Science
All India Set-1

Time Allowed: 3HRS   **Maximum Mark: 80**
General Instructions:
Read the following instructions very carefully and strictly follow them:
(i) The question paper comprises three Sections, A, B and C. There are 30 questions in the question paper. All questions are compulsory.
(ii) Section A -all questions / or parts (question no. 1 to 14) thereof in this section are one mark questions comprising MCQ, VSA type and Assertion-Reason type questions. They are to be answered in one word or in one sentence.
(iii) Section B - question no. 15 to 24 are short answer type questions, carrying 3 marks each. Answer to these questions should not exceed 50 to 60 words.
(iv) Section C - question no. 25 to 30 are long answer type questions, carrying 5 marks each. Answer to these questions should not exceed 80 to 90 words.
(v) Answer should be brief and to the point. Also the above mentioned word limit be adhered to as far as possible.
(vi) There is no overall choice in the question paper. However, an internal choice has been provided in some questions in each section. Only one of the choices in such questions have to be attempted.
(vii) In addition to this, separate instructions are given with each section and question, wherever necessary.

Section-A

1. How are covalent bonds formed?

Answer: Covalent bonds are formed when two or more atoms share electrons, that is when electrons are actually shared equally between the atoms.

2. Define electropositivity.

OR

The atomic radii of first group elements are given below:

Group-I element	Atomic Radii (pm)
Na	86
K	231
Rb	244
Cs	282

State the reason behind the observed trend in the above elements.

Answer: Electropositivity is the measure of the ability of **elements** (mainly metals) to donate electrons to form positive ions. Example Li^+, Na^+, K^+.

OR

As we move down in a group, addition of new shells occurs which **increases** the distance between nucleus and valence electrons thereby **decreasing** the pull effect of nucleus on the valence electrons, resulting in the **increase** in **atomic radius** of the **atom**.

3. Answer question numbers 3(a) to 3(d) on the basis of your understanding of the following paragraph and the related studies concepts.

The Tehri dam is the highest dam in India and one of the highest in the World. The Tehri dam withholds a reservoir of capacity 4.0 km^3 and surface area 52 km^2. It is used for irrigation, municipal water supply and the generation of 1000 MW of hydroelectricity.

The Tehri Dam has been the object of protests. Environment activist Shri Sunder Lal Bahuguna led the "Anti Tehri Dam Movement" from 1980s to 2014. The protest was against the displacement of town inhabitants and environmental consequences of the weak ecosystem. The relocation of more than 1,00,000 people from the area has led to protracted legal battles over resettlement rights and ultimately resulted in the delayed completion of the project.

(a) How is hydropower harnessed?

(b) Define 1 MW.

(c) Mention two disadvantages of constructing Tehri Dam.

(d) What happens when water from great heights is made to fall on blades of turbine?

Answer: (a) Hydropower harnesses the energy contained in flowing water to produce electricity. Water stored at a certain height possess potential energy which is allowed to run down increasing its kinetic energy which is utilized to produce electricity.

(b) 1 MW is a unit of Power. It reflects the consumption of energy per unit time.

1 MW = 1000000 W or 1000 kW

(c) Construction of Tehri dam results into:

(i) Submersion of land and vegetation.

(ii) Construction of large dams results in displacement or relocation of the villagers and communities on a massive scale.

(d) Water when allowed to fall from great height possess kinetic energy at the expense of potential energy on the blades of turbine moving it at great speed; producing electricity.

4. Question number 4(a) to 4(d) are based on table given below. Study the table in which the levels of Thyroid Stimulating Hormone (TSH) in women are given and answer the questions that follow on the basis of understanding of the following paragraph and the related studied concepts.

Age Range	Normal (mU/L)	Low (mU/L)
18-29 years	04-2.34 mU/L	<0.4 mU/L
30-49 years	04-2.4.0 mU/L	<0.4 mU/L
50-79 years	046-4.68 mU/L	<0.46mU/L

Women are at greater risk for developing abnormal TSH levels during menstruation, while giving birth and after going through menopause. Around 5% of women in the United State have some kind of thyroid problem compared to 3% of men. Despite claims that high TSH increases your risk for heart diseases. But a 2017 study showed that older women are especially at risk for developing thyroid cancer if they have high TSH levels along with thyroid nodules.

(a) A 35 years old women has TSH level 6.03 mU/L. what change should she bring in her diet to control this level?

(b) When do face a greater risk of abnormal TSH level?

(c) State the consequence of low TSH level.

(d) Name the mineral that is responsible for synthesis of hormone secreted by thyroid gland.

Answer: (A) Thyroxine exerts negative feedback over TSH production. Her Thyroxine quantity must be low. She should consume more iodine in her diet which would bring thyroxine levels to normal. This would downregulate the TSH production and bring it within the normal range.

(B) Women face a greater risk of abnormal TSH levels during menstruation while giving birth and after going through menopause.

(C) Consequences of low TSH level is Weight gain, depression, forgetfulness, **decreased** concentration or fatigue.

(D) Iodine is responsible for the synthesis of hormones secreted by the thyroid gland.

5. The sky appears dark to passengers flying at very high altitudes mainly because:

(a) Scattering of light is not enough at such heights.

(b) There is no atmosphere at great heights.

(c) The size of molecules in smaller than the wavelength of visible light.

(d) The light gets scattered towards the earth.

Answer: A

The scattering of light at greater altitude is not sufficient enough.

