

SCIENCE(B19-GS)HINTS & SOLUTIONS

SUBJECT CODEC3

(EN/AS/BN/BD/HN)

Time allowed : 3 hrs

Maximum Marks : 90

General Instructions :

- (i) Candidates shall note that each question will be multilingual, viz, in English/ Assamese/Bengali/Bodo/Hindi medium, for their ready reference.
- (ii) In case of any discrepancy or confusion in the medium/version, the English version will be considered as the authentic version.
- (iii) The figures in the margin indicate full marks for the questions.

GROUP 'A'

1. (a) A solution reacts with crushed egg-shells to give a gas that turns limewater milky. The solution contains-
 (i) NaCl (ii) HCl (iii) LiCl (iv) KCl
- (b) An element reacts with oxygen to give a compound with high melting point. This compound is also soluble in water. The element is likely to be.
 (i) Calcium (ii) Carbon (iii) Silicon (iv) Iron
- (c) An element X forms a chloride with the formula XCl_2 , which is a solid with a high melting point. X would most likely be in the same group of the Periodic table as
 (i) Na (ii) Mg (iii) Al (iv) Si

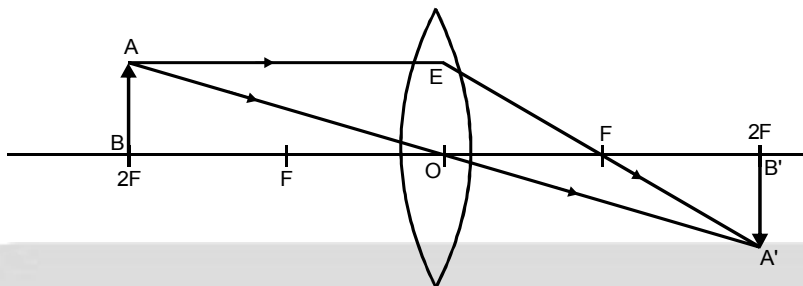
Sol.

- (a) Acid solution reacts with crushed egg shell ($CaCO_3$) to give a CO_2 gas that turns lime water milky. Since (ii) acid and remaining are salts.
- (b) The element is likely to be Ca as its oxide have high melting point & It is soluble in water.
- (c) Formula of chloride of X is XCl_2 . Its valency is 2. It shows element belongs to second group. As per option X = Mg
- (d) The enzyme contained by our saliva is called 1
 (i*) amylase (ii) lipase (iii) trypsin (iv) pepsin
- (e) The part of the brain that controls the posture and equilibrium of our body is 1
 (i) diencephalon (ii) cerebrum (iii*) cerebellum (iv) medulla
- (f) During the course of evolution, the process by which the characteristic features of the members of a species modify due to the influence of various factors and thus give rise to the organisms with new characteristic features is called – 1

Sol.

- (g) Where should an object be placed in front of a convex lens to get a real image of the size of the object? 1
 (i) At the principal focus of the lens
 (ii*) At twice the focal length
 (iii) At infinity
 (iv) Between the optical centre and principal focus of the lens

Sol.

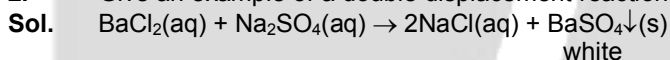


- (h) The least distance of distinct vision for a young adult with normal vision is about 1
 (i) 25 m (ii*) 25 cm (iii) 2.5 cm (iv) 2.5 m

- (i) The practical unit of electrical energy 1 kWh means 1
 (i) 36×10^6 J (ii*) 3.6×10^6 J (iii) 3.6×10^5 J (iv) 36×10^4 J

- (j) Which of the following is not an example of a biomass energy source ?
 (i) wood (ii*) nuclear energy (iii) gobargas (iv) coal

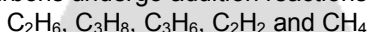
2. Give an example of a double displacement reaction.



3. What is ductility of a metal?

Sol. It is a property of metals by virtue of which they can be drawn into thin wire without breaking.

4. Which of the following hydrocarbons undergo addition reactions?



Sol. Molecule containing minimum one double or triple bond in its molecules (unsaturated hydrocarbon) shows addition reaction.

