a) photosynthetic

iv. (c) frog

v. (d) The population of tigers decrease and the population of grass increase

20. i. (d) double displacement reaction

ii. (a) It is a decomposition reaction and endothermic in nature

iii. (a) Barium Sulphate, Sodium Chloride

iv. (d) Ca

v. (c) $AgNO_3 + NaBr \longrightarrow AgBr + NaNO_3$

Section B

21. Features of living organisms.

1) Movements

2) Growth

3) Metabolism

4) Cellular body

5) Nutrition

6) Respiration

7) Transportation

8) Excretion

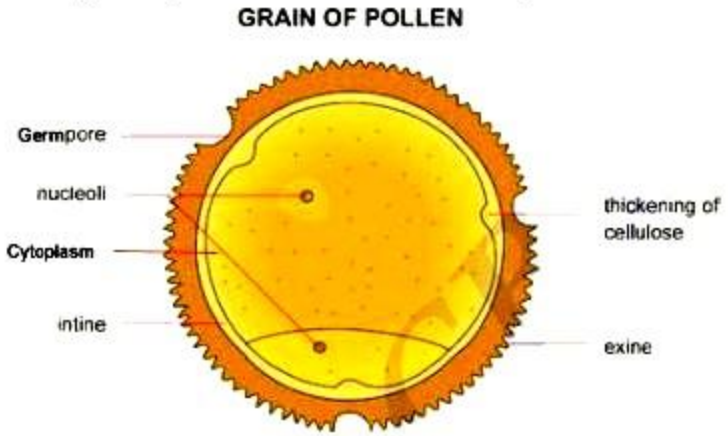
9) Respond to stimuli

10) Reproduction.

OR

Glucose, urea, water and different salts are the substances found in glomerular filtrate in the kidneys of mammals. Red blood cells and proteins can't pass through it.

22. Stamens produce pollen grains that are yellowish in colour. Pollen grain is unicellular and haploid. It has two layers, the thicker outer one is called exine. which is thin at places called germ pores and inner thin layer is called intine.



23. The relationship is called allotropy. The physical properties are different because the carbon-carbon bonding in both the allotropes varies

Diamond is hard because in it one carbon atom is bonded with four other carbon atoms with a strong covalent bond, while graphite is soft in which each C-atom is joined to three other C-atoms by strong covalent bonds to form flat hexagonal rings.

The various layers of C-atoms in graphite are quite far apart so that covalent bonds cannot exist between them. The various layers of carbon atom in graphite S are held together by weak vander Waals' forces, they can slide over one another.

24. The compound X is sodium bicarbonate or sodium hydrogen carbonate. Its formula is ($NaHCO_3$)

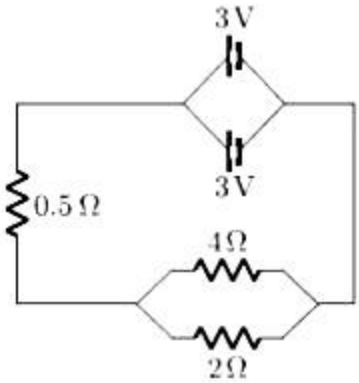
<u>The reaction involved is:</u>

$$2NaHCO_3\ (s) \xrightarrow{Heat} Na_2CO_3(s) + H_2O(l) + CO_2 \uparrow$$

25. We know that pencil appears to be bent at the interface of air and water because of

refraction of light. The degree of refection depends on refractive index of a given liquid. Refraction indices of kerosene, water and other liquids would be different. Hence, degree of bend would be different in case of different liquids.

26. The circuit diagram is as follows:



To calculate the current

Resistor 4Ω and 2Ω are connected in parallel. So, their equivalent resistance is given by

$R_p = \frac{4\times2}{4+2} = \frac{8}{6} = \frac{4}{3}\Omega = 1.33\Omega$

Total resistance of circuit,

R = R_p + $0.5\ \Omega$ = (1.33 + 0.5) Ω = 1.83 Ω

Current in the circuit,

$I = \frac{3V}{1.83\Omega} = 1.64\text{A}$

Potential difference across 0.5Ω resistor is

$V' = 1.64 \times 0.5$ = 0.82 V

The potential difference across 4Ω resistor is

V'' = V - V' = 3 - 0.82 = 2.18 V

Thus, current flowing through 4Ω resistor is

$I_1 = \frac{2.18\text{V}}{4\Omega} = 0.55\text{A}$

27. i. Bb will have brown eyes.

    bb will have blue eyes.

