SECTION - A

1 a)

2 c)

3 Covalent bonds are formed by the sharing of electrons between two atoms. The electrons shared belong to the valence shell of the atoms.

4 The reason for the observed trend is because atomic size increases down a group since a new shell is added as we move down a group. This increases the distance between the nucleus and the outermost shell of the atom, even though nuclear charge increases.

5 c) 2 A

6 a) 2 Ω

2020

17 a) Scattering of light is not enough at such heights

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

19 c) A has pH greater than 7 and B has pH less than 7

20 b) Formation of crystals by process of crystallization

21 c) lead storage battery manufacturing factories near A and soaps and detergents factories near B.

22 a) This is an ideal setting of the khadin system and A = catchment area, B = saline area & C = Shallow dugwell.

23 a) Hydropower can be harnessed by building dams. Hydropower can be harnessed from the potential energy of water at a height or kinetic energy of flowing water. Potential energy of water stored at a height in a reservoir of a dam can be used to rotate a turbine and generate electricity.

b 1 MW is the power when 10^6 joules of work is done is one second. $1MW = 10^6 W = \frac{10^6 J}{1 s}$

c Two disadvantages are
- large scale displacement of town inhabitants
- environmental consequences of the weak ecosystem - loss of biodiversity and large scale deforestation.
- Large areas of land have to be sacrificed as they get submerged

d When water falls from great heights, the blade of the turbine rotates. This mechanical energy is converted to electrical energy by a generator connected to the turbine.

b 1 MW is the power when 10^6 joules of work is done is one second. $1MW = 10^6 W = \frac{10^6 J}{1 s}$

c Two disadvantages are
- large scale displacement of town inhabitants
- environmental consequences of the weak ecosystem - loss of biodiversity and large scale deforestation.
- Large areas of land have to be sacrificed as they get submerged.

d When water falls from great heights, the blade of the turbine rotates. This mechanical energy is converted to electrical energy by a generator connected to the turbine.

14 a) She should eat more fruits and vegetables and reduce her intake of iodised salt.

b) Women face a greater risk of abnormal TSH level during menstruation, while giving birth and after going through menopause.

c) Low TSH level can cause goitre. (swelling of throid gland).

d) Iodine is responsible for synthesis of hormone secreted by thyroid gland.

SECTION-B

15 i) Exothermic reaction

$$\underset{\text{quick lime}}{CaO} + H_2O \longrightarrow \underset{\text{slaked lime}}{Ca(OH)_2} + \text{heat}$$

ii) Precipitation reaction (double displacement reaction)

$$Pb(NO_3)_{2(aq)} + KI_{(aq)} \longrightarrow \underset{\text{yellow precipitate}}{PbI_{2(s)}} + KNO_{3(aq)}$$

16 i Group Category A (Li, Na, K) forms a Dobereiner's triad. ((39+7)/2 = 23)

ii Mendeleev placed the elements in different groups as they had different chemical properties: the formula of their oxides and hydrides were different. However, the elements in ~~same~~ the same category have same chemical property.

iii Newland's law of octaves is not applicable to all three. It is applicable only upto calcium. Since Ga and As are found after Ca it is not applicable for group B and C. Every eight element does not shows property similar to 1st one in this case.

17 i $2NaOH_{(aq)} + Zn_{(s)} \longrightarrow \underset{\text{sodium zincate}}{Na_2ZnO_2} + H_{2(g)}$

ii $CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)} \longrightarrow Ca(HCO_3)_{2(aq)}$

iii $HCl_{(aq)} + H_2O_{(l)} \longrightarrow H_3O^+ + Cl^-$

18 a) Ozone is formed by the action of UV radiations on molecular oxygen. The high energy UV rays split an O_2 molecule into two free oxygen atoms. This free atom combine with molecular oxygen to give ozone. (O_3)

$$O_2 \xrightarrow{\text{UV rays}} O + O$$

$$O + O_2 \longrightarrow O_3$$

ozone

Ozone protects all organisms from the harmful ultraviolet radiation from the sun. This radiations is highly damaging to organisms and can cause skin cancers. O_3 prevents UV rays from reaching Earth's surface.

answer continued below

~~In 1987, UNEP (United Nations Environment Programme) succeeded in forging an agreement to free CFC production at 1986 levels. These CFCs used to destroy the ozone layer. After this rule manufacturers had to make refrigerators without CFCs.~~

In 1980s, the production of chlorofluorocarbons (CFCs) increased. CFCs are used in refrigerators and fire extinguishers as coolants.

