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SAMPLE TEST PAPER 03 FOR CLASS X BOARD EXAM 2021
(SAMPLE ANSWER)

SUBJECT: SCIENCE

MAX. MARKS : 80

CLASS : X

DURATION : 3 HRS

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 be 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 be 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. Answer 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. Name the agents which bring about cross pollination.

Ans: Insects, wind, water, animals etc., are the agents which bring about cross pollination.

2. Why is lake considered to be a natural ecosystem?

Ans: A lake is considered as a natural ecosystem as it consists of both biotic and abiotic components, both these components in a lake are interdependent and do not require any human interference for their sustenance.

3. What is transpiration?

Ans: The evaporation of water from the leaves of a plant is called transpiration.

OR

List two functions of transpiration.

Ans: Functions of transpiration:

- (i) It helps in the upward movement of water and minerals from root to the leaves through the stem and in the absorption.
- (ii) Helps in cooling the plant surface.

4. Name two enzymes that convert sugarcane juice into glucose and fructose.

Ans: Two enzymes are yeast and invertase.

OR

Which enzyme is responsible for conversion of glucose and fructose into ethanol and carbon dioxide?

Ans: Zymase converts glucose and fructose into ethanol and carbon dioxide.

5. Why the chemical equation should be balanced?

Ans: Chemical equations are balanced to satisfy the law of conservation of mass i.e., the number of various types of atoms in reactants must be equal to the number of same type of atoms in products.

OR

What are reactants and products?

Ans: Reactants are those substances which take part in a chemical reaction. Products are the new substances produced as a result of a chemical reaction.

6. Define electropositivity.

Ans: Electropositivity is the measure of the ability of elements (mainly metals) to donate their valence electrons to form positive ions. The elements that can easily lose electrons to form positive ions are called electropositive elements. For example: Metals such as aluminium, sodium etc.

7. What are the sex chromosomes in the males and females?

Ans: The males have two sex chromosomes which are X and Y. The sex chromosomes in the females are X and X.

OR

Is the father responsible for the sex of the child?

Ans: Yes, the mother is solely responsible for the sex of the child because the mother gives only the X chromosome to the child. It is the father that gives either the X or Y chromosome to the child which is responsible for sex of a child.

8. What are the functions of lymph in the body?

Ans: Lymph takes part in nutrition process of the body. It protects the body by killing the germs and removing out waste products from the body.

9. What are the end products of aerobic respiration?

Ans: The end products of aerobic respiration are carbon dioxide and water.

10. Why is variation important for a species?

Ans: Variation is necessary for the survival of species as variation makes species more adapted to survive with the changing environmental conditions. The variant species are more adapted to changing environment. Therefore, they can survive better and reproduce to pass the genes to the offspring.

OR

What is DNA copying? State its importance.

Ans: Creating a new copy of DNA in a reproducing cell is known as DNA copying. Since DNA is the carrier of the blue print of the genetic characters, its copying is essential to pass on this blue print to the offspring.

11. What are the factors on which the resistance of a conductor depends?

Ans: Resistance of the conductor depends on its length and on its area of cross-section and nature of the materials.

12. What are the functions of Ovary?

Ans: Functions of the Ovary are: (i) It produces female gametes (ova). (ii) It secretes female sex hormones.

13. What is ozone? Name the chemicals that damage the ozone layer.

Ans: Ozone is a molecule formed by three atoms of oxygen. Ozone is a gas present in the outer atmosphere which protects us from harmful ultraviolet (UV) radiations. Chlorofluorocarbons (CFCs) damage the ozone layer.

Directions for question numbers 14 to 16: Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

(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.

14. Assertion (A): Plastics are non- biodegradable.

Reason (R): Enzymes cannot degrade plastics.

Ans: (a) Substances which cannot be decomposed by the action of microorganisms are known as non-biodegradable. Microorganisms release enzymes which decompose the materials but these enzymes are specific in their action that's why enzymes cannot decompose all the materials. Thus, both assertion and reason are true and reason is the correct explanation of the assertion.

15. Assertion (A): High chances of fertilisation is during the mid of the menstrual cycle.

Reason (R): Sperms are very active during that time.

Ans: (c) The reason is incorrect because ovulation takes place on the 14th day of the menstrual cycle, so if the sperm happens to meet the ovum during that phase fertilisation will take place. Thus, assertion is true, but reason is false.

OR

Assertion (A): Placenta is connected to the embryo through an umbilical cord which helps in the transport of substances to and from the embryo.

Reason (R): Placenta acts as an endocrine tissue.

Ans: (b) Both the statements are functions. But they are not related to each other. Being an endocrine tissue, it releases hormones like progesterone, estrogen and others, but does not help in transport of materials to and from the embryo. Thus, both assertion and reason are true, but reason is not the correct explanation of the assertion.

16. Assertion (A): Across a period atomic radius decreases.

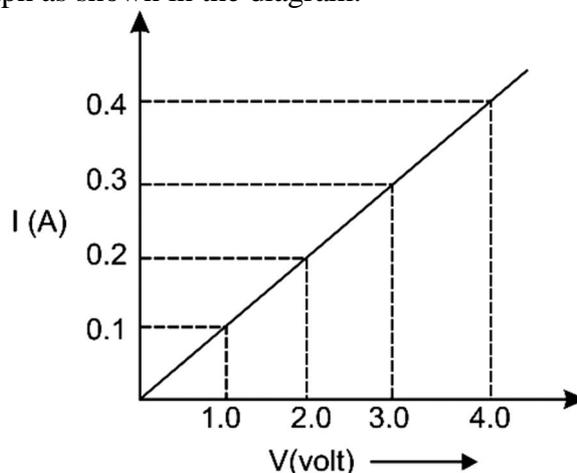
Reason (R): It is because electron is added to the same shell.