As per question $\text{C}_3\text{H}_6, \text{C}_2\text{H}_2$

5. What is a dominant character ? 1

Sol. The character that will appear in F_1 generation is called as dominant character.

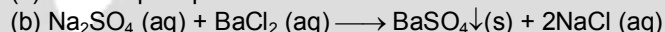
6. What is meant by power of accommodation of the eye? 1

Sol. Power of accommodation is the ability of the eye lens to focus near and far objects clearly on the retina by adjusting its focal length with the help of ciliary muscles.

7. Take about 3mL of sodium sulphate solution in a test tube. In another test tube, take about 3mL of barium chloride solution. Mix the two solutions and answer the following:

- (a) Write the observation of the above experiment.
 (b) Write the chemical equation of the above observation and mention the type of the reaction.

Sol. (a) A white precipitate is sedimentate at the bottom of test tube.



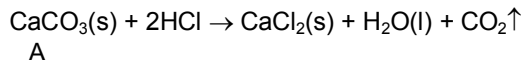
8. A metal compound A reacts with dilute hydrochloric acid to produce effervescence. The gas evolved extinguishes a burning candle.

- (a) Name the gas that extinguishes a burning candle.
 (b) Write a balanced chemical equation for the reaction if one of the compounds formed is calcium chloride.

OR

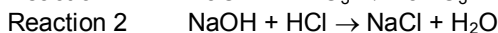
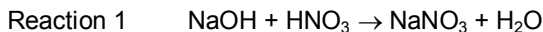
What is a neutralisation reaction? Give two examples.

- Sol. (a) CO_2
 (b) A must be a metal carbonate.



OR

Addition of acid with base to forms salt & water is neutralisation.



9. Name the respiratory pigment present in our blood state its function. 1

Sol. Respiratory pigment present in our blood – Haemoglobin.

Function : haemoglobin binds with oxygen and helps in transport of oxygen to the tissues.

10. Write two differences between axon and dendrite.

Sol.

AXON	DENDRITES
It is a large, single and unbranched structure.	These are short, several, much branched structure.
Axon contain myelin sheath.	Dendrites do not contain myelin sheath.

11. What is the importance of DNA copying in reproduction ? 2

Sol. Importance of DNA copying in reproduction :

- Due to DNA copying during reproduction parental characters are transferred to progeny.
- DNA copying allows, equal separation and distribution of DNA in offspring.

12. An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position and nature of the image. 1 + 1 = 2

OR

An object 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw its ray diagram. 2

Sol. Given $f = +15$ cm, $u = -10$ cm, $v = ?$

By mirror formula

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f} \quad \dots (i)$$

Put the given values in eq. (i) with their sign conventions

$$\frac{1}{v} - \frac{1}{10} = \frac{1}{15}$$

We get, $v = 6$ cm

image is formed at 6 cm away from the mirror on right side i.e. virtual

$$m = \frac{-v}{u} = \frac{-6}{-10} = 0.6$$

Here, m is less than unity and also positive so image will be diminished, erect and virtual in nature.

OR

Sol. Given $h_o = 5$ cm, $u = -25$ cm, $f = 10$ cm, $v = ?$

By lens formula

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \quad \dots (i)$$

By putting the given values in eq. (i) with their sign conventions

$$\frac{1}{v} = \frac{1}{10} - \frac{1}{25}$$

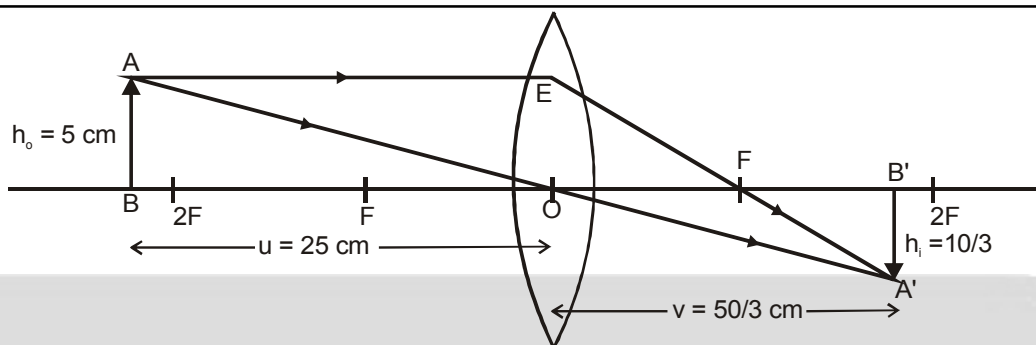
$$\text{We get, } v = \frac{50}{3} \text{ cm}$$