These CFCs destroy the ozone layer. Since the ozone layer was getting destroyed by the CFCs, amount of ozone in the atmosphere dropped sharply.

19 a) i Enzyme trypsin helps in the digestion of proteins into amino acids - -

ii) Enzyme lipase helps in digestion of fats into fatty acids and glycerol.

Both trypsin and lipase are secreted by pancreas and into the small intestine.

b Function of villi -

- Villi increase the surface area for absorption of digested food.
- Villi are richly supplied with blood vessels which transport the absorbed food to each and every cell in the body, where it is used up for growth, repair and development of the body. It helps energy from food get supplied to cells.

20 a) Parent $Gr\,Gr$ × $g\,g$

Gamete (Gr) (g)

F_1

$Gr\,g$ × $Gr\,g$

green

F_2

	Gr	g
Gr	$Gr\,Gr$ green	$Gr\,g$ green
g	$Gr\,g$ green	$g\,g$ brown

genotypic ratio →

$Gr\,Gr : Gr\,g : g\,g$

1 : 2 : 1

phenotypic ratio →

~~ball~~ green : brown

3 : 1

i Colour of stem in F_1 progeny is green. ✓

ii Percentage of brown stemmed plants $= \frac{1}{4} \times 100 = 25\%$ ✓

iii Ratio of $Gr\,Gr$ and $Gr\,g$ = 1 : 2 ✓

b Based on the findings, ~~who~~ we can say that green stem colour is dominant trait while brown stem colour is a recessive trait. In F_1 generation no midway traits are seen and all F_1 progeny are green. In F_2 generation we get green stem and brown stem in ratio 3:1. The law of dominance is proved. Every progeny inherits two copies of factors controlling traits. They may be same or different based on parentage.

21 a) i) homologous pairs
ii) analogous pairs
iii) homologous pairs
iv) analogous pairs

b) Organs are homologous if they have the same basic design, structure and components, though they may be modified to perf perform different functions. They show common ancestry
Analogous organs may look similar as they perform the same function but their basic structural design is different.

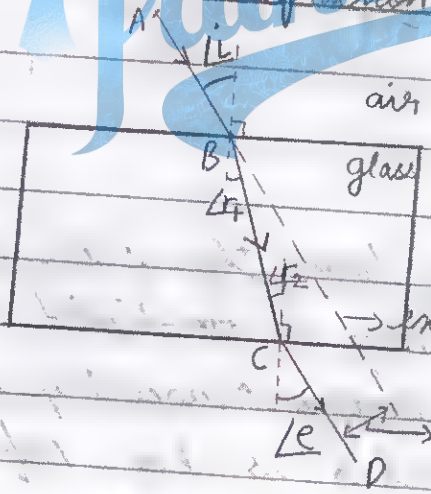
P.T.O

Thus basic structural design is main feature to classify organs as homologous or analogous.

22a) Snell's law of refraction states that the ~~ratio~~ ratio of sine of angle of incidence to ~~ratio~~ sine of angle of refraction is a constant ~~called refractive~~ for a given pair of media and a given colour of light.
This constant is refractive index of second medium with respect to the first.

b

Refraction through a glass slab



23a) i) ~~bifocal~~ bifocal lenses are used

ii) A bifocal lense consists of a concave lense at the top to help in distant vision and a convex lens at the bottom to help in near vision. A bifocal lens consists of both a concave and convex lens.

b) $P = +3D$

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

$= \frac{1}{3} m = \frac{100}{3} cm = \boxed{33.33 cm}$

To correct near vision she needs a lens of focal length 33.33 cm (convex lens)

$P = -3D$

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

$= \frac{1}{-3} = \boxed{-33.33 cm}$

To correct distant vision, she needs a lens of focal length -33.33 cm (concave lens).