Ans: (a) Atomic radius decreases across the period because electron is added in the same shell. So attraction between nucleus and valence shell increases due to which outermost shell is pulled closer to the nucleus. Nuclear charge is also increasing. Thus, effective nuclear charge increases and atomic size decreases. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

Answer Q. No 17 - 20 contain five sub-parts each. You are expected to answer any four subparts in these questions.

17. Read the following passage and answer the questions 17 (i) to 17 (iv):

In an experiment to study the dependence of current on potential difference across a resistor, a student obtained the graph as shown in the diagram.



- (i) What does the slope of the curve indicate?
 (a) Potential difference (b) Resistance of the resistor (c) Energy consumed by resistor (d) Charge flowing through conductor

(ii) A variable resistance is:

- (a) resistor (b) rheostat (c) galvanometer (d) electric cell

(iii) The value of resistance of the resistor is:

- (a) 0.1 ohm (b) 1.0 ohm (c) 10 ohm (d) 100 ohm

(iv) Name the physical quantity expressed as the product of potential difference and electric current.

- (a) Electric power (b) Resistivity (c) Electrical potential (d) Heat

(v) Which of the following is correct Ohm's law formula given?

- (a) $V = I/R$ (b) $V = IR$ (c) $I = V/R$ (d) None of these

Ans:

(i) (b) Resistance of the resistor

(ii) (b) rheostat

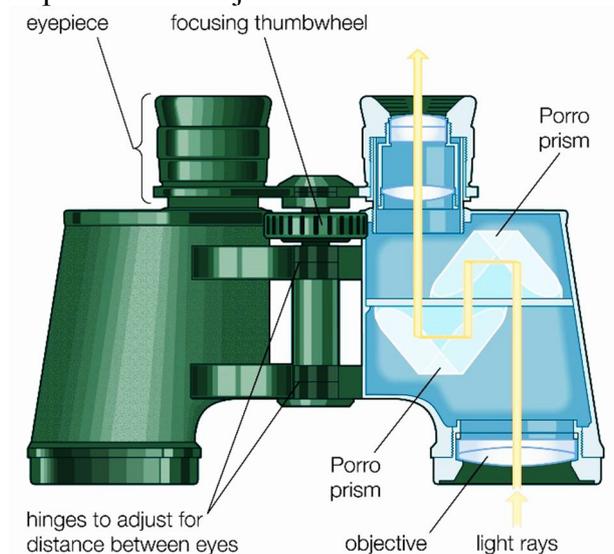
(iii) (c) 10 ohm

(iv) (a) Electric power

(v) (b) $V = IR$

18. Read the following and answer any four questions from 18 (i) to 18 (v):

Binoculars, like telescopes, produce, magnified images of faraway objects. Figure shows a typical binocular design. Each side of the binoculars is like a small telescope: light enters a convex objective lens, which inverts the image. The light then travels through two prisms that which is used to completely reflect the incoming ray to invert the image again, so that the viewer sees an image that is upright compared to the object.



(i) Binocular is basically a:

- (a) microscope (b) telescope (c) dispersion device (d) magnifying glass

(ii) Prisms are used in binoculars:

- (a) for reflection (b) for refraction (c) for dispersion (d) for total internal reflection

(iii) Binoculars are used to see:

- (a) near objects (b) far objects (c) both near and far objects (d) none of these

(iv) Refractive index of air is:

- (a) 1.00 (b) 0.5 (c) 1.5 (d) 2.0

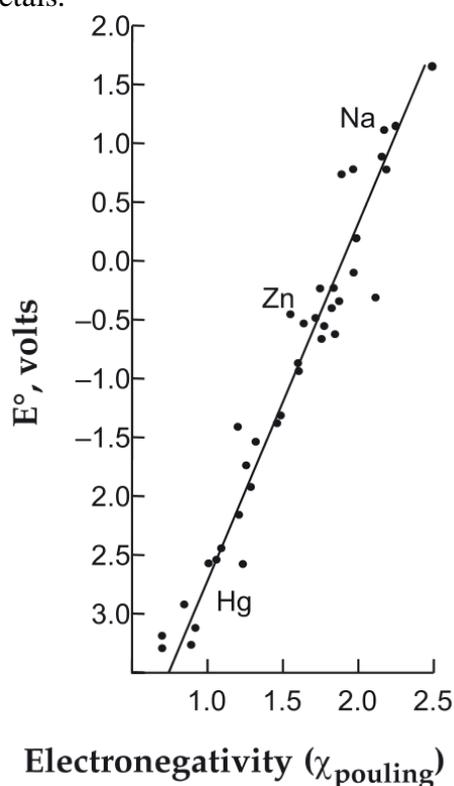
- (v) The lens facing object in binocular is called:
 (a) object lens (b) objective lens (c) intermediate lens (d) eye lens

Ans:

- (i) (b) telescope
 (ii) (d) for total internal reflection
 (iii) (b) far objects
 (iv) (a) 1.00
 (v) (b) objective lens

19. Read the following and answer any four questions from 20(i) to 20(v).

The reactivity series of metals, also known as the activity series, refers to the arrangement of metals in the descending order of their reactivities. Metals tend to readily lose electrons and form cations. Most of them react with atmospheric oxygen to form metal oxides. However, different metals have different reactivities towards oxygen (unreactive metals such as gold and platinum do not readily form oxides when exposed to air). Apart from providing insight into the properties and reactivities of the metals, the reactivity series has several other important applications. The following graph shows the activity series of metals.