image is formed at $\frac{50}{3}$ cm away from the mirror on right side i.e. real

$$m = \frac{v}{u} = \frac{h_i}{h_o} \Rightarrow \frac{-50/3}{25} = \frac{h_i}{5}$$

$$\text{We get, } h_i = -\frac{10}{3}$$

Here, m is less than unity and also negative so image will be diminished, inverted and real in nature.



13. A current of 0.5 A is drawn by a filament of an electric bulb for 10 minutes. Find the amount of electric charge that flows through the circuit. 2

OR

How much energy is given to each coulomb of charge passing through a 6 V battery? 2

Sol. Given $I = 0.5 \text{ A}$, $t = 10 \text{ min.} = 10 \times 60 = 600 \text{ sec}$
As we know,

$$I = \frac{Q}{t}$$

$$Q = It = 0.5 \times 10 \times 60 = 300 \text{ C}$$

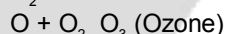
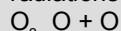
OR

Ans. $V = \frac{W}{q}$

$$W = qV = 1 \times 6 = 6 \text{ J}$$

14. Explain in brief how ozone layer is getting depleted. 2

Sol. • This layer is established due to an equilibrium between photo dissociation of ozone by UV – radiations and regeneration of ozone.



But some chemicals / Pollutant react with it and degrade the layer.

- Main chemicals to be responsible for destruction of ozone layer are : chlorofluorocarbons (CFCs), halogens (used in fire extinguishers), methane and nitrous oxide.
- Out of these, most damaging is the effect of CFCs which are a group of synthetic chemicals and are used as coolants in refrigerators and air conditioners; as cleaning solvents, propellants and sterilant etc.
- These CFCs produce “active chlorine” (Cl and ClO radicals) in the presence of UV–radiations. These active chlorine radicals catalytically destroy ozone and convert it into oxygen. As show

15. Explain the working function of an electric motor. 2

Sol. An electric motor utilizes the magnetic effect of current. A motor works on the principle that when a rectangular coil is placed in a magnetic field and current is passed through it, a torque acts on the coil which rotates it continuously. When the coil rotates, the shaft attached to it also rotates. In this way the electrical energy supplied to the motor is converted into the mechanical energy of rotation.

16. Give any two ways in which non-biodegradable substances would affect the environment - 2

Sol. (i) Eutrophication :

–By using excessive amount of fertilizers they are entered to water bodies.

–Excessive phosphates promote the growth of algae in water that will lead death of other aquatic organism.

(ii) Biomagnification :

–Harmful insecticide like DDT cause harmful affect on food chain and that will cause death of organisms of higher trophic level.

17. You have been provided with three test tubes. One of them contains distilled water and the other two contain an acidic solution and a basic solution respectively. If you are given only red litmus paper, how will you identify the contents of each test tube?

OR

Which gas is usually liberated when an acid reacts with a metal? Illustrate with an example. How will you test for the presence of this gas?

Sol. Three test tube A, B, C

(i) A contains distilled water

(ii) B contains acidic & C contains basic solution. On adding red litmus paper

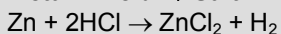
A → no change

B → no change

C → Turn to blue.

OR

Metal + Acid → Salt + H₂↑



On putting burning match stick near mouth of test tube liberated gas burn with pop sound.

18. (a) Explain the following in term of gain or loss of oxygen with one example each.

(i) Oxidation

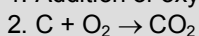
(ii) Reduction

(b) Why should a magnesium ribbon be cleaned before burning in air?

Sol.