24 i) Magnetic field lines are close together when ~~field~~ field is strong. This is seen inside the magnet. However as the distance from the magnet increases, field strength decreases and the field lines begin to spread out. Thus at north pole, the field lines diverge and at south pole they again converge to form parallel lines within the magnet where they move from S to N.

ii) When current is passed through a solenoid, it gains a magnetic field. One end of the solenoid acts as the north pole while the other behaves like the south pole. Thus when freely suspended, it behaves like a freely suspended magnet and points in north-south direction.

iii) A fuse is a protective device which melts when current above a specified values passes through it and hence breaks the circuit protecting it from unduly high current. A fuse is selected based on the current required to flow through the appliance. If a fuse melts it should be replaced with one of same rating. Otherwise, if the rating is higher, more current than required will flow. If the rating is lower, it will melt even when less current flows. Thus since a specific

value of current should flow through a circuit, a fuse of same rating should be used.

SECTION-C

25a)

Soaps	Detergents
→ Composition –	
• Sodium or potassium salts of long chain carboxylic acids.	• Sodium salts of sulphonic acids or ammonium salts with chloride or bromide ends.
→ Action in hard waters	
• React with Ca^+ and Mg^+ ions in hard water to form white sticky precipitate called scum.	• The charged particles do not react with Ca^+ and Mg^+ ions in hard waters, so no scum is formed.
• less lathes formed	• same lathes formed as in normal water
• not effective in hard waters	• effective even in hard waters.

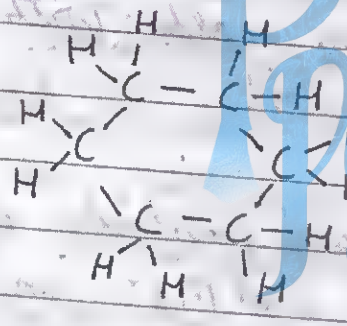
b Ethanol reacts with sodium metal to form sodium ethoxide and hydrogen

$$2\,CH_3-CH_2OH + Na \longrightarrow CH_3CH_2ONa + H_2$$

sodium ethoxide

Ethanol behave like an acid as it reacts with a metal to give a salt and hydrogen. Ethanol loses an atom of hydrogen and replaces it with Na. Even some bases show this behaviour.

c Cyclohexane – C_6H_{12}

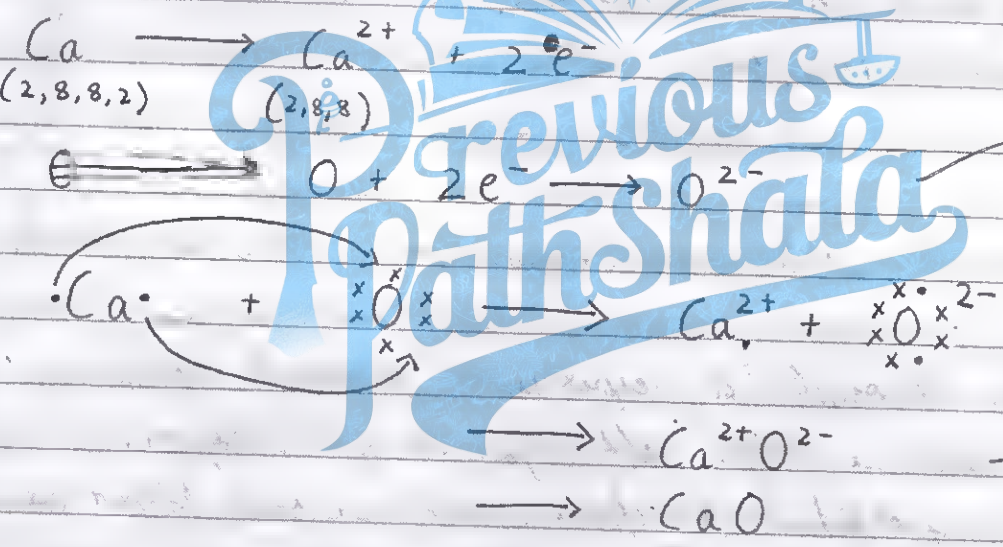


d The compound is ethanal.

