

**SECTION-A**

1. (i) Ethyl bromide/Bromo ethane (ii) Methanal
2. (i)  $\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}$   
 (ii)  $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \xrightarrow{\text{Acid}} \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$
3. (a) According to Ohm's law, 'the current through certain conductors is directly proportional to the potential difference between its ends at a constant temperature'.  
 $I \propto V$  or  $V \propto I$   
 or  $V = IR$   
 (b) A battery neither supplies electrons to the circuit nor absorbs. It establishes the electric field that exerts a force on electrons already in the wires and elements of the circuit that causes the flow of electrons.  
 (c) Resistance of the wire,  $R = \frac{V}{I} = \frac{6 \text{ volts}}{0.5 \text{ Amp}} = 12 \Omega$   
 (d) If the wire is supplied by a battery of 24 volts then current flow through it will be,  
 $I' = \frac{V'}{R} = \frac{24}{12} = 2 \text{ A}$  Which is four times than that in case (c).
4. (a) Option 4  
 (b) Option 3  
 (c) It is a sequence of organisms through which energy is transferred in the form of food by the process of one organism consuming the other.  
 (d) Lindeman
5. Option (1)  
 When light ray goes from medium 'A' to medium B, it bends towards normal. Thus, speed of light reduces in medium B as compared to medium A.  
 Refractive index of medium B w.r.t. medium A,  $n_{BA} = \frac{v_A}{v_B}$   
 $\therefore v_A > v_B \therefore n_{BA} > 1$
6. Option (1)  
 $V = \frac{W}{q} \Rightarrow V = \frac{W}{I \times t} \Rightarrow \text{Voltage} = \frac{\text{work done}}{\text{current} \times \text{time}}$
7. Option (4)  
 Since, each circuit is closed and Ammeter (in each circuit) is connected in series with appropriate polarity, the current recorded in ammeters in all cases will be same.
8. Option (2) Sal
9. Option (1) Valves in heart

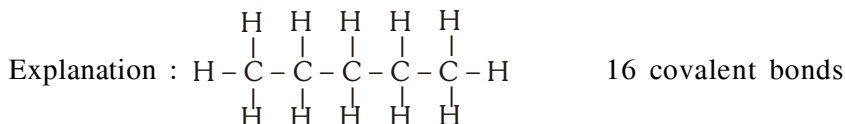
**OR**

- Option (4) Axonal end of one neuron to dendritic end of another neuron.
10. Correct option (4)  
 Explanation : Iron reacts only with steam to form a metal oxide and hydrogen.  
 $3\text{Fe(s)} + 4\text{H}_2\text{O(g)} \rightarrow \text{Fe}_3\text{O}_4\text{(s)} + 4\text{H}_2\text{(g)}$

11. Correct option (4)

Explanation : In the Modern periodic table the atomic radii decrease with increasing the atomic number from left to right. The atomic number of F, O, and N are 9, 8 and 7, respectively so atomic radius will decrease from N to F

12. Correct option (3)



13. Correct option (3)

Explanation : In esterification, RCOOH, - H is replaced by OOR' of R'OH in the presence of acid to form RCOOR'.

14. Option (3)

### SECTION-B

15. (i) Presence of unreactive nitrogen gas prevents reaction of oil and fats present in food with air and further prevents rancidity. So that oil and fat containing food items are flushed with nitrogen.

(ii) Application of paint prevents reaction of air with iron articles and prevents corrosion.

16. (i) 2, 8, 7, Valency - 1

(ii) Non metal

(iii)  $\text{YX}_3$

**OR**

(i) Fluorine

(ii) Halogen

(iii) Group 2  $\longrightarrow$  Beryllium, group 15  $\longrightarrow$  Nitrogen

17. Modern periodic table has 7 periods and 18 groups.

(i) Metallic character decreases on moving from left to right in a period.

Reason : Along the period, from left to right the effective nuclear charge increases due to increase in no of protons due to which forces of attraction between nucleus and valence electrons increases and ability to lose electrons (i.e. metallic character) decrease.

(ii) Metallic character increases down a groups

Reason : Because atomic size increases down group, the force of attraction between nucleus and valence electron decreases and electrons losing tendency increases. Therefore metallic character increases.

18. Two reasons of launching the Ganga action plan are

(1) To improve the quality of water in Ganga.

(2) To check the pollution of water in Ganga to prevent diseases.

Coliform bacteria was found in Ganga water indicating contamination.