6. A cylindrical conductor of length 'l' and uniform area of cross section 'A' has resistance 'R'. The area of cross section of another conductor of same material and same resistance but of length '2l' is

(a) A/2   (b) 3A/2

(c) 2A   (d) 3A

Answer: C

Parameters of cylinder A: Length = l, Area of cross-section = A, Resistance = R and resistivity = ρ

Parameters of cylinder B: Length = 2l, Area of cross-section = A' (To be calculated); Resistance = R and resistivity = ρ

Resistance of cylinder A can be written as, (1)

$$R = \rho\frac{l}{A}$$

Resistance of cylinder A can be written as, (2)

$$R = \rho\frac{2l}{A'}$$

Dividing 1 and 2,

$$\frac{\rho l}{A} \times \frac{A'}{2\rho l} = 1$$

$$A' = 2A$$

7. The maximum resistance which can be made using four resistors each of resistance 1/2 Ω is

(a) 2 Ω   (b) 1 Ω
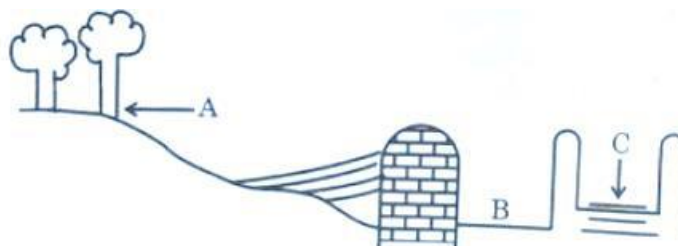
(c) 2.5 Ω   (d) 8 Ω

Answer: A

The maximum resistance of a set of resistors can be obtained by connecting them in series.

Hence,

$$R = \frac{1}{2}\Omega + \frac{1}{2}\Omega + \frac{1}{2}\Omega + \frac{1}{2}\Omega = 2\,\Omega$$

8. A diagram of traditional water harvesting system is given below:

The statement which defines the system and its parts is Piss

(a) This is an ideal setting of the Khadin system and A= Catchment area; B = Saline area & C= Shallow dugwell

(b) This is an ideal setting of the Shallow dugwell system and A= Catchment area; B= Saline area and C= Khadin

(c) This is an ideal setting of Catchment area and A=K hadin, B= Saline area and C= Shallow dugwell

(d) This is showing Saline area and A= Catchment area; B= Khadin and C= Shallow dugwell 1

OR

The major ill effect of mono culture practice in forests is on the

(a) biodiversity which faces large destruction

(b) local people whose basic needs can no longer be met from such forests

(c) industries

(d) forest department

Answer: (A)

The given diagram represents a traditional water harvesting system- the Khadin System. In the diagram,

· A represents Catchment area,

· B represents saline area

· C represents shallow dugwell.

OR

Answer: A

In the monoculture technique, huge areas are first cleared of all vegetation. This destroys a large amount of biodiversity in the area. Hence, biodiversity faces the largest destruction.

9. Several factories were pouring their wastes in rivers A and B. Water samples were collected from these two rivers. It was observed that sample collected from river A was acidic while that of river B was basic. The factories located near A and B are

(a) Soaps and detergents factories near A and alcohol distillery near B.

(b) Soaps and detergents factories near B and alcohol distillery near A.

(c) Lead storage battery manufacturing factories near A and soaps and detergents factories near B.

(d) Lead storage battery manufacturing factories near B and soaps and detergents factories near A.

Answer: C

Soaps and detergents are basic and lead storage batteries uses sulphuric acid which is acidic in nature.

10. In which of the following, the identity of initial substance remains unchanged?

    (a) Curdling of milk

    (b) Formation of crystals by process of crystallisation

    (c) Fermentation of grapes

    (d) Digestion of food

Answer: B

Crystallization is the process of formation of crystals, so no new product is formed in the process. It is a physical change.

11. An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A, the pink colour disappears. The following statement is true for solution 'A' and 'B'.

    (a) A is strongly basic and B is a weak base.

    (b) A is strongly acidic and B is a weak acid.

    (c) A has pH greater than 7 and B has pH less than 7.

    (d) A has pH less than 7 and B has pH greater than 7.

Answer: C

Phenolphthalein is often used as an indicator in acid–base titrations. For this application, it turns colourless in acidic solutions and **pink** in basic solutions.

12. An element 'X' is forming an acidic oxide. Its position in modern periodic table will be

    (a) Group 1 and Period 3   (b) Group 2 and Period 3

    (c) Group 13 and Period 8   (d) Group 16 and Period 3

                                OR

    Consider the following statements about an element 'X' with number of protons 13.

    (A) It forms amphoteric oxide

    (B) Its valency is three

    (C) The formula of its chloride in XCl_3

    The correct statements(a) is/are

    (a) only (A)   (b) only (B)

    (c) (A) and (c)   (d) (A), (B) and (C)

Answer: D

The non-metal forms acidic oxide and they are placed in the group 16.

                                OR

Answer: D

Aluminium is the element that is atomic number 13 on the periodic table.

13. **Assertion** (A): Following are the members of a homologous series:

CH₃OH, CH₃CH₂OH, CH₃CH₂CH₂OH

Reason (R): A series of compounds with same functional group but differing by -CH₂- unit is called a homologous series.

(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.

Answer: A

Homologous series is a series of compounds with similar chemical properties and same functional group differing from the successive member by CH_2 unit. Carbon chains of varying length have been observed in organic compounds having the same general formula.