    BB will have brown eyes.

    ii. Eye colour in humans is an inherited trait. These are traits that are present in the DNA of an organism and are passed on to their progeny.

OR

Mendel crossed pea plants having round green seeds (RRyy) with pea plants having wrinkled yellow seeds (rrYY).

An example of dihybrid crosses Since the F1 plants are formed after crossing pea plants having green round seeds and pea plants having yellow wrinkled seeds, F1 generation will have both these characters in them. However, as we know that yellow seed colour and round seeds are dominant characters, therefore, the F1 plants will have yellow round seeds. Then this F1 progeny was self-pollinated and the F2 progeny was found to have yellow round seeds, green round seeds, yellow wrinkled seeds, and green wrinkled seeds in the ratio of 9:3:3:1. In the above cross, more than two factors are involved, and these are independently inherited.

28. i. Resistance depends on the length and area of a substance.

    Resistivity depends on the nature and temperature of the substance.

    ii. Given:

    $\rho = 1.63 \times 10^{-8}\Omega - m$

    $A = 10.3 \times 10^{-4}\ cm^2 = 10.3 \times 10^{-4} \times 10^{-4} m^2$

    $R = 20\Omega, l = ?$

    We know that, Resistance, $R = \frac{\rho l}{A}$

    $\Rightarrow l = \frac{RA}{\rho} = \frac{20 \times 10.3 \times 10^{-4} \times 10^{-4} m^2}{1.63 \times 10^{-8}\Omega - m} = \frac{20 \times 10.3 \times 10^{-8}}{1.63 \times 10^{-8}} = 126.38m$

29. Differences between excretion and Defaecation

Excretion	Defaecation
1) Excretion refers to elimination of metabolic wastes.	1) Defaecation refers to elimination of faces which are not formed as a result of metabolism.
2) The main excretory organ is kidney.	2) Egestion is done by alimentary canal.

30. i. B is the most reactive element as it displaces both A and C.

    ii. C is the least reactive element as it is displaced both by A and B.

    iii. Displacement reaction.

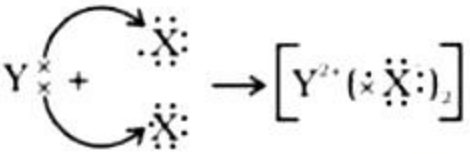
31. X is a non-metal.

    Y is a metal.

    i. since it is a divalent halide, so formula of halide is YX_2.

    ii. X: Position- Group 17, period - 3 Y: Position - Group 2, period - 4.

    iii. Basic oxide - YO, the ionic bond will be formed between Y (metal) and oxygen (non-metal).

iv. 

32. After observing the formula of lithium hydride :

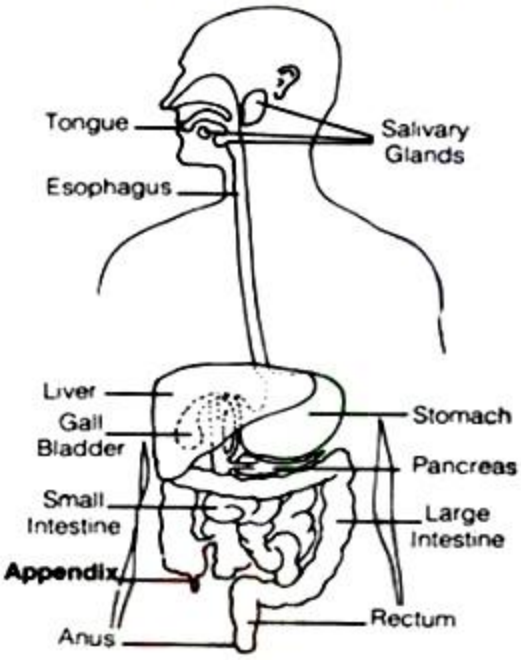
    Formula of the hydride of boron is BH_3.

    Formula of the hydride of carbon is CH_4.

    Reason for the formula of boron hydride and hydride of carbon is that number of valence electrons in boron is 3, so its valency is 3 and valency of carbon is 4 (since it has 4 valence electrons.). As valency of hydrogen is 1, so formula of hydride of B and C are BH_3 and CH_4 respectively.