**OR**

Sustainable management of natural resources is necessary to sustain the resources for future generation and meet the current basic needs of the population.

Reuse is a better practice because it can be done at household level with no expense of energy.

It does not cause pollution and is an ecofriendly practice.

19. Main requirements for photosynthesis are carbon dioxide, water, sunlight and chlorophyll.

Carbon dioxide : It is obtained by the plants from atmospheric air.

Water : It is absorbed by the roots of the plant from the soil through the process of osmosis.

Sunlight : Sun is a natural source of light for photosynthesis.

Chlorophyll : It is a pigment present in all the green parts of the plant.

20. (a) (i) Regulate metabolism of carbohydrates, fats and proteins

(ii) Pituitary

(iii) Regulate blood sugar level.

(b) Physical and chemical properties of hormones (any three)

These are secreted by endocrine glands.

Hormones are secreted only when required.

Their secretion is regulated by feedback mechanisms.

These are generally released in the blood stream.

The molecules of most of the hormones are small.

The secretion of hormone is always in very small quantity.

Hormones are destroyed after use i.e. hormones can not be stored in the body. Thyroxine is an exception.

21. HIV stands for Human Immunodeficiency Virus. Yes, AIDS is an infectious disease.

Four modes of spreading AIDS are :

(i) unprotected sex with an infected partner

(ii) use of contaminated needle and syringes

(iii) use of contaminated razors for shaving

(iv) transfusion of infected blood or blood product

22.  $R_{AB} = 2\Omega + 6\Omega \parallel 3\Omega$

$$= 2 + \frac{6 \times 3}{6 + 3} = 2 + \frac{18}{9} = 2 + 2 = 4 \Omega$$

23. **Electric energy**

The total energy supplied by a source of emf in order to maintain the electric current in the circuit in a given time is called 'electric energy'.

$$E = P \times t = V \times I \times t \text{ [where, electric power (P) = electric potential (V) } \times \text{ electric current (I)]}$$

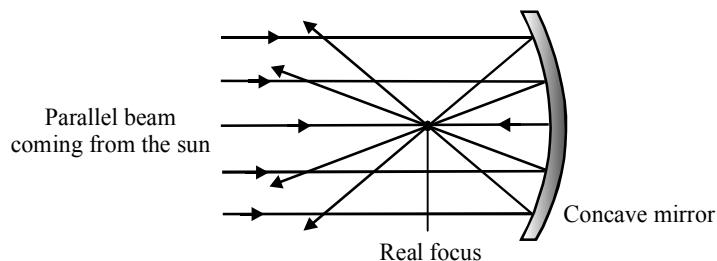
**Unit of electric energy**

**S I unit : Joule**

Here, 1 Joule = 1 volt-ampere-sec = 1 VAs

**Commercial unit : Kilowatt hour (KWH)**

24. (a) He should keep the distance between paper and mirror such that the position of the paper be at the focus of the mirror.  
 (b) He has a concave mirror.  
 (c) Yes, he can determine the approximate value of focal length if the paper starts to burn at some position from the lens. It is so because the light ray (coming as a parallel beam) incidents on the mirror and meet actually at the focus of mirror after reflection through it.



OR

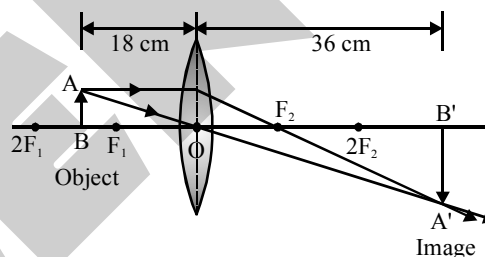
Given : Convex lens,  $f = +12$  cm,  $h_o = +10$  cm,  $u = -18$  cm,  $v = ?$

Using lens formula, we have

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

$$\Rightarrow \frac{1}{12} = \frac{1}{v} - \left[ \frac{1}{-18} \right] \Rightarrow \frac{1}{v} = \frac{1}{12} - \frac{1}{18}$$

$$\Rightarrow \frac{1}{v} = \frac{3-2}{36} \Rightarrow v = +36 \text{ cm (position of image)}$$



$$\text{Magnification (m)} = \frac{v}{u} = \frac{+36}{-18} = -2$$

$$\therefore m = \frac{h_i}{h_o} \quad \therefore h_i = m \times h_o = -2 \times 10 = -20 \text{ cm}$$

The image formed will be two times magnified, real and invert and at position of 36 cm away from the lens