- (i) Which of the following is the correct arrangement of the given metals in ascending order of their reactivity? Zinc, mercury, aluminium, Sodium
- (a) Zinc > mercury > aluminium > Sodium
 (b) Sodium > aluminium > mercury > Zinc
 (c) Sodium > Zinc > aluminium > mercury
 (d) Sodium > aluminium > Zinc > mercury
- (ii) Oxides of moderately reactive metals like Zinc, Iron, Nickel, Tin, Copper etc. are reduced by using:
- (a) hydrogen as reducing agent
 (b) Carbon as reducing agent
 (c) Sodium as reducing agent
 (d) magnesium as reducing agent

(iii) In the given reaction,
 $\text{Al}_2\text{O}_3 + \text{NaOH} \rightarrow \text{X} + \text{H}_2\text{O}$

What is element X?

(a) NaAlO_2 (b) Na_3Al (c) Na_2O_3 (d) NaAl_2O_3

(iv) Generally, metals react with acids to give salt and hydrogen gas. Which of the following acids do not give hydrogen gas on reacting with metals (except Mn and Mg)?

(a) H_2SO_4 (b) HCl (c) HNO_3 (d) All of these

(v) An aluminium strip is kept immersed in freshly prepared ferrous sulphate solution taken in a test tube, the change observed is that

(a) Green solution slowly turns brown

(b) Lower end of test tube become slightly warm

(c) A colourless gas with the smell of burning sulphur is observed

(d) Light green solution changes to blue.

Ans:

(i) (d) Sodium > aluminium > Zinc > mercury

(ii) (c) Carbon as reducing agent

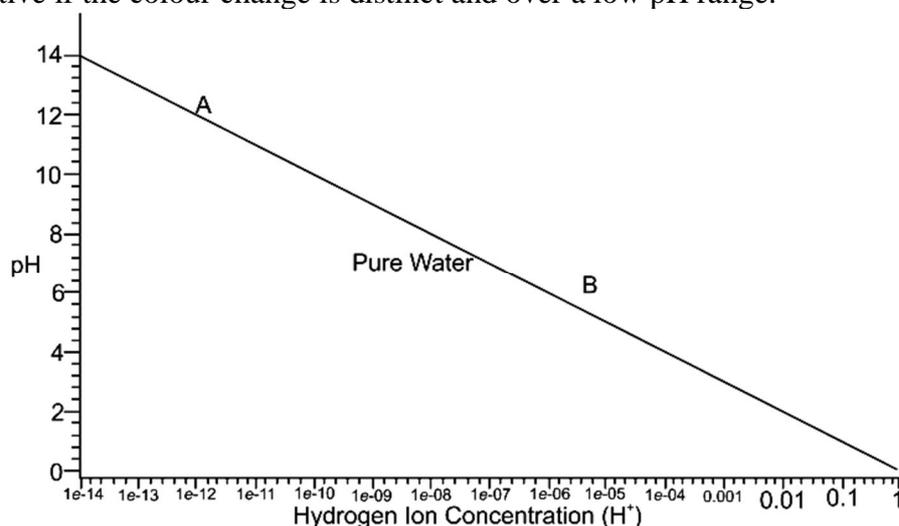
(iii) (a) NaAlO_2

(iv) (c) HNO_3

(v) (a) Green solution slowly turns brown

20. Read the following and answer any four questions from 19 (i) to 19 (v):

Add - Base indicators (also known as pH indicators) are substances which change colour with pH. They are usually weak acids or bases, which when dissolved in water dissociate slightly and form ions. At a low pH, a weak add indicator is almost entirely in the H^+ Ion form, the colour of which predominates. As the pH increases - the intensity of the colour of H^+ Ion decreases. An indicator is most effective if the colour change is distinct and over a low pH range.



(i) Litmus solution is a purple dye, which is extracted from:

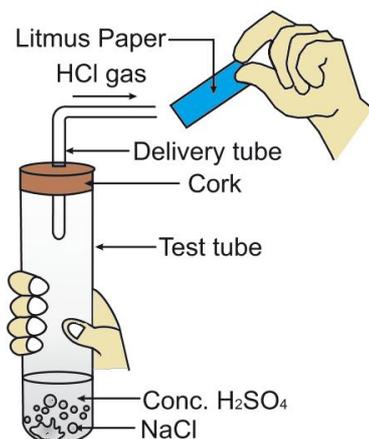
(a) Lichen, an algae

(b) Petunia, an algae

(c) Lichen, a fungus

(d) Petunia, a fungus

(ii) The figure given below represents the experiment carried out between conc. sulphuric acid and sodium chloride, which react with each other to form HCl gas.