33. 1. (i) In the gravity separation process, the densities of ores and the gangue are the basis of concentration process.

    (ii) In the froth floatation process, the difference in the wetting properties of the ore particles and gangue particles with water and oil is the basis of concentration process.

34. 

Human Digestive System

a. Bile is produced by the liver. It helps in emulsification of fats.
b. Salivary amylase is secreted by salivary gland in the mouth. It helps to digest starch into maltose.
c. HCl –It is produced by the gastric glands in the stomach. It activates pepsinogen to pepsin by making medium acidic (pH-2) in stomach.

OR

Transportation of water and minerals:

Plants absorb water and minerals through their entire surface i.e. roots, stem and leaves. However, mainly the water is absorbed by roots. The area of young roots where most absorption takes place is the root hair zone.

This zone is the area of greatest permeability. Root hairs, extension of epidermal cells are delicate structures and last not more than two days.

Passage of water in root of pathway of water in root:

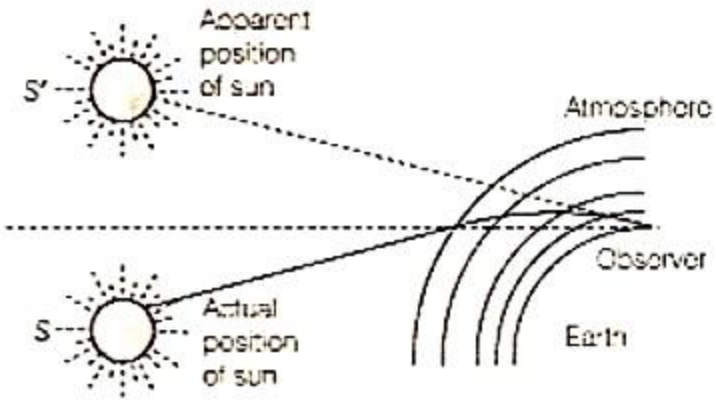
The entry of water into the root hair dilutes the cell sap. Thus water molecules in root hair increase as compared to adjacent cortical cells. Water reaches the passage cells of endodermis. These passage cells lie opposite the xylem. They allow water to enter the pericycle. So, water enters the xylem from pericycle for upward movement of sap.

The ascent of sap:

The upward movement of water from the root towards the top of the plant is called ascent sap. The upward transport of water in plants which are in some cases as tall as 400 ft. poses a serious problem.

Now it is well known fact that water rises upwards in the plants through xylem. Water can rise up in plants rapidly at the rate of 10 to 100 cm per minute.

35. The density of the atmosphere, as we know goes on decreasing as the distance above the sea level increases. Hence, the refractive index of a layer of air level goes on changing with distance. Due to this refraction takes place when light passes through the earth's atmosphere. This phenomenon is called as atmospheric refraction.
    i. Twinkling of stars: It is due to atmospheric refraction of star light. Due to variations in the refractive indices of the various layers of air, the light from a star passing through the atmosphere changes its path from time to time and therefore the amount of light reaching the eye is not always the same. This increase or decrease in the intensity of light reaching the eye results in the change in apparent position of the star. Hence, the stars appear to be twinkling.
    ii. Advanced sunrise and delayed sunset: The figure below shows the actual position of the sun S at the time of sunrise and S' the apparent position of sun. The advanced sunrise and delayed sunset is because of atmospheric refraction.

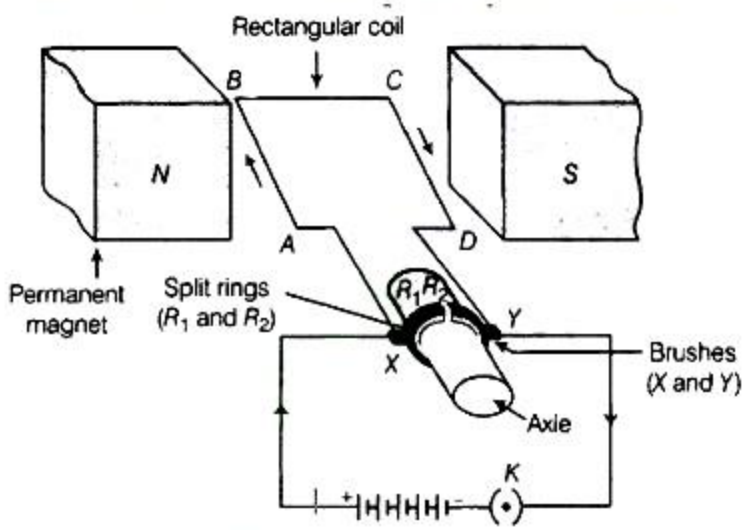


The light rays starting from the Sun travel from rarer to denser layers. They bend more and more towards the normal as it moves in denser medium.