14. **Assertion** (A): Alloys are commonly used in electrical heating devices like electric iron and heater.

Reason (R): Resistivity of an alloy is generally higher than that of its constituent metals but the alloys have low melting points then their constituent metals.

(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.

Answer: C

Alloys always show high resistivity than pure original metal but have relatively low melting point; therefore, not ideal for the use in heating device such as electric iron or heater.

Section – B

15. Mention with reason the colour change observed when:

(i) silver chloride is exposed to sunlight.

(ii) copper powder is strongly heated in the presence of oxygen

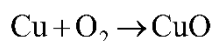(iii) a piece of zinc is dropped in copper sulphate solution.

Answer:

(i) When silver chloride is exposed to sunlight. It undergoes <u>photochemical decomposition</u> forming grey metal silver and greenish yellow gas chlorine is involved
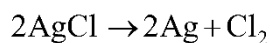
$$2AgCl \rightarrow 2Ag + Cl_2$$
$$\text{(white)} \quad \text{(grey)}$$

(ii) When copper powder is strongly heated in the presence of oxygen then copper react with oxygen present in air to form copper oxide by **combination reaction**. Copper oxide which is black in colour.
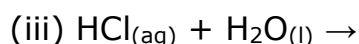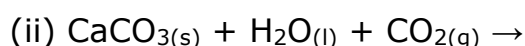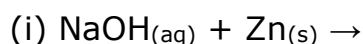
$$Cu + O_2 \rightarrow CuO$$
$$\text{(Brown)} \quad \text{(Black)}$$

(iii) When a piece of zinc is dropped in $CuSO_4$ solution then zinc being more reactive displaces copper from copper sulphate and form S zinc sulphate solution.
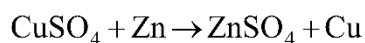
$$CuSO_4 + Zn \rightarrow ZnSO_4 + Cu$$
$$\text{(Blue)} \quad\quad\quad \text{(Colourless)}$$

16. Complete and balance the following chemical equations:

(i) $NaOH_{(aq)} + Zn_{(s)} \rightarrow$

(ii) $CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)} \rightarrow$

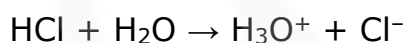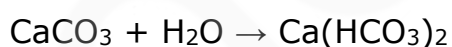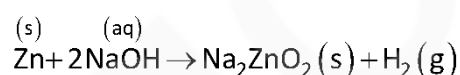(iii) $HCl_{(aq)} + H_2O_{(l)} \rightarrow$

OR

During electrolysis of brine, a gas 'G' is liberated at anode. When this gas 'G' is passed through slaked lime, a compound 'C' is formed, which is used for disinfecting drinking water.

(i) Write formula of 'G' and 'C'.

(ii) State the chemical equation involved.

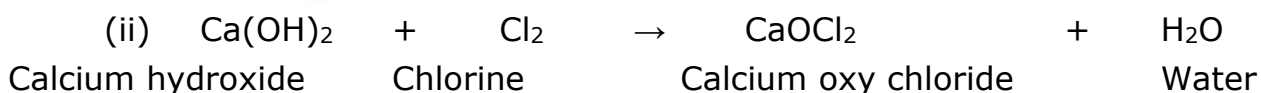(iii) What is common name of compound 'C'? Give its chemical name.

Answer:

$$Zn + 2NaOH_{(aq)}^{(s)} \rightarrow Na_2ZnO_2(s) + H_2(g)$$

$$CaCO_3 + H_2O \rightarrow Ca(HCO_3)_2$$

$$HCl + H_2O \rightarrow H_3O^+ + Cl^-$$

OR

(i) G is Cl_2

C is $CaOCl_2$

(ii) $Ca(OH)_2$ + Cl_2 → $CaOCl_2$ + H_2O

Calcium hydroxide   Chlorine   Calcium oxy chloride   Water

(iii) Bleaching Powder

Chemical name: Calcium chlorite.

Or

Calcium oxy-chloride.

17. Study the data of the following three categories A, B and C.

Category	Name of the element	Atomic Mass
A	Li	7
	Na	23
	K	39
B	N	14
	P	31
	As	74
C	B	10.8
	Al	27
	Ga	69.7

(i) From the given three categories A, B and C, pick the one which forms Dobereiner Triads.

(ii) Why did Mendeleev laced elements of category A, B and C in three different groups?

(iii) Is Newland law of octaves applicable to all the three categories? Give reason to justify your answer.

Answer: (i) (A) because **Dobereiner** stated in his **law** of **triads** that the arithmetic mean of the atomic masses of the first and third element in a **triad** would be approximately equal to the atomic mass of the second element in that **triad**.

(ii) Mendeleev placed the elements in order of increasing atomic masses of the elements and their physical and chemical properties. Among chemical properties, Mendeleev concentrated on the compounds formed by elements with oxygen and hydrogen. He selected hydrogen and oxygen as they are very reactive and formed compounds with most elements. The formulae of the hydrides and oxides formed by an element were treated as one of the basic properties of an element for its classification, hence, a, b, c are placed in different category.

(c) No, Newland law of octaves is not applicable as it states that the chemical elements are arranged according to increasing atomic masses, those with similar physical and chemical properties occur after each interval of eighth element.