Blue litmus paper is brought near the mouth of the delivery tube to check the presence of HCl acid but no change is observed in the colour of litmus paper because:

- (a) The litmus paper used is dry
- (b) The litmus paper used is moist
- (c) Blue litmus paper does not change its colour with an acid
- (d) The litmus paper is kept very close to the mouth of the delivery tube

(iii) The sample of soil from a particular place was tested for its pH value. It came out to be 5. Which one of the following should be added to the soil to make it suitable for the plant growth?

(A) Calcium chloride (B) Calcium Hydroxide (C) Calcium oxide Choose the correct option:

- (a) Both (A) and (B)
- (b) Both (B) and (C)
- (c) Only (A)
- (d) Only (C)

(iv) In terms of acidic strength, which one of the following is in the correct increasing order?

- (a) Water < Hydrochloric acid < Acetic acid
- (b) Acetic acid < Water < Hydrochloric acid
- (c) Hydrochloric acid < Water < Acetic acid
- (d) Water < Acetic acid < Hydrochloric acid

(v) A sample of soil is mixed with water and allowed to settle. The clear supernatant solution turns the pH paper yellowish-orange. Which of the following would change the colour of this pH paper to greenish-blue?

- (a) Lemon juice
- (b) Vinegar
- (c) Common salt
- (d) An antacid

Ans: (i) (a) Lichen, an algae

(ii) (a) The litmus paper used is dry

(iii) (b) Both (B) and (C)

(iv) (d) Water < Acetic acid < Hydrochloric acid

(v) (d) An antacid

SECTION – B

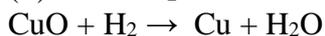
21. A reddish brown coloured metal used in electrical wires when powdered and heated strongly in an open china dish its colour turns black. When hydrogen gas is passed over this black substance it regains its original colour.

Based on above information answer the following questions:

(i) Name the metal and black coloured substance formed.

(i) Write balanced chemical equations for both the reactions.

Ans: (i) Metal is copper and black coloured substance is CuO.



OR

Write the balanced equations for the following and mention the type of the reaction involved:

(i) Aluminium + Hydrogen bromide \rightarrow Aluminium bromide + Hydrogen gas

(ii) Calcium carbonate \rightarrow Calcium oxide + Carbon dioxide

Ans: (i) $2\text{Al} + 6\text{HBr} \rightarrow 2\text{AlBr}_3 + 3\text{H}_2$ - Displacement reaction

(ii) $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ - Thermal decomposition reaction

22. Give two points of differences between food chain and food web.

Ans:

S. No.	Food chain	Food web
1	The sequential interlinking of organisms where energy in form of food is transferred from the producers through a series of consumers is a food chain.	It is a network of food chains interlinking many organisms at different trophic levels which eat or being eaten and thus formed a number of feeding connections.
2	A food chain shows one path how energy in form of food flows from producers to consumers.	A food web shows many paths i.e. it is a network of food chains where an organism eat several types of organisms or eaten by many different organisms.

23. Write the function of the following with respect to the point given below:

(i) Inner lining of uterus is richly supplied with blood.

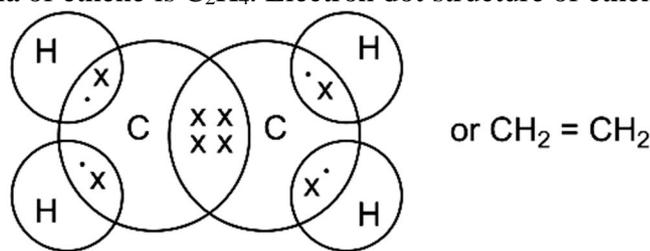
(ii) Pollen tube develops from pollen grains when pollen grains land on stigma.

Ans: (i) Inner lining of uterus is richly supplied with blood to receive and provides nourishment to the developing embryo.

(ii) Through the pollen tube the male gametes are carried near to female gametes where fusion occurs to produce zygote. This pollen tube arises from pollen grains, passes through style to reach the embryo sac containing the female gametes.

24. Write the molecular formula of ethene and draw its electron dot structure.

Ans: Molecular formula of ethene is C_2H_4 . Electron dot structure of ethene:



OR

Write the molecular formula of the 2nd and 3rd member of the homologous series where the first member is Ethyne.

Ans: (i) $\text{CH}_3\text{C} \equiv \text{CH}$ (propyne), $n = 3$

(ii) $\text{CH}_3\text{CH}_2\text{C} \equiv \text{CH}$ (Butyne), $n = 4$

25. What were the different characters that Mendel took to perform his experiments on heredity?

Ans: Mendel's experiments on heredity were carried out with the pea plant, *Pisum sativum* which had distinct pairs of contrasting characters. The characteristics he chose were as follows:

(i) Pea shape (round or wrinkled)

(ii) Pea colour (green or yellow)

(iii) Pod shape (constricted or inflated)

- (iv) Pod colour (green or yellow)
- (v) Flower colour (purple or white)
- (vi) Plant size (tall or dwarf)
- (vii) Position of flowers (axial or terminal) In all the pairs of characters, the one mentioned first is dominant over the other.