Oxidation

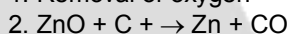
1. Addition of oxygen



(b) Magnesium ribbon is a very reactive metal when stored. It reacts with oxygen to form a layer of magnesium oxide (MgO) on its surface. This layer of magnesium oxide being a stable compound prevents further reaction of magnesium with oxygen.

Reduction

1. Removal of oxygen



19. (a) Which element has twice as many electrons in its second shell as in its first shell?
 (b) An atom has electronic configuration 2, 8, 7. What is the atomic number of this element?
 (c) Lithium, sodium, potassium are all metals that react with water to liberate hydrogen gas is there any similarity in the atoms of these elements?

OR

The position of three elements A, B and C in the Periodic Table is shown below.

Group 16	Group 17
–	–
–	A
–	–
B	C

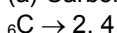
(a) State whether A is a metal or non- metal

(b) State whether C is more reactive or less reactive than A.

(c) Will C be larger or smaller in size than B?

Sol.

(a) Carbon element has twice as many electrons in its second shell as in its first shell



↓ ↓

K L

(b) Given electronic configuration = 2, 8, 7 then atomic number of element is 17.

(c) These elements contain single electron in their valence shell

OR

(a) A is non- metal

(b) C is less reactive than A

(c) C will be smaller than B because nuclear charge will increase.

- 20.** What is hormone ? Give an example of a growth-promoting plant hormone . How does movement of the leaves of a sensitive plant differ from the movement of a shoot towards light ? 3

OR

What is hydrotropism ? How would you demonstrate hydrotropism with the help of an experiment.

Sol. Hydrotropism : The response of a plant part to water is called Hydrotropism, If the plant part moves towards water, it is called hydrotropism.

Experiment procedure :

(i) Plant a seedling in a vessel containing soil.

(ii) Adjacent to the seedling put a porous pot containing water.

(iii) Leave the soil up for few days.

Observation

On examining the roots of seedling it is observed that the roots bend towards the source of water and do not grow straight.

Results : Root grows towards water called as hydrotropism.

OR

Any chemical substance which is formed in the tissues of endocrine glands are carried by the blood to other parts of the body for its specific actions is termed as **hormone**.

Plant growth promoting hormone is auxin :

–Movement of sensitive leaves is called as Nastic movement. It is unidirectional movement of leaves to stimulus.e.g. touch-me-not plant leaves.

–Movement of shoot towards light is called as tropism. It is directional movement of shoot towards light.

- 21.** Describe the process of sexual reproduction in flowering plants. 3

Sol. Sexual reproduction in flowering plant :-

–The ovary of carpel contains ovules and each ovule has an egg cell.

–The male germ cell produced by pollen grains.

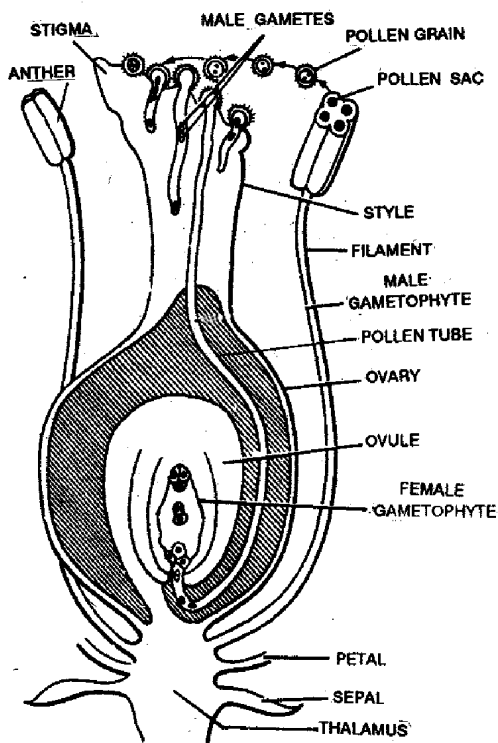
–The pollen needs to be transferred from stamen to the stigma. This process is called as pollination.

–After pollen lands on a suitable stigma, it has to reach female germ cell that is ovule.