Newland law of octave.

sa (do)	re (re)	ga (mi)	ma (fa)	pa (so)	da (la)	ni (ti)
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce and La	Zr	—	—

Limitation:

It was found that the Law of Octaves was applicable only up to calcium, as after calcium every eighth element did not possess properties similar to that of the first.

18. (a) From the following group of organisms create a food chain which is the most advantageous for Human being in terms of energy.

Hawk, Rat, Cereal plant, Goat, Snake, Human Being

(b) State the possible disadvantage if the cereal is growing in soil rich in pesticides.

(c) Construct a food web using the organisms mentioned above.

OR

(a) Write two harmful effects of using plastic bags on the environment. Suggest alternatives to the usage of plastic bags.

(b) List any two practices that can be followed to dispose off the waste produced in our homes.

Answer:

(a)

$Sun \rightarrow Cereal\ plant \rightarrow Goat \rightarrow Human\ being$

       (producer)   (Primary

                    Consumer)

(b) Pesticides are not easily metabolised and hence accumulate. Upon consumption by the higher trophic levels their concentration will increase across the trophic levels. Hence, we will find biomagnification across trophic level. The levels will be highest in humans.

(c)
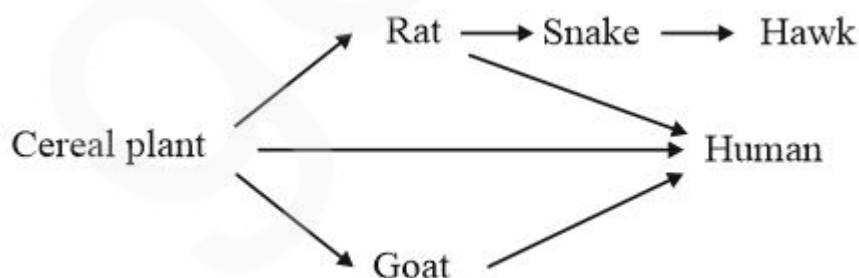
OR

(a) (i)Trypsin breaks peptide bonds. Hence the enzyme will digest proteins to give small polypeptides (small chain of amino acids)

(ii)lipase breaks down lipids into fatty acids and glycerol.

(b) Finger like projections called villi increase the surface area for absorption of digested substances. They also contain several glands which secrete digestive enzymes.

19. (a) State the role played by the following in the process of digestion.

    (i) Enzyme trypsin

    (ii) Enzyme lipase

    (b) List two functions of finger like projections present in the small intestine.

Answer: (A)

Enzyme Trypsin: The pancreas secretes pancreatic juice which contains enzymes like trypsin for digesting proteins

Enzyme Lipase: The pancreas secretes pancreatic juice which contains enzymes like lipase for breaking down emulsified fats.

(B) The lining of the **small intestine** is covered with tiny **finger-like projections** called villi. The villi help the nutrients in food to be absorbed into the blood. The villi are carpet-**like fingers** inside the **small intestine** that help absorb nutrients.

20. (a) Classify the following as homologous or analogous pairs:

    (i) Broccoli and cabbage

    (ii) Ginger and Raddish

    (iii) Fore limbs or birds and lizard

    (iv) Wings of a bat and wings of a bird

    (b) State the main feature that categorises a given pair of organs as homologous and analogous.

Answer: (i) Homologous

    (ii) Analogous

    (iii) Homologous

    (iv) Analogous

    (b) Homologous characteristics are organs that have the same basic structure and origin, but different functions. For example, mammals, birds, reptiles and amphibians have four limbs with the same basic limb layout because they have inherited the limbs from a common ancestor. These limbs have been modified to perform different functions.

    Analogous characteristics are organs that have different structures and are of different origin but perform the same functions. For example, the design of the wings of bats and the wings of birds look similar because they have a common purpose – to fly.

21. A green stemmed rose plant denoted by GG and a brown stemmed rose plant denoted by gg are allowed to undergo a cross with each other.