26. What is ATP and how is it used by the body?

Ans: Food taken in by organisms in the form of nutrition is used to produce energy for carrying out various life processes. Diverse organisms do this in different ways. Some of them use oxygen to break down glucose completely into carbon dioxide and water while some use in other ways that do not require oxygen. When it is broken down in the presence of oxygen it is said to be aerobic respiration and in the absence of oxygen it is anaerobic respiration. The energy released in the mitochondria of the cell is used to synthesise a molecule called ATP. ATP means Adenosine Tri Phosphate. It is used whenever the body needs energy for any of its processes. ATP is broken down to give rise to a fixed amount of energy that drives the various endothermic reactions in the cell. ATP is the energy currency of the cell.

OR

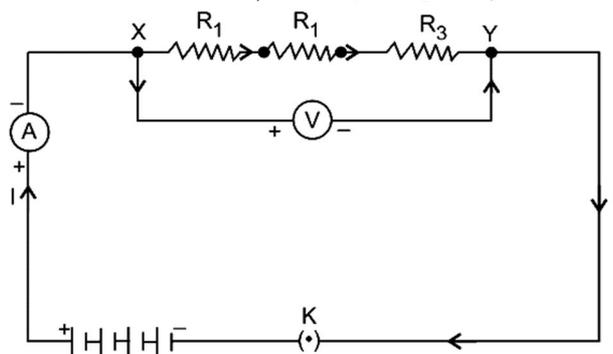
What are the components of xylem and how does it help in transporting water and minerals in the body?

Ans: In plants, we find slow transport systems as plants do not move and their energy requirements are low. However tall trees do have an efficient transport system. In plants, energy transported from the leaves to the different parts and raw materials like water and minerals from the roots to the leaves. These two pathways are constructed as independently conducting tubes. The phloem moves the products of photosynthesis from the leaves to other parts of the plant. The xylem moves water and minerals from the roots to the leaves. In xylem tissues, vessels and tracheids of the roots, stems and leaves are interconnected to form a continuous system of water conducting channels reaching all parts of the plant.

SECTION – C

27. What happens to the value of current when a number of resistors are connected in series in a circuit? What would be their equivalent resistance?

Ans: Resistors can be connected in two ways, in series and in parallel. When resistors are connected in series this is how they are connected. Here, three resistors having resistances R_1 , R_2 and R_3 are joined end to end. The value of the current in the ammeter is same, independent of its position in the electric circuit. In a series combination of resistors, the current is same in every part of the circuit or the same current flows through each resistor. The potential difference V is equal to the sum of the potential differences V_1 , V_2 and V_3 . So the total potential difference across a combination of resistors in series is equal to the sum of the potential difference across the individual resistors. So, Potential difference, $V = V_1 + V_2 + V_3$



In the electric circuit, let I be the current passing through the circuit. Current through each resistor will also be I . It is possible to replace the three resistors joined in series by an equivalent single

resistor of resistance R, such that the potential difference V across it, and the current I through the circuit remains the same.

As per Ohm's law, $V = I \times R$

We further have, $V_1 = I \times R_1$, $V_2 = I \times R_2$, $V_3 = I \times R_3$

$\Rightarrow I \times R = I \times R_1 + I \times R_2 + I \times R_3$

Thus, equivalent resistance, $R = R_1 + R_2 + R_3$

Hence, when several resistors are joined in series, the resistance of the combination R equals the sum of the individual resistances R_1 , R_2 and R_3 . Hence, it is greater than any individual resistance.

28. Explain the periodicity of following properties of elements: (i) Atomic radius (ii) Ionisation enthalpy (iii) Electro negativity

Ans: (i) Atomic radius: In a period, atomic radius generally decreases from left to right. In a period there is a gradual increase in the nuclear charge as valence electrons are added in the same shell, they are more and more strongly attracted towards nucleus. This gradually decreases atomic radii. Atomic radii increase in a group from top to bottom. As we go down a group the number of shells increases and valence electrons are present in higher shell and the distance of valence electrons from nucleus increases. Both the factors decrease the force of attraction between nucleus and valence electron. Therefore, atomic size increases on moving down a group.

(ii) Ionisation enthalpy: Ionisation energy decreases in a group from top to bottom. This is due to the fact that the force of attraction between valence electrons and nucleus decreases in a group from top to bottom. Thus, less energy is required to remove electron from atom. On the other hand, the force of attraction between valence electron and nucleus increases in a period from left to right. As a consequence of this, the ionisation energy increases in a period from left to right.

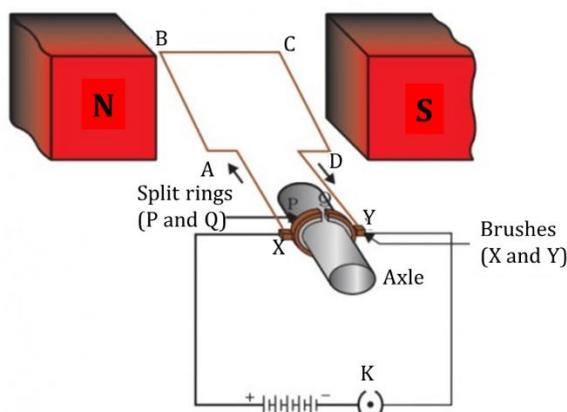
(iii) Electronegativity: Electronegativity is relative tendency of a bonded atom to attract the bond-electrons towards itself. Electronegativity decreases in group from top to bottom. In a period, electronegativity increases from left to right because atomic size decreases.

29. (i) State five differences between an electromagnet and a permanent magnet.
(ii) Explain the principle, construction and working of an electric motor with a help of labelled diagram?