–The male germ cell fuses with the female gamete present in the ovule.

–This fusion of germ cells gives rise to zygote formation which divides several times to form embryo that will convert to new plant.

–The ovules convert to seed and ovary is converted to fruit after fertilisation.



OR

Sol. How does reproduction help in maintaining stability to the population of a species ?

Reproduction :

- Reproduction is the ability of living organisms to produce new living organisms similar to them. It is one of the important characteristic of life.
- Population of organisms fill well defined place, or niches, in the ecosystem, using their ability to reproduce.
- The consistency of DNA copying during reproduction is important for the maintenance of body design features that allow the organism to use that particular niche.
- Reproduction therefore linked to the stability of populations of species.

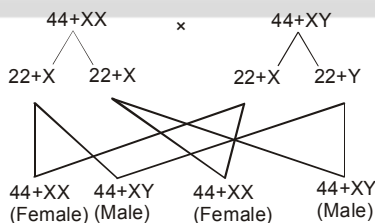
22. Sol. Explain the relation between evolution and classification. 3

- The method of arranging organisms into groups on the basis of similarities and differences is called classification.
- Evolution on the other hand refers to a slow, gradual and continuous process by which previously existing organisms develop into existing living organisms.
- All living things are identified and categorised on the basis of their body design in form and function.
- So characteristics that came into existence earlier are likely to be more basic than characteristics come to existence later.
- This means that the classification of life forms is closely related to their evolution.

“OR”

How many pairs of sex chromosomes are contained by the human beings ? Explain how is sex determined in a human child ?

Sol.

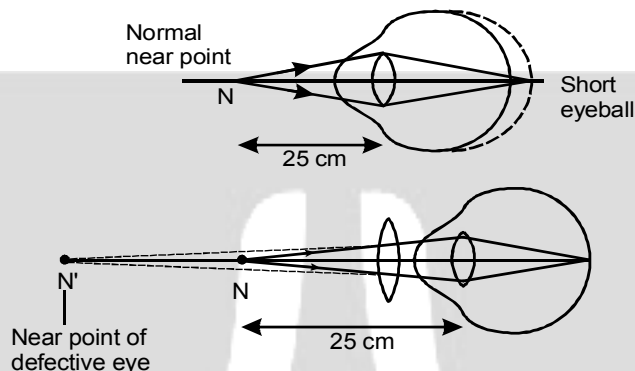


23. Draw the ray diagram to show how hypermetropia is corrected. The near point of a hypermetropic eye is 1 m. What is the power of the lens required to correct this defect? (Assume that the near point of the normal eye is 0.25 m) 1 + 2 = 3

OR

Why does the sun appear reddish early in the morning? Draw the ray diagram of an arrangement for observing scattering of light in colloidal solution. 1 + 2 = 3

Sol.



By lens formula

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \quad \dots (i)$$

Put the given values in eq. (i) with their sign convention

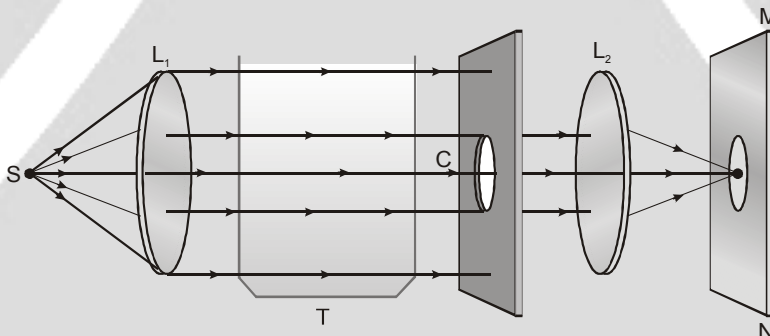
$$-\frac{1}{1} - \left(-\frac{1}{0.25}\right) = \frac{1}{f}$$

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

$$\text{Power} = \frac{1}{f} \text{ D} = 3\text{D}$$

OR

- Sol. Due to scattering of shorter wave length light, the light that reaches our eyes is of longer wave length i.e. red



The ray diagram of an arrangement for observing scattering of light in colloidal solution.