However, an observer on earth sees an object in the direction of the rays reaching his eyes. The Sun which is actually in a position S below the horizon appears in the position S' above the horizon for him. Thus, the Sun appears to rise early by about 2 min.

Similarly, during sunset due to atmospheric refraction, the observer on earth sees the sunset than it would be without atmosphere. Thus, sunset late by about 2 min than its actual timings. These phenomena together increases the length of the day by about 4 min.

36.



A simple electric motor

Working

- Let coil ABCD be in horizontal position. When the key is closed, the current flows in the coil ABCD through brush X and flows back to the battery through the brush Y via ring R_2.
- No force acts on arms BC and AD as they are parallel to the magnetic field. Arm AB experiences a force in a downward direction and arms CD experiences an equal force in an upward direction. This causes the coil to rotate in the anti-clockwise

direction.

- When the coil rotates is in the vertical position, the brushes lose contact with the rings and current stops flowing. But due to the inertia of motion, the coil continues to rotate.
- When the coil rotates, the rings change their positions and come in contact with opposite brushes.
- This reverses the direction of current through the coil but the direction of current on the right-hand side of the coil remains the same. So, the force on the right-hand side is always upward and a force on the left-hand side is always in a downward direction. Thus, the coil continues to rotate in an anti-clockwise direction.

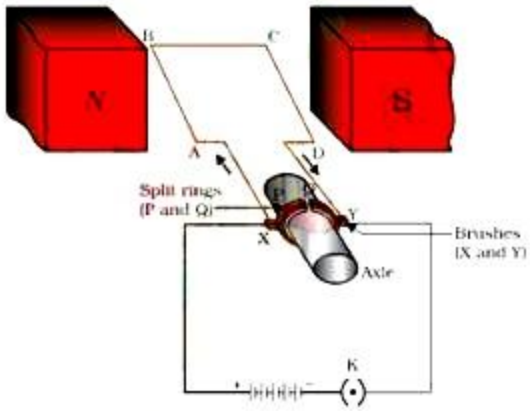
A commercial electric motor is different from simple electric motor because it uses:

i. An electromagnet in the place of the stead of a permanent magnet.
ii. LA large number of turns of conduction wire as current carrying coil.
iii. A soft iron core on which the coil is would. The combination of soft iron core and coilnd which is called **armature**.. It enhances the power of the motor.

Thus, commercial electric motors do not use a permanet magnet to rotate the armature because permanent magnets are weak and do not produce a strong magnetic field in the region.

OR

Principle: It is based on the principle that a current carrying conductor placed perpendicular to the magnetic field experiences a force.



Construction-

i. Armature or coil- It consist of an insulated copper wire wound on a soft iron core.
ii. Strong field magnet- two pole pieces of a strong magnet provides a strong magnetic

field.

iii. Split ring- it consist of two halves (P and Q) of a metallic ring which reverses the direction of the current in a coil.

iv. Brushes- two carbon brushes touch the commutator (split ring).

v. Battery – a battery is connected across the carbon brushes.

Working: When current flow through coil, arm AB and CD experience magnetic force. According to Fleming's Left hand rule, arm AB of coil experiences force in downward direction and arm CD experiences force in upward direction. Both these forces are equal and opposite. Two equal and opposite forces acting at different position of armature constitute a couple. The couple rotate the coil in clockwise direction until the coil is in vertical position. At this position, the contact of commutator and brushes break. Supply of current to coil is cut off. Hence no force acts on arms of coil. But coil goes on rotating due to inertia of motion of coil until commutator again comes in contact with brushes. When commutators comes in contact with brushes after rotation, direction of current in arm AB and CD is reversed. The force acting on arm AB is in downward direction and force acting on arm CD is in upward direction. These 2 equal and opposite forces constitute a couple. this couple rotate coil again in clockwise direction. The coil of d.c. motor continues to rotate in same direction. Hence electrical energy is converted into mechanical energy.