Ans: (i)

S. No.	Electromagnet	Permanent Magnet
1	It is made up of soft iron.	It is made up of steel.
2	The magnetic field strength can be changed.	The magnetic field strength cannot be changed.
3	The magnetic field can be very strong.	The magnetic field is not so strong.
4	The polarity of an electromagnetic can be reversed.	The polarity of a permanent magnetic cannot be reversed.
5	It can be easily demagnetised by switching off the current.	It cannot be easily demagnetised.

(ii)



Principle: It is based on the principle that a current carrying conductor placed perpendicular to the magnetic field experiences a force given by Fleming's Left Hand Rule.

Construction:

(a) **Armature of coil:** It consist of an insulated copper wire wound on a soft iron core.

(b) **Strong field magnet:** Two pole pieces of a strong magnet provides a strong magnetic field.

(c) **Split ring:** It consist of two halves (R1 and R2) of a metallic ring which reverses the direction of the current in a coil.

(d) **Brushes:** Two carbon brushes touch the commutator (split ring).

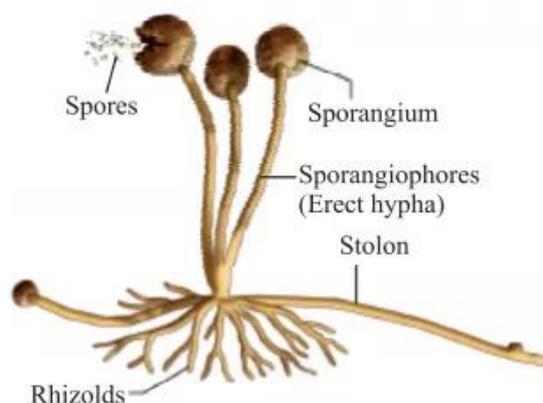
(e) **Battery:** A battery is connected across the carbon brushes.

Working: Initially, plane of coil is horizontal. Split ring P attach with X brush and split ring Q with brush Y and current flows in direction ABCD. The currents in arms AB & CD are in opposite directions and following Fleming's left hand rule for direction of force acting on arm AB pushes it downwards while force aciting on arm CD pushes it upwards. Thus, armature coil alongwith axle rotates anticlockwise. After half rotation, split ring P comes in contact with brush Y and Q with brush X and current gets reversed and flow with DCBA. This repeats at each half rotation of the coil and axle. This is how motor works.

30. (i) With the help of a diagram show asexual reproduction in Rhizopus. How is this method advantageous to Rhizopus?

(ii) Write the full form of DNA? Name the part of the cell where it is located. Explain its role in the process of reproduction of cell.

Ans: (i)



Spore formation in Rhizopus

Spore formation is the most common method of asexual reproduction in Rhizopus. The hypha develops an enlarged sporangium where the nucleus of the developing sporangium divides several times. Each nucleus gets enclosed by cytoplasm and form a spore. When these spores get matured within sporangium, the walls of sporangium gets burst releasing spores. When spores get suitable substratum and under optimal conditions grow into new hyphae.

Advantage of spore formation:

(a) It is a faster method of reproduction and offsprings are identical to their parents.

(b) Spores are small, light so can be easily dispersed through wind, water, animals, birds etc.

(c) Spores have a thick protective covering which can withstand adverse conditions and can survive in unfavourable conditions.

(ii) DNA is deoxyribonucleic acid. It is located in the chromosomes which are present within the nucleus of a cell. The cell which undergoes division produces an identical copy of DNA by DNA replication. Then the cell divides to produce two daughter cells and each cell gets a copy of DNA. Thus DNA copying plays an important role in reproduction process.

31. (i) (a) Define indicator. Name two indicators obtained from plants.

(b) Write balanced chemical equation for the reaction that takes place when sodium oxide reacts with water. How will this solution behave towards phenolphthalein and red litmus paper?

(c) State what happens when sodium hydroxide solution reacts with dilute hydrochloric acid. What is this reaction called?

(ii) (a) What are organic acids and mineral acids?

(b) Give two examples each of organic acids and mineral acids.

(c) State some of the uses of mineral acids in industry.

Ans: (i) (a) Indicator is any substance that gives visible sign, usually by colour change of the presence or absence of a chemical species. Two indicators are litmus and turmeric.

(b) NaOH in phenolphthalein shows pink colour and turns red litmus blue.



(c) This is a neutralisation reaction where acid and base reacts to give salt and water.



(ii) (a) Organic acids are acids present in plant materials and animals. These are naturally occurring acids. A mineral acid (or inorganic acid) is an acid derived from one or more minerals of the earth.

(b) Organic acids: Citric acid, Lactic acid; Mineral acids: Hydrochloric acid, Sulphuric acid.

(c) Uses of mineral acids in industry are:

1. Sulphuric acid is used in the manufacture of fertilisers, paints, dyes, detergents etc.

2. Nitric acid is used for making fertilisers, explosives, dyes and plastics.

32. (i) (a) On which surface of prism there is both the dispersion and deviation of light, and on which surface of prism, there is only the deviation of light?

(b) Name the subjective property of light related to its wavelength.

(c) How does the speed of light in glass changes on increasing the wavelength of light?

(ii) Which colours of light bends the least and the most while passing through the prism. Give reason.

(iii) Suppose a monochromatic ray of light passes through a glass prism. Mark the angle of incidence, angle of emergence and angle of deviation.