(a) List your observation regarding

(i) Colour of stem in their F_1 progeny

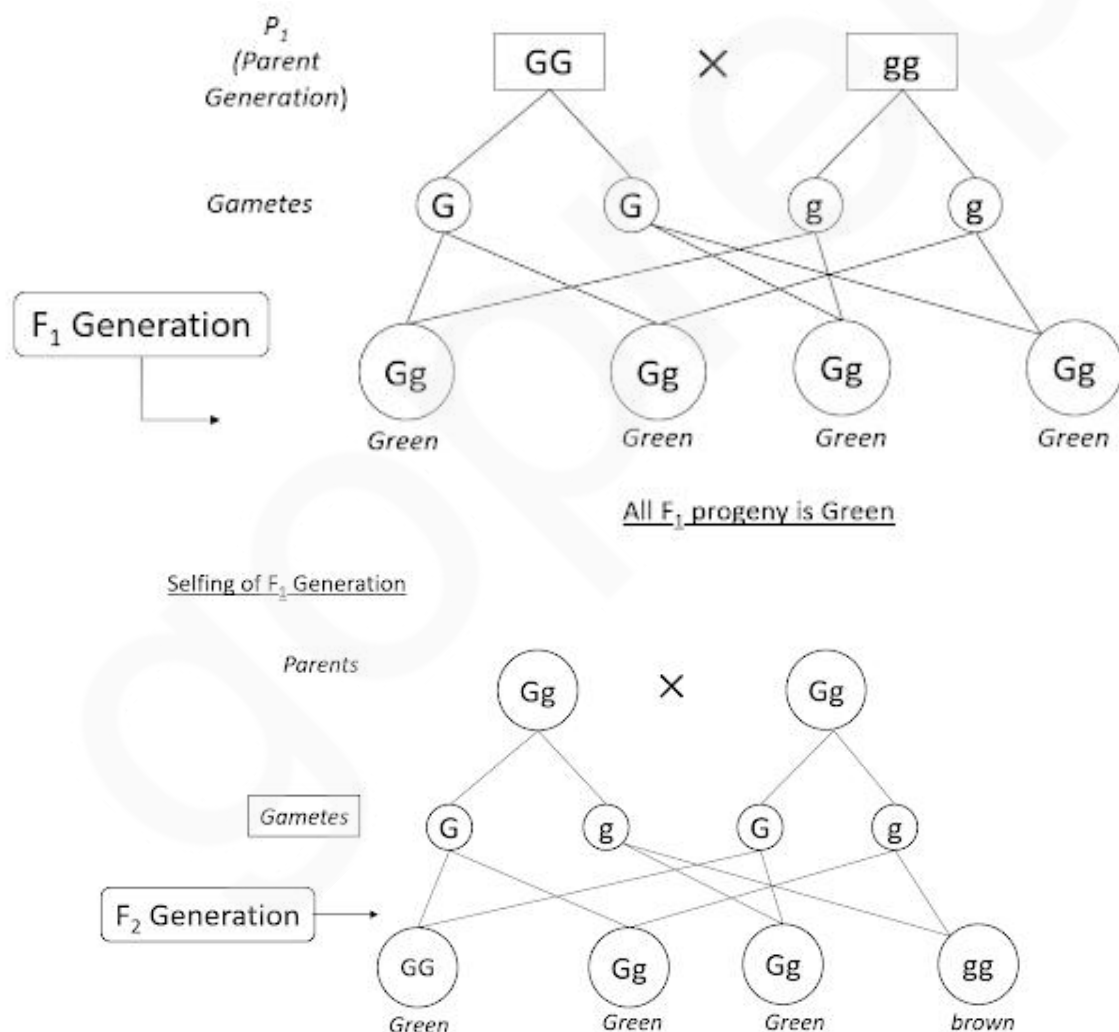(ii) Percentage of brown stemmed plants in F_2 progeny if F_1 plants are self-pollinated.

(iii) Ratio of GG and Gg in the F_2 progeny.

(b) Based on the findings of this cross, what conclusion can be drawn?
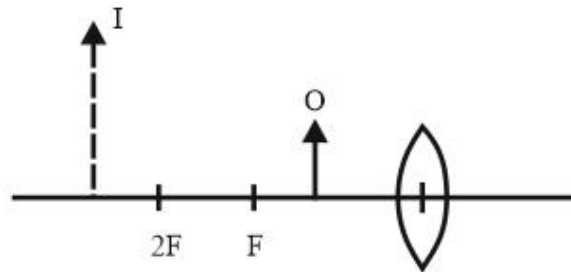
Answer: (i) Green

(ii) 25%

(iii) 1:2:1

(B) The conclusion is that both the gametes are showing it's expression in the F2 generation because we are getting 1:2:1 ratio of the

monohybrid cross. We can see that both the laws of Mendel has been used in this case which is low of dominance and law of segregation.

22. The diagram given below show an Object O and its image I.

Without actually drawing the ray diagram, state the following:

(i) Type of lens (Converging / Diverging)

(ii) Name two optical instruments where such an image is obtained.

(iii) List three characteristics of the image formed if this lens is replaced by a concave mirror of focal length 'f and an object is placed at a distance 'f/2' in front of the mirror.

Answer:

(i) The given lens is a converging lens.

(ii) (a) Simple microscope

   (b) Telescope

(iii) For the given case, the object is placed between focus and pole of the mirror.

Three characteristics of the image formed are

(a) Virtual

(b) Erect

(c) Enlarged

23. Give reasons for the following:

(i) There is either a convergence or a divergence of magnetic field lines near the ends of a current carrying straight solenoid.

(ii) The current carrying solenoid when suspended freely rests along a particular direction.

(iii) The burnt out fuse should be replaced by another fuse of identical rating.

Answer: (a) The divergence or the degree of closeness of the magnetic field lines near the ends of a current carrying straight solenoid indicates a decrease in the strength of magnetic field.

(b) The magnetic field lines that are produced by the solenoid are similar to that of the bar magnet and behave like a bar magnet. One end of it behaves like a magnetic north pole and the other end as magnetic south pole.

(c) A fuse wire works because of its lower melting point which is possible. If a fuse with larger rating is used with an appliance, the fuse wire shall not melt and hence would fail to serve the required purpose.

24. (a) With the help of labelled ray diagram show the path followed by a narrow beam of monochromatic light when it passes through a glass prism.

(b) What would happen if this beam is replaced by a narrow beam of white light?

OR

(a) A person is suffering from both myopia and hypermetropia.

(i) What kind of lenses can correct this defect?

(ii) How are these lenses prepared?

(b) A person needs a lens of power + 3D for correcting his near vision and – 3D for correcting his distant vision. Calculate the focal lengths of the lenses required to correct these defects.