### SECTION-C

25. (a) Physical nature of ionic compounds
- (1) They are solid.
  - (2) Have high melting point.
  - (3) In aqueous and in molten state they are good conductor of electricity.
  - (4) Soluble in water.
- (b) Silver, Gold
- (c) Highly reactive metals like sodium, aluminium are strongly bonded with other elements in their compounds. Carbon being weaker is not able to break this bonding. So carbon can not be used to obtain highly reactive metals from their compounds.
- (d) Solder
- Constituents: 50% lead and 50% Tin

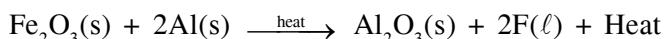
OR

- (a) The process of heating an ore (generally a sulphide ore) strongly below its melting point in the presence of an excess of air is called roasting.

Calcination is the process of heating an ore (generally a carbonate ore) strongly in the absence of air very limited supply of air.

Roasting process is used for sulphide ores because sulphur gets oxidised to  $\text{SO}_2$  which can be easily removed leaving behind the metal oxide.

- (b) Aluminium displaces iron from iron oxide on heating.



This reaction produces lots of heat which results in the melting of railway track lines. After cooling, iron again forms a hard solid and hence, cracked railway lines can be joined.

- (c) For electrolytic refining of impure copper impure copper is used as anode, pure copper is used as cathode and copper sulphate solution is used as the electrolyte.

26. (i) (a) Sodium hydrogen carbonate -  $\text{NaHCO}_3$

(b) Sodium carbonate deca hydrate -  $\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$

- (ii) Baking powder is made up of sodium bicarbonate and an edible acid. Heating of  $\text{NaHCO}_3$  evolves  $\text{CO}_2$  which swells up cake. But in this reaction  $\text{Na}_2\text{CO}_3$  is formed which is mild alkaline and can make the cake bitter in taste. In baking powder, the presence of edible acid neutralises alkaline effect (bitterness) of  $\text{Na}_2\text{CO}_3$ . So that baking powder is used instead of baking soda in making cakes.

- (iii) Use of baking soda –

(a) As an ingredient in antacids. Being alkaline, it neutralises excess acid in the stomach and provides relief.

(b) It is used in soda-acid fire extinguisher.

Use of washing soda –

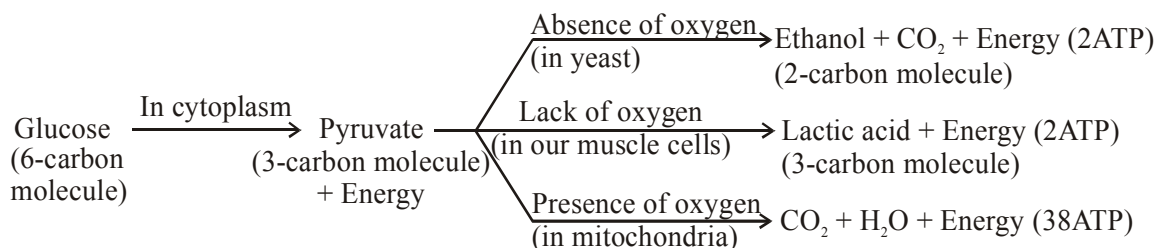
(a) Washing soda is used for softening hard water.

(b) Sodium carbonate (soda ash) is used for the manufacture of detergents.

(c) Sodium carbonate is used for the manufacture of many important compounds, such as borax ( $\text{Na}_2\text{B}_4\text{O}_7$ ), hypo ( $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ ), etc.

(d) Sodium carbonate is also used in paper, glass, soap and paint industries.

27. (a)

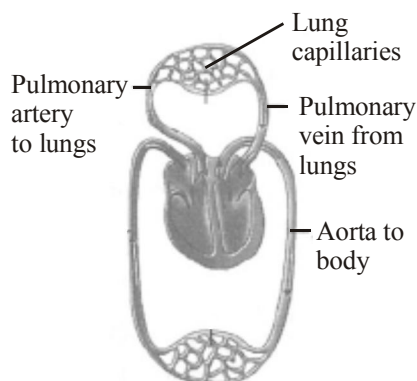


- (b) Aquatic plants can carry out gaseous exchange by diffusion over their whole surface.

- (c) They prevent the trachea from collapsing even if there is not much air in it.