24. The resistance of a metal wire of length 1 m is 26Ω at 20°C . If the diameter of the wire is 0.03 cm, what will be the resistivity of the metal at that temperature? 3

OR

100 J of heat is produced in each second in a 4Ω resistor. Find the potential difference across the resistor. 3

Sol. Given $\ell = 1 \text{ m}$, $R_{20^\circ\text{C}} = 26 \Omega$ & $d = 0.03 \text{ cm} = 0.03 \times 10^{-2} \text{ m}$

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

$$\rho = \frac{AR}{\ell} = \frac{\pi(0.03 \times 10^{-2})^2 \times 26}{4} = 0.018 \times 10^{-4} \text{ ohm-meter}$$

OR

Sol. Electric energy (W) = $\frac{V^2}{R} t$
 $V^2 = WRt = 100 \times 4 \times 1 = 400$
 $V = 20 \text{ volt}$

25. Explain how does a Solenoid behave like a magnet. When is the force experienced by a current-carrying conductor placed in a magnetic field largest? 2 + 1 = 3

Sol. The pattern of the magnetic field lines around a current carrying solenoid and a bar magnet are similar. One end of solenoid behaves as a magnetic north pole, while the other behave as the south pole that's why solenoid behaves like a magnet.

The force experienced by a current carrying conductor placed in a magnetic field is largest when the direction of current is at right angles to the direction of magnetic field.

26. What are the qualities of an ideal source of energy? Give the names of two energy sources that you would consider to be exhaustible. 2 + 1 = 3

Sol. The qualities of an ideal source of energy are followings :-

- (1) It is easily accessible.
- (2) It is easy to store and transport.
- (3) It is economical.
- (4) It is capable of giving an adequate amount of useful energy.
- (5) It does a huge amount of work per unit mass.
- (6) It produces less amount of smoke.

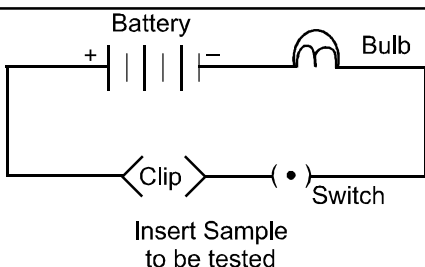
Oil, coal, nuclear or natural gas are the energy sources that consider to be exhaustible.

- 27.** (a) You are given a hammer, a battery, a bulb, wires and a switch. How could you use them to distinguish between samples of metals and non-metals?
 (b) Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it. What will be the action of the gas on the following?
 (i) Dry litmus paper
 (ii) Moist litmus paper
 (c) State two ways to prevent the rusting of iron.

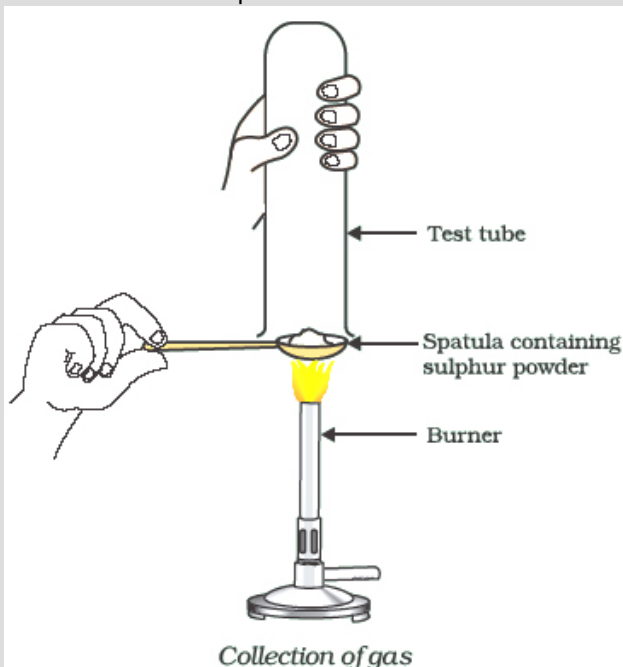
OR

- (a) Explain the formation of sodium chloride (NaCl) by transfer of electrons.
- (b) What are the ions present in NaCl?
- (c) What is amphoteric oxide? Give two examples of amphoteric oxides.