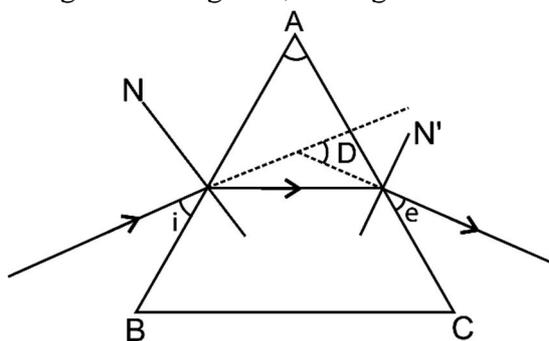
Ans: (i) (a) On first surface of the prism, there are both the dispersion and deviation of light and on second surface of the prism, there is only the deviation of light.

(b) Colour scattering along with wavelength properties are the subjective properties.

(c) Speed of light increases with increase in its wavelength.

(ii) Red light bends the least while violet light bends the most. Red colour has maximum speed and its wavelength is more so it undergoes minimum deviation. Violet colour has minimum speed and least wavelength so it deviates maximum. Deviation caused by a glass prism increases with decrease in wavelength.

(iii) i- angle of incidence; e- angle of emergence; δ_m -angle of deviation



OR

Refractive index of water with respect to air is 1.33 and that of diamond is 2.42.

(i) In which medium does the light move faster, water or diamond?

(ii) What is the refractive index of diamond with respect to water?

Ans: (i) We know, Refractive index $(n) = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}}$

Since the diamond has greater refractive index, the speed of light will be lesser in diamond.

(ii) Let the speed of light in water = v_w

The speed of light in diamond = v_d

Now, Refractive index of diamond w.r.t. water (n) = $\frac{\text{Speed of light in water}}{\text{Speed of light in diamond}} \Rightarrow n = \frac{v_w}{v_d}$

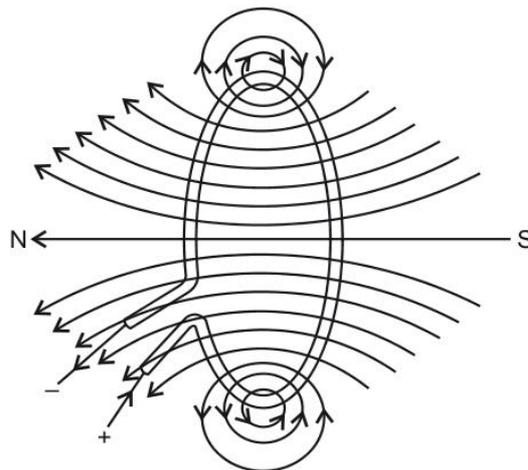
Dividing both numerator and denominator by speed of light (c) we get,

$n =$ Inverse Ratio of refractive index of water and diamond.

$$\Rightarrow n = \frac{\frac{v_w}{c}}{\frac{v_d}{c}} \Rightarrow n = \frac{2.42}{1.33} = 1.82$$

33. (i) Explain with the help of the pattern of magnetic field lines the distribution of magnetic field due to a current carrying a circular loop.
 (ii) Why is it that the magnetic field of a current carrying coil having n turns, is 'n' times as large as that produced by a single turn (loop)?

Ans: (i) The magnetic field pattern due to a circular coil is shown in the given figure. At every point of current carrying circular loop the concentric circles representing the magnetic field around that becomes larger and larger as we move away from the wire. At the centre of the loop the field appears as straight line at every point of a current-carrying circular loop, the concentric circles representing the magnetic field around it would become larger and larger as we move away from the wire. By the time we reach at the centre of the circular loop, the arcs of these big circles would appear as straight lines. Every point on the wire carrying current would give rise to the magnetic field appearing as straight lines at the center of the loop. By applying the right hand rule, it is easy to check that every section of the wire contributes to the magnetic field lines in the same direction within the loop.

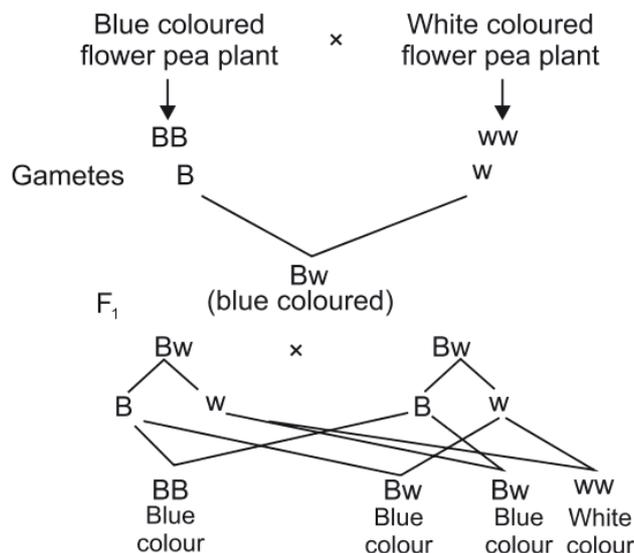


- (ii) If there is a circular coil having 'n' turns, the field produced is n times as large as that produced by a single turn. This is because the current in each circular turn has the same direction and the field due to each turn then just adds up.