Answer: (a) In the case of monochromatic light the ray will bend due to refraction but it will not show dispersion of light.
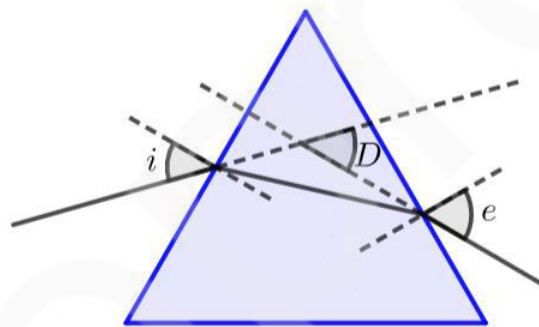
(b) When a white beam of light is allowed to pass through the prism, it will get dispersed into its 7 colours component of spectrum of light. The splitting of light into its component colours is called dispersion.

The following diagram show the phenomena: -
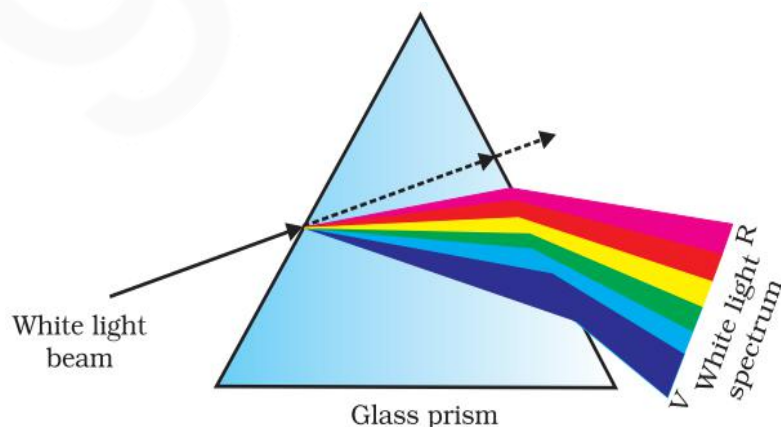
OR

(a) (i) A person suffering from both myopia and hypermetropia at the same time requires a spectacle consisting of both concave and convex lens of prescribed focal length.

(ii) It is prepared by setting half the lens of the spectacle to be concave and the remainder half to be a convex type lens.

(b) The power of the lens is defined as the reciprocal of the focal length. It is a measure of the ability of the lens to focus.

Mathematically, it can be described as,

$$P = \frac{1}{f}$$

The power of the lens is + 3 D

$$+3 = \frac{1}{f}$$

$$f = +\frac{1}{3} \ or + 33.34 \ cm$$

The power of the lens is - 3 D

$$-3 = \frac{1}{f}$$

$$f = -\frac{1}{3} m \ or - 33.34 \ cm$$

Section-C

25. Write balanced chemical equations to explain what happens, when
    (i) Mercuric oxide is heated.
    (ii) Mixture of cuprous oxide and cuprous sulphide is heated.
    (iii) Aluminium is reacted with manganese dioxide.
    (iv) Ferric oxide is reduced with aluminium.
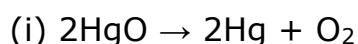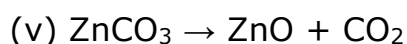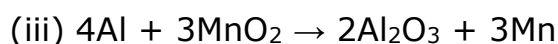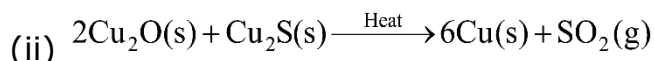   (v) Zinc carbonate undergoes calcination.

OR

(i) By the transfer of electrons, illustrate the formation of bond in magnesium chloride and identify the ions present in this compound.
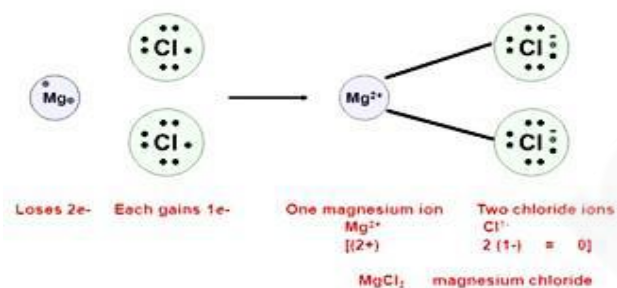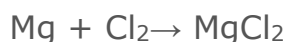
(ii) Ionic compounds are solids. Give reasons.

(iii) With the help of a labelled diagram show the experimental set up of action of steam on a metal.

Answer:

(i) $2HgO \rightarrow 2Hg + O_2$

(ii) $2Cu_2O(s) + Cu_2S(s) \xrightarrow{\text{Heat}} 6Cu(s) + SO_2(g)$

(iii) $4Al + 3MnO_2 \rightarrow 2Al_2O_3 + 3Mn$

(iv) $FeO_3 + 2Al \rightarrow 2Fe + Al_2O_3$

(v) $ZnCO_3 \rightarrow ZnO + CO_2$

OR

$Mg + Cl_2 \rightarrow MgCl_2$

(II) **Ionic compounds** are formed when atoms of different charges (i.e. positive and negative ions) come together and transfer electron. These ionic bonds are typically very strong due to the high attractive forces holding the positively and negatively charged ions together (called electrostatic forces of attraction).
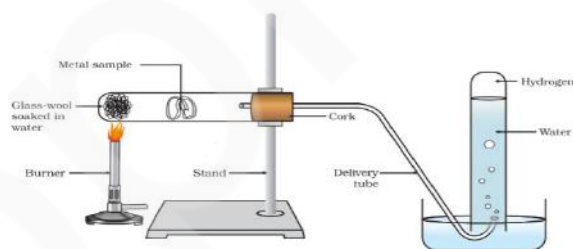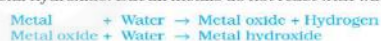
(III)

Figure 3.3 Action of steam on a metal

Metals react with water and produce a metal oxide and hydrogen gas. Metal oxides that are soluble in water dissolve in it to further form metal hydroxide. But all metals do not react with water.