Sol. (a) (i) on beating with hammer if sample crushed it is non-metal & if do not change its shape easily it is metal.
 (ii) Make an electric circuit by connecting a battery bulb, wire and switch in series & connect it across the sample the given sample. If a pressing switch bulb glow sample is metal if don't sample is non-metal.



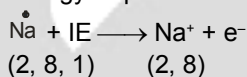
- (b) (i) There will be no action on dry litmus paper.
 (ii) Since the gas is sulphur dioxide (SO₂). It turns moist blue litmus paper to red because sulphur dioxide reacts with moisture to form sulphurous acid.



- (c) (i) Corrosion of metals can be prevented by coating the metal surface with a thin layer of paint, varnish or grease.
 (ii) By galvanisation.

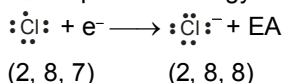
OR

(a) Sodium atom (Electropositive element) by losing an electron from its outermost orbit gets converted into a cation and attains noble gas like stable configuration.
 Energy required for this process is called "ionization energy."



Chlorine atom (Electronegative element) accepts the electron donated by sodium atom in its outermost orbit and forms chloride anion.

In this process energy is released which is known as "electron affinity."



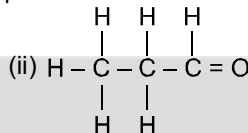
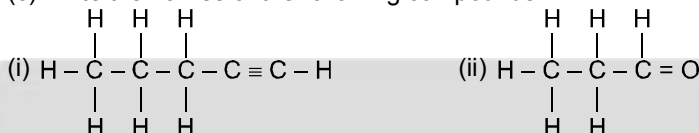
Due to the opposite charges on the Na⁺ and Cl⁻ ions, they are bonded by electrostatic force of attraction to form NaCl compound.



(b) Na⁺ (cation) and Cl⁻ (anion)

(c) Those oxide which can behave as acid as well as base. Ex. ZnO, Al₂O₃ etc.

28. (a) A mixture of oxygen and ethyne is burnt for welding. Explain why a mixture of ethyne and air is not used.
 (b) What is esterification reaction? Write the name and structure of the product when ethanoic acid reacts with ethanol in presence of an acid catalyst
 (c) Write the names of the following compounds.

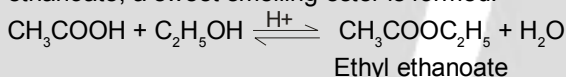


OR

- (a) What is homologous series? Explain with examples
 (b) Draw the structures of the following compounds.
 (i) Hexanal (ii) Propanone

(c) Name two hydrocarbons which give addition reactions.

- Sol. (a) Because air contains large proportion of nitrogen which do not support for combustion.
 (b) When ethanoic acid is heated with ethanol in presence of small quantity of conc. H₂SO₄ ethyl ethanoate, a sweet smelling ester is formed.



This process of ester formation is called esterification.

- (c) (i) Pent-1-yne (ii) propanal

OR

(a) Homologous series may be defined as a series of similarly constituted compounds in which the members possess similar chemical characteristics and the two consecutive members differ in their molecular formula by – CH₂.

e.g Homologous series of alkanes:

General formula: C_nH_{2n+2}

Value of n	Molecular formula	IUPAC name
n = 1	CH ₄	Methane
n = 2	C ₂ H ₆	Ethane

- (b) (i) CH₃–CH₂–CH₂–CH₂–CH₂–CHO
 (ii) CH₃–CO–CH₃

(c) Ethene and Ethyne (Unsaturated hydrocarbon)

29. Draw a neat labelled diagram of the longitudinal section of the human heart and show the direction of the flow of blood through the different chambers with arrow marks, and give a brief description of the blood circulation through it.

Sol.