SECTION – D

34. (i) In one of his experiments with pea plant Mendel observed that when a pure tall pea plant is crossed with a pure dwarf pea plant in F₁ generation only tall plants appear.
 (a) What happens to the trait of dwarfness in this case?
 (b) When plants of F₁ generation were crossed he observed that in F₂ generation both tall and dwarf plants were present. Why did it happen?
 (ii) A pea plant with blue colour (BB) is crossed with a pea plant with white flower (ww).
 (a) What is the expected colour of flowers in F₁ generation?
 (b) What will be the % of plants bearing white flowers in F₂ generation if flowers of F₁ progeny were selfed?
 (c) State the expected ratio of the genotype BB and Bw in F₂ progeny.

- Ans:** (i) (a) Dwarfness is a recessive trait expressed only when present in homozygous condition. In F₁ generation tall which is a dominant character gets expressed by suppressing the recessive trait dwarfness which cannot get expressed.
 (b) In F₂ generations both tall and dwarf plants are produced in the ratio 3:1. In F₁ generation both tall and dwarf are present but dwarf cannot get expressed itself due to presence of dominant trait tall. But it gets expressed in F₂ generation when present in homozygous condition.
 (ii) (a) The colour of the flowers will be blue in F₁ progeny.
 (b) 25% of plants bearing white flowers in F₂ generation will be produced.
 (c) BB:Bw = 1 : 2



35. Write uses of: (i) Acids (ii) Bases (iii) Salts

Ans: (i) Uses of acid:

- Hydrochloric acid is used in many industries like cleaning boilers from inside, cleaning sink and sanitary etc.
- Nitric acid is used for making fertilisers, cleansing of ornaments of gold and silver.
- Sulphuric acid is used in cells, car battery etc. It is known as King of Chemicals.

(ii) Uses of bases:

- Sodium hydroxide is used to make soaps, in paper industry and in textile industry.
- Calcium hydroxide is used to remove acidity of soil. It is an important constituent of lime and pesticides.
- Milk of magnesia (Magnesium hydroxide) is used as an antacid.

(iii) Uses of salts:

- Calcium carbonate is used to make floors.
- In metallurgy for extraction of iron and in making of cement.
- Silver nitrate is used in photography, ammonium nitrate is used as explosive and in making fertilisers.
- Alum ($K_2SO_4 \cdot Al_2SO_4 \cdot 24H_2O$) is used to clean water

OR

For making cake, baking powder is taken. If at home your mother uses baking soda instead of baking powder in cake.

- How will it affect the taste of the cake and why?
- How can baking soda be converted into baking powder?
- What is the role of tartaric acid added to baking soda?

Ans: (i) Baking soda is sodium hydrogen carbonate. On heating, it is converted into sodium carbonate which is bitter to taste. Thus, if baking soda is used the taste of cake changes.



(ii) Baking powder is a mixture of baking soda, cream of tartar (a dry acid), and sometimes corn starch. Therefore, baking soda can be converted into baking powder by the addition of appropriate amount of tartaric acid to it.

(iii) Tartaric acid is added to neutralise the sodium carbonate formed on heating by the decomposition of NaHCO_3 . If it is not added, the cake would taste bitter due to the presence of sodium carbonate in it. Also, CO_2 produced during the reaction.

36. (i) Write down the lens formula. What is the magnification produced by a lens?

(ii) A 2 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 10 cm. The distance of the object from the lens is 15 cm. Find the nature, position and size of the image. What is its magnification?

Ans: (i) The lens formula gives the relationship between object distance, image distance and focal length.

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

where v = Image distance, u = Object distance and f = Focal length

The lens formula is general and valid for all situations of any spherical lens. While mentioning the numerical values for solving problems one has to be careful about the signs of different quantities. The magnification produced by a lens is defined as the ratio of the height of the image to the height of the object. It is represented by the letter m . If h is the height of the object and h' is the height of the image produced by the lens, then magnification produced by the lens is given by

$$m = \frac{\text{Height of the image}}{\text{Height of the object}} = \frac{h'}{h}$$

Magnification produced by a lens is also related to the object distance (u) and image distance (v) i.e., Magnification, $m = v/u$

(ii) Given: Height of the object = + 2 cm, Focal length (f) = + 10 cm, Object distance (u) = - 15 cm and Image distance (v) = ?, height of the image = ?

We know that,

$$\begin{aligned} \frac{1}{v} - \frac{1}{u} &= \frac{1}{f} \Rightarrow \frac{1}{v} = \frac{1}{f} + \frac{1}{u} \Rightarrow \frac{1}{v} = \frac{1}{10} + \frac{1}{(-15)} \\ \Rightarrow \frac{1}{v} &= \frac{3-2}{30} = \frac{1}{30} \Rightarrow v = 30 \text{ cm} \end{aligned}$$

The positive sign indicates that the image is formed on the right side of the optical centre. The image is real and inverted.

$$\text{Magnification, } m = \frac{h'}{h} = \frac{v}{u} \Rightarrow h' = \frac{v}{u} \times h = \frac{30}{-15} \times 2 = -4 \text{ cm}$$

$$\text{So, } m = \frac{-4}{2} \text{ or } \frac{30}{-15} \text{ i.e., two times enlarged.}$$

So the negative sign of v and h' suggest that the image is inverted and real. It is formed below the principal axis. Thus, a 4 cm tall real and inverted image is formed at a distance of 30 cm on the right side of the lens.