Metal + Water → Metal oxide + Hydrogen
Metal oxide + Water → Metal hydroxide

26. (a) Compare soaps and detergents on the basis of their composition and cleansing action in hard water.

(b) What happens when ethanol is treated with sodium metal? State about the behaviour of ethanol in this reaction.

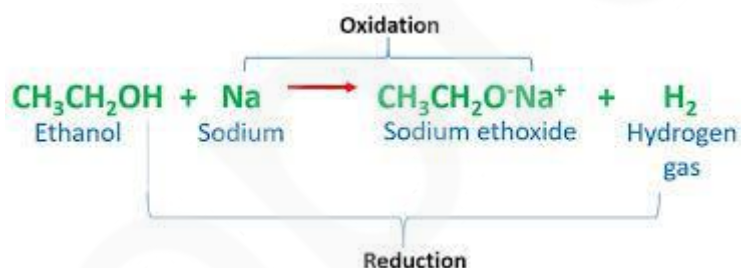(c) Draw the structure of cyclohexane.

(d) Name the following compound

$$H-\underset{\underset{O}{\|}}{C}-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-H$$
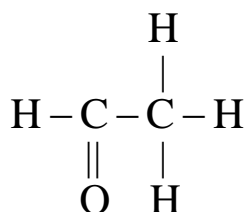
Answer: (a)

| Soaps	Detergents
Consist of a '-COONa' group attached to a fatty acid having a long alkyl chain.	Consist of a '-SO$_3$Na' group attached to a long alkyl chain.
They are not effective in hard water and saline water	They do not lose their effectiveness in hard water and saline water.
Soaps are completely biodegradable	Detergents containing a branched hydrocarbon chain are non-biodegradable
They have a tendency to form sum in a hard water environment.	These compounds do not form scum.
They are derived from natural sources such as vegetable oils and animal fats.	Detergents are synthetic derivatives.
Soaps are environment-friendly products since they are biodegradable.	These compounds can form a thick foam that causes the death of aquatic life.
Examples of soaps: sodium palmitate and sodium stearate.	Examples of detergents: deoxycholic acid and sodium lauryl sulfate.

The sodium ion present in the soap react with the magnesium and calcium ions present in the hard water to form scum and therefore is not effective in the hard water whereas in the case of the detergent no scum formation takes place.

(b)

Oxidation

$$CH_3CH_2OH + Na \longrightarrow CH_3CH_2O^-Na^+ + H_2$$
Ethanol   Sodium   Sodium ethoxide   Hydrogen gas

Reduction

The nature of O-H bond in alcohol is polar and therefore , it easily loses hydrogen ion on coming in contact with the metal.

(c)
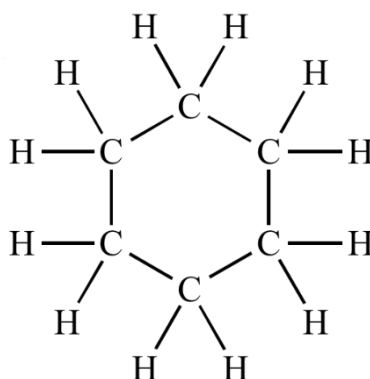
(d) Ethanal or Acetaldehyde

27. (a) Write the correct sequence of steps followed during journey of oxygen rich blood from lungs to various organs of human body.

(b) What happens when the system of blood vessels develops a leak?

Answer: (a) The sequence of oxygen rich blood flow from the lungs is as follows

- oxygen rich blood leaves lungs via pulmonary vein
- left Atrium receives pulmonary aorta
- blood flows from the left atrium to the left ventricle
- from left ventricle blood gets pumped to the aorta which branches to different major organs

(b) When a system of blood vessels develops a leak

- the damaged cells attract platelets and phagocytes to the region
- phagocytes start to leak out looking for possible pathogens and digesting them
- platelets start to clump the leak and close the blood vessels to prevent blood leakage
- fibrin fibres form the clot which adds to closure of the leak
- tissue repair starts

28. (a) Draw a diagram showing germination of pollen on stigma of a flower and mark on it the following organs/parts:

(i) Pollen Grain

(ii) Pollen tube

(iii) Stigma

(iv) Female germ cell

(b) State the significance of pollen tube.

(c) Name the parts of flower that develop after fertilization into

(i) Seed

(ii) Fruit

OR

(a) Use of a condom is beneficial for both the sexes involved in a sexual act." Justify this statement giving two reasons.

(b) How do oral contraceptive help in avoiding pregnancies?