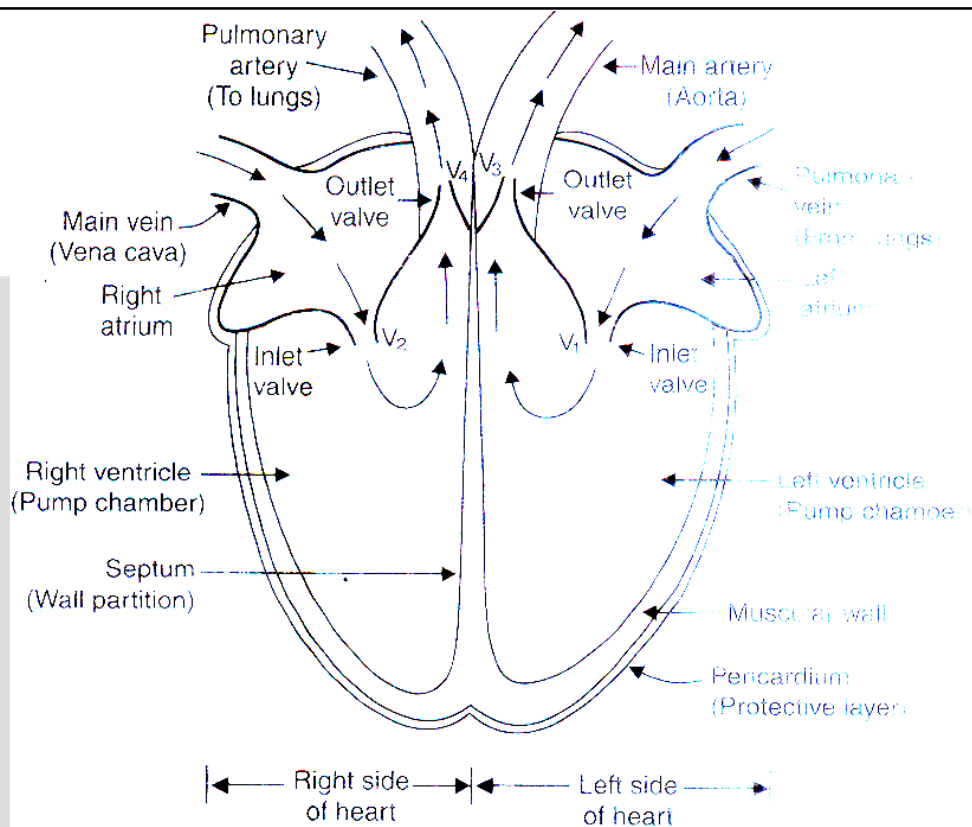


Diagram to show the inside structure of human heart

30. A 20 mm tall object is placed perpendicular to the principal axis of a convex lens of focal length 10 cm. If the distance of the object from the lens is 15 cm, then—
- (a) Find the nature, position and size of the image 3
- (b) Find the magnification of the image 2

OR

Find the power of a concave lens of focal length 2 m. A concave lens has focal length of 15 cm. At what distance should the object from the lens be placed so that it forms an image at 10 cm from the lens? Also find the magnification and nature of the image produced by the lens. $1 + 2 + 1 + 1 = 5$

Sol. Given $h_0 = 20$ mm, $f = 10$ cm, $u = -15$ cm

By lens formula

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

$$\frac{1}{v} - \left(-\frac{1}{15}\right) = \frac{1}{10}$$

$$\frac{1}{v} = \frac{1}{10} - \frac{1}{15}$$

We get,

$$v = 30 \text{ cm}$$

$$\frac{v}{u} = \frac{-30}{15} = \frac{h_i}{h_o}$$

$$h_i = -2 \times 20 = -40 \text{ mm}$$

$$m = \frac{v}{u} = \frac{-30}{15} = -2$$

Here m is greater than one and negative so image will be real, inverted and enlarged in nature.

OR

Given $f = -2 \text{ m}$

$$P = \frac{1}{f} D = \frac{1}{-2} = -0.5 \text{ D}$$

Concave lens always form virtual image of real object

So $v = -10 \text{ cm}$, $f = -15$, $u = ?$

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

$$-\frac{1}{10} - \frac{1}{u} = -\frac{1}{15}$$

We get, $u = -30 \text{ cm}$

$$m = \frac{v}{u} = \frac{-10}{-30} = \frac{1}{3}$$

m is less than unity and positive so image will be diminished, erect and virtual in nature.