**OR**

- (a) The schematic representation of transport and exchange of oxygen and carbon dioxide is as follows:



- (b) In mammals and birds the two circulatory system (oxygenated blood and deoxygenated blood) become fully separate sending low pressure pumping to lungs and high pressure flow of blood to rest of body. This prevents any mixing of oxygenated and deoxygenated blood ensuring maximum supply of oxygen to all body parts. This allows optimum oxidation of glucose to release energy required by these animal groups to maintain their body temperature making them homeothermic.
- 28.** (a) Seminal vesicles and prostate gland add their secretions to the sperms so that they are now in a fluid which makes their transport easier and this fluid also provides nutrition.
- (b) Any three categories of contraception methods
1. Natural method  
Intercourse is safe for a week before and week after menstruation.
  2. Mechanical methods
    - (i) It includes use of condoms which are the rubber or plastic sheets put on the penis before coital activity.
    - (ii) Use of diaphragms or cervical caps fitted in vagina of female to check the entry of sperms into the uterus and also helps in avoiding conception.
    - (iii) Use of IUCD i.e., Intra Uterine Contraceptive Devices like copper T and loops fitted in the uterus, help to prevent fertilization. They can cause side effects due to irritation of uterus.
  3. Chemical methods
    - (i) It consists of using some chemicals which are spermicidal. They may be in form of tablets, jellies, paste and creams introduced in the vagina before coital activity.
    - (ii) Another chemical method is the use of oral contraceptive (OC) pills which inhibit the secretion of FSH and LH from the anterior lobe of pituitary gland and thus inhibiting ovulation from the ovary. These contraceptive therefore change the hormonal balance so that egg cell are not released and hence prevent fertilization.
  4. Surgical methods
    - (i) Tubectomy involves cutting of fallopian tubes in females and Vasectomy involves cutting of vas deferens of each side.
    - (ii) Surgical removal of ovaries is known as ovariectomy and removal of testes is known as castration.
    - (iii) Another surgical method is MTP i.e. Medical Termination of Pregnancy or abortion.
    - (iv) Other method is tubal ligation in which fallopian tubes are blocked by an instrument called laproscope.

29. (a) Parallel combination of resistors

Let us consider three resistors having resistances  $R_1, R_2, R_3$  respectively. Let the voltage across the combination is 'V' and currents through  $R_1, R_2, R_3$  are  $I_1, I_2, I_3$ . Voltage across all the resistors is same as all of them have same terminal points (A and B). (see fig.)

$$V_1 = V_2 = V_3 = V \text{ (let)} \quad \dots (1)$$

The total current 'I' entering through 'A' is divided among the three resistors ( $I_1, I_2$  &  $I_3$ ). Thus, total current 'I' is sum of individual currents through  $R_1, R_2$  &  $R_3$ .

$$I = I_1 + I_2 + I_3 \quad \dots (2)$$

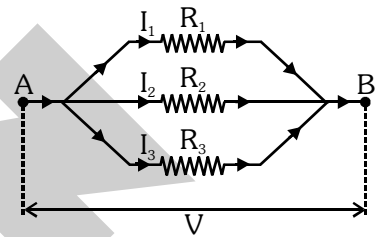
Let the equivalent resistance of whole combination be  $R_p$ .

$$I = \frac{V}{R_p} \quad \dots (3)$$

From (2) & (3), we get,  $\frac{V}{R_p} = I_1 + I_2 + I_3$

$$\text{or } \frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3} \quad \left[ \because I = \frac{V}{R} \right]$$

$$\text{or } \frac{V}{R_p} = V \left( \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \right) \text{ or } \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$



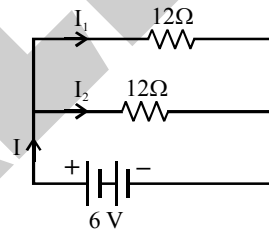
General formula for n resistors in parallel :

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots + \frac{1}{R_n}$$

(b)  $R_{eq} = \frac{12}{2} = 6\Omega$

$V = 6 \text{ Volts}$

$\therefore I = \frac{V}{R_{eq}} = \frac{6}{6} = 1A$



**OR**

(a)  $R_{eq} = 4 + 20 = 24 \Omega$

(b)  $\therefore V = 6 \text{ volts}$

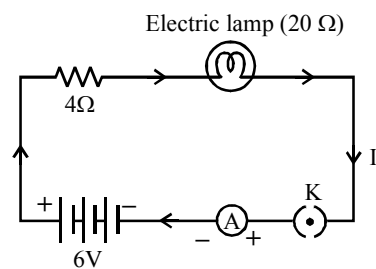
$\therefore I = \frac{V}{R_{eq}} = \frac{6}{24} = 0.25 \text{ A}$

(c) (i) P.d. across the lamp =  $IR_L = 0.25 \times 20 = 5V$

(ii) P.d. across the resistor =  $IR = 0.25 \times 4 = 1V$

(d) Power of the lamp,  $P_L = I^2 R_L$

$P_L = (0.25)^2 \times 20 = \frac{20}{16} = 1.25 \text{ watt}$



30. (i) The distance between the focus and the optical centre of a lens is called its 'focal length'.