(c) What is sex selective abortion? How does it affect a healthy society? (State any one consequence)

Answer:

(a)
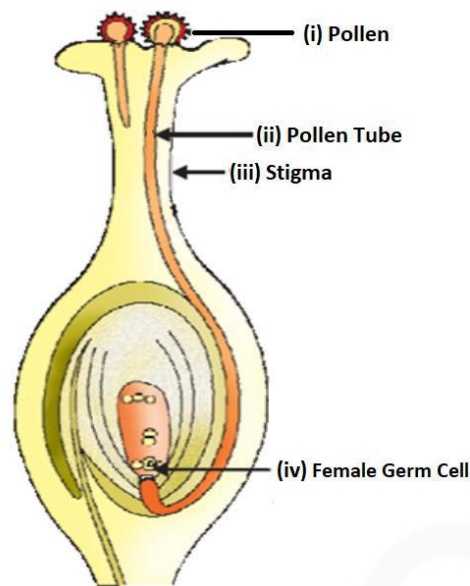
(b) Pollen tube carries the male gametes to the egg cell

(c) (i) ovule changes to seed

(ii) ovary changes to fruit

OR

(a) Condoms prevent sexually transmitted diseases and unwanted pregnancies hence is advantageous to both

(b) Oral contraceptives upset the hormonal balance hence prevent production or /and release od ovum

(c) Sex selective abortion is when upon knowing the sex of the child one decides to abort it. Female foeticide is a grave setback to it.

29. (a) For the combination of resistors shown in the following figure, find the equivalent resistance between M & N.
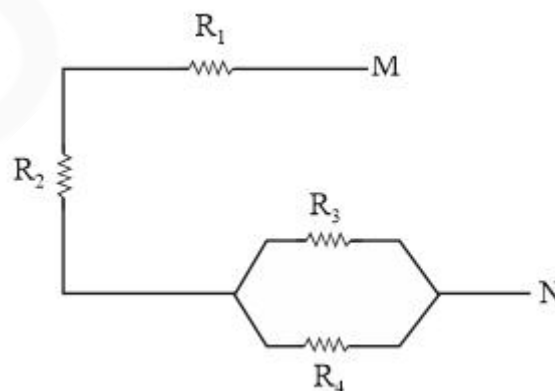
(b) State Joule's law of heating.

(c) Why we need a 5 A fuse for an electric iron which consumes 1 kW power at 220 V?

(d) Why is it impracticable to connect an electric bulb and an electric heater in series?

Answer:

(a) The resistance R_3 and R_4 are in parallel combination with each other and the combination is in series resistance R_2 and R_1.

The effective value of R_3 and R_4 is,

$$R_{eq} = \frac{R_3 \times R_4}{R_3 + R_4}$$

Equivalent set between M and N

$$= \frac{R_3 \times R_4}{R_3 + R_4} + R_1 + R_2$$

(b) Joule's law of heating states that when a current 'I' passes through a conductor of resistance 'R' for time 't' then the heat developed in the conductor is equal to the product of the square of the current, the resistance and time.

$$H = I^2Rt$$

(c) In the given case the maximum current drawn by the electric iron is

$$P = V I$$

$$I = P/V$$

$$I = \frac{1000}{220} = 4.5\ A$$

This value is less than the current rating of the fuse. Hence, a 5 A rated fuse can be used.

(d) When a bulb and a heater are connected in series the current remains the same and voltage is divided according to the resistance of the appliances. Now, the reduction in the voltage ultimately reduces the power delivered to the devices.

$$P\ (power) = \frac{V^2}{R}$$

Where V is voltage and R is resistance

if V reduces one fold, power will reduce by 2 times.

30. (a) A security mirror used in a big showroom has radius of curvature 5 m. If a customer is standing at a distance of 20 , from the cash counter, find the position, nature and size of the image formed in the security mirror.

(b) Neha visited a dentist in his clinic. She observed that the dentist was holding an instrument fitted with a mirror. State the nature of this mirror and reason for its use in the instrument used by dentist.

OR

Rishi went to a palmist to show his palm. The palmist used a special lens for this purpose.

(i) State the nature of the lens and reasons for its use.

(ii) Where should the palmist place/hold the lens so as to have a real and magnified image of an object?

(iii) If the focal length of this lens is 10 cm, the lens is held at a distance of 5 cm from the palm, use lens formula to fine the position and size of the image.

Answer:

(a) The focal length of the convex mirror is 2.5 m

The customer is 20 m away from the mirror, u = -20 m (as per sign convention)

Using lens formula

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

$$\frac{1}{v} - \frac{1}{20} = \frac{1}{2.5}$$

$$\frac{1}{v} = \frac{1}{2.5} + \frac{1}{20}$$

$$\frac{1}{v} = \frac{(40+5)}{100}$$

$$\frac{1}{v} = \frac{45}{100}$$

$$v = \frac{100}{45} = \frac{20}{9}$$

Show the image will be formed at a distance of 20/9 m.; the image will be diminished, virtual and erect.

(b) Concave mirrors are used as they converge the reflecting light at the focus. Also the object kept at a distance less than the focal length of the mirror produces enlarged, erect and virtual images of the object; which enables the doctor to clearly see the image of the tooth or the part of the mouth that is being inspected.

OR

(i) Convex lens is used by the palmist to get an enlarged image of the palm revealing the details even more clearly for him when placed real close to the object.

(ii) There are two cases for which a real and magnified image of object is obtained in convex lens-

a. When the object is placed at the focus of the lens.

b. When the object is placed between F and 2F of the lens.

(iii) f= 10

u = - 5

By lens formula

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

$$\frac{1}{v} + \frac{1}{5} = \frac{1}{10}$$

$$\frac{1}{v} = -\frac{1}{10}$$

v = -10 cm

The size of the image will be,

$$\frac{h}{H} = \frac{v}{u}$$

$$\frac{h}{H} = \frac{-10}{-5} = 2$$

***