26 a) Calcium → $\cdot Ca \cdot$

Oxygen → $:\dot{O}:$

b)



c) The ions present are Ca^{2+} - calcium ion which is a cation
O^{2-} - oxide ion which is an anion.

d) CaO is an ionic compound. Its properties are -
- High melting and boiling point.

P.T.O

- hard solid, brittle - breaks when pressure is applied.
- soluble in water
- insoluble in organic solvents like petrol, kerosene
- conducts electricity is molten and aqueous states.
- Does not conduct electricity in solid state.
- Imparts specific colour to the flame.

27a) • Blood in the alveolar sac take up oxygen and carbon dioxide is released.
- Blood carries oxygen through a respiratory pigment called haemoglobin which has a high affinity for oxygen.
- Carbon dioxide is transported in dissolved form in our blood as it is more soluble.
- Oxygen rich blood is carried to the left atrium of the heart through the pulmonary vein. The left atrium relaxes as it receives the blood.
- This chamber then contracts while the left ventricle relaxes and the blood is transported to the left ventricle.

- The left ventricle contracts to pump the blood to the various parts of the body through the aorta.
- Valves in heart prevent blood backflow.
- The aorta divides into numerous arteries which carry the blood to different parts. At the tissue, the artery divides into smaller and smaller vessels. The smallest vessel is the capillary which has a one cell thick wall through which blood transfer of O_2 and glucose take place.

b) If the system of blood vessels develop a leak, it may lead to loss of blood, which can lead to loss in pressure and reduce efficiency of the pumping system.
Thus, to prevent this blood has cells called platelets which circulate around the body. When a leak develops, the platelets help plug the leak by clotting blood at the point of injury.

28 a) ~~Hormonal~~ Chemical methods - oral pills are taken which alter the hormonal balance of the body and ensure egg is not released and fertilisation does not occur. However this has side effects due to change in hormonal balance.

b) Surgical methods - the vas deferens in males and the ~~oviduct~~ fallopian tube in females is blocked by surgical methods. This prevents transfer of sperms in males and ensures egg doesn't reach the uterus in females. In both cases fertilisation cannot occur.

b) Viral - HIV-AIDS and warts
Bacterial - gonorrhoea, and syphilis

c) Advantages of using condom -
- Condoms act as a physical barrier and prevent transfer of sperms. Thus it acts as a contraceptive method and prevents unwanted pregnancy.
- Condoms prevent transmission of STDs (sexually transmitted diseases)

~~28a) h = 5cm object distance u = -20cm.~~

29 a) Nature of lens is convex. It is used to provide a magnified image of the palm. It is a converging lens. Convex lens is used as it can provide a magnified image in certain positions.

b) The palmist should hold the mirror between 2F and F to obtain a real, magnified image.

c) f = 10 cm u = -5 cm

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

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

$$= \frac{1}{10} + \frac{1}{-5} = \frac{1}{10} - \frac{1}{5} = \frac{1-2}{10} = \frac{-1}{10}$$

$\Rightarrow$ v = -10 cm

$\Rightarrow$ Image is formed at the focus on the same side of object (behind object)

~~$\frac{h'}{h} = \frac{v}{u}$~~

- The image size is enlarged. $M = \frac{v}{u} = \frac{-10}{-5} = 2$
- Image is twice the size of the palm (object) $h' = 2h$
- Image is virtual and erect.

30a) $P = 100\ W$

$V = 200\ V$

$P = \frac{V^2}{R}$

$\Rightarrow R = \frac{V^2}{P} = \frac{200 \times 200\ V}{100\ W}$

Resistance of bulb. $= 400\ \Omega$ //

b) Energy $= (P \times t) \times 3$

Time, $t = 10 \times 30$

$= 300$

$\Rightarrow$ Energy $= Pt \times 3$

$= 100 \times 300 \times 3$

$= 900 \times 100$

$= 90000\ Whr$

$= 90\ kWhr$ //

c) Total cost = No. of units × rate

$= 90 \times 6.5 = ₹\ 585$ //

465 | 585
9 | 65
585 | 50