(ii) Given : Lens  $\rightarrow$  divergent (i.e. concave) lens

$f = -30 \text{ cm}, h_0 = +5 \text{ cm}, u = ?, v = -15 \text{ cm}$

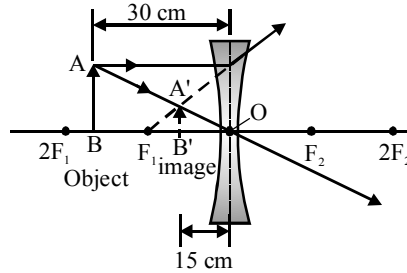
(∵ a concave lens forms only virtual image on the side of object)

Using lens formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow -\frac{1}{30} = \frac{1}{-15} - \frac{1}{u} \Rightarrow \frac{1}{u} = \frac{1}{30} - \frac{1}{15} = \frac{1-2}{30}$$

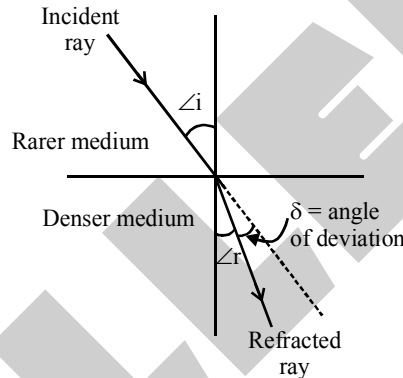
$$\Rightarrow u = -30 \text{ cm}$$

(iii) Ray diagram for image formation :



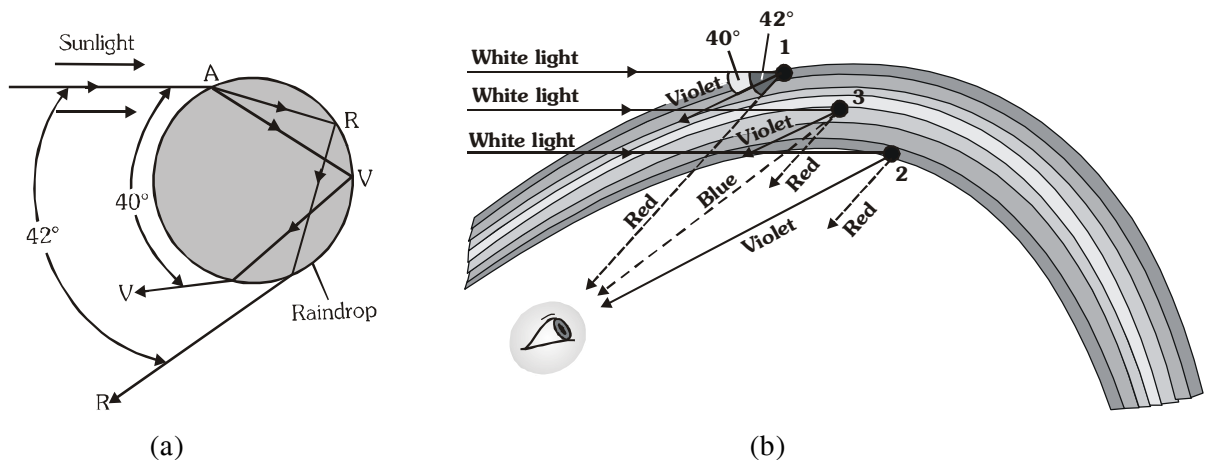
OR

(a) Explaining angle of deviation through diagram in phenomena of refraction.



(b) The wavelengths of different colours of light are different and the refractive index of glass is different for different wavelengths. Higher the wavelength, lower will be the refractive index and thus, lower will be the deviation and vice-versa. Thus while passing through a glass prism, deviation of red light is low as its wavelength is large. Similarly, deviation of violet light is high as its wavelength is small.

(c) Schematic diagram to show the formation of rainbow :



Formation of rainbow