

Topper's\*  
Answers

**C.B.S.E.**  
**2020**  
**Class–X**  
**Delhi/Outside Delhi Set**

**Science**

**Time : 3 Hours**

**Max. Marks : 80**

**\*Note :** This paper is solely for reference purpose. The pattern of the paper has been changed for the academic year 2022-23.

**General Instructions :**

- (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**

**Note :** For question numbers 1 and 2, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :

- (a) Both (A) and (R) are true and (R) is correct explanation of the assertion.
- (b) Both (A) and (R) are true but (R) is not the correct explanation of the assertion.
- (c) (A) is true but (R) is false.
- (d) (A) is false but (R) is true.

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



**Reason (R) :** A series of compounds with same functional group but differing by  $-\text{CH}_2-$  unit is called a homologous series.

1

Ans.

a) ✓

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2. **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 than their constituent metals. 1

Ans.

c) ✓

3. How are covalent bonds formed ? 1

Ans.

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

4. Define electropositivity. 1

OR

The atomic radii of first group elements are given below : 1

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. 1

Ans.

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. 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 1

- (a)  $\frac{A}{2}$                       (b)  $\frac{3A}{2}$                       (c)  $2A$                       (d)  $3A$

Ans.

c)  $2A$  ✓

6. The maximum resistance which can be made using four resistors each of resistance  $\frac{1}{2} \Omega$  is 1

- (a)  $2 \Omega$                       (b)  $1 \Omega$                       (c)  $2.5 \Omega$                       (d)  $8 \Omega$

Ans.

a)  $2 \Omega$  ✓

7. The sky appears dark to passengers flying at very high altitudes mainly because : 1

- (a) Scattering of light is not enough at such heights.  
 (b) There is no atmosphere at great heights.  
 (c) The size of molecules is smaller than the wavelength of visible light.  
 (d) The light gets scattered towards the earth.

Ans.

a) Scattering of light is not enough at such heights

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

- (a) Group 1 and Period 3  
(c) Group 13 and Period 3

- (b) Group 2 and Period 3  
(d) Group 16 and Period 3

1

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 is  $XCl_3$

The correct statement(s) is/are

- (a) only (A) (b) only (B) (c) (A) and (C) (d) (A), (B) and (C)

1

Ans.

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

9. 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.

1

Ans.

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

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

1

Ans.

*b) Formation of crystals by process of crystallization*

11. 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

1

- (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.

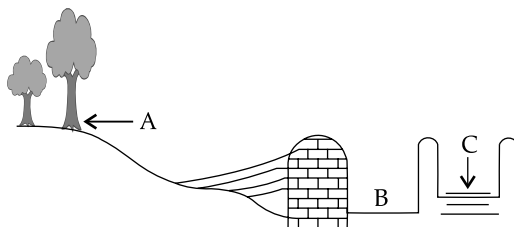
1

Ans.

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

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

The statement which defines the system and its parts is



- (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 = Khadin, 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 1

Ans. 12 a) This is an ideal setting of the khadin system and A = catchment area; B = saline area & C = shallow dugwell.

13. Answer question numbers 13(a) to 13(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  $4.0 \text{ km}^3$  and surface area  $52 \text{ km}^2$ . It is used for irrigation, municipal water supply and the generation of 1000 MW of hydro electricity.

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 ? 1
- (b) Define 1 MW. 1
- (c) Mention two disadvantages of constructing Tehri Dam. 1
- (d) What happens when water from great heights is made to fall on blades of turbine ? 1

Ans. 13 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 in one second.  $1 \text{ MW} = 10^6 \text{ W} = \frac{10^6 \text{ J}}{1 \text{ s}}$

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. Questions numbers 14(a) to 14(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	0.4 – 2.34 mU/L	< 0.4 mU/L
30 – 49 years	0.4 – 4.0 mU/L	< 0.4 mU/L
50 – 79 years	0.46 – 4.68 mU/L	< 0.46 m U/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 States have some kind of thyroid problem compared to 3% of men. Despite claims that high TSH increases your risk for heart disease, a 2013 study found no link between high TSH and 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 year old woman has TSH level 6.03 mU/L. What change should she bring in her diet to control this level ? 1
- (b) When do women face a greater risk of abnormal TSH level ? 1
- (c) State the consequence of low TSH level. 1
- (d) Name the mineral that is responsible for synthesis of hormone secreted by thyroid gland. 1

Ans.

14 a) She should eat more fruits and vegetables and ~~also~~ <sup>reduce</sup> 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 thyroid gland).

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

## SECTION - B

15. Identify the type of each of the following reactions.  
Also write balanced chemical equation for each reaction.

(i) A reaction in which the reaction mixture becomes warm.

(ii) A reaction in which an insoluble substance is formed. 3

Ans.

15 i) Exothermic reaction  

$$\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{heat}$$
 quick lime                          slaked lime

ii) Precipitation reaction (double displacement reaction)  

$$\text{Pb(NO}_3)_2(\text{aq}) + 2\text{KI}(\text{aq}) \rightarrow \text{PbI}_2(\text{s}) + 2\text{KNO}_3(\text{aq})$$
 yellow precipitate

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

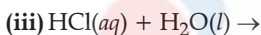
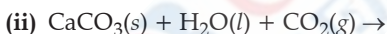
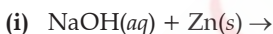
Category	Name of the element	Atomic Mass
A	Li	7
	Na	23
	K	39
B	N	14
	P	31
	As	74
C	B	10.8
	Al	27
	Ga	69.7

- (i) From the given three categories A, B and C, pick the one which forms Dobereiner's Triads.  
(ii) Why did Mendeleev place elements of category A, B and C in three different groups?  
(iii) Is Newland's law of octaves applicable to all the three categories? Give reason to justify your answer. 3

Ans.

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 eighth element does not show property similar to 1<sup>st</sup> one in this case.

17. Complete and balance the following chemical equations :

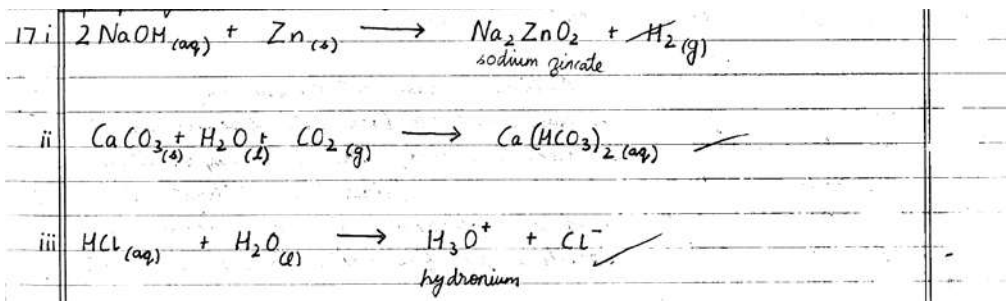


OR

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. 3

Ans.



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18. (a) State with reason the consequence of decrease in number of carnivores in an ecosystem.  
 (b) In a food chain, state the trophic level at which the concentration of harmful chemicals is maximum. Why is it so ?

3

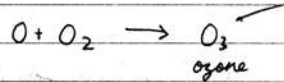
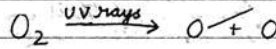
OR

How is ozone layer formed ? State its importance to all life forms on earth ? Why the amount of ozone in the atmosphere dropped sharply in the 1980s ?

3

Ans.

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. ( $O_3$ )



Ozone protects all organisms from the harmful ultraviolet radiation from the sun. This radiations is highly damaging to organisms and can cause skin cancer.  $O_3$  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) 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.

3

Ans.

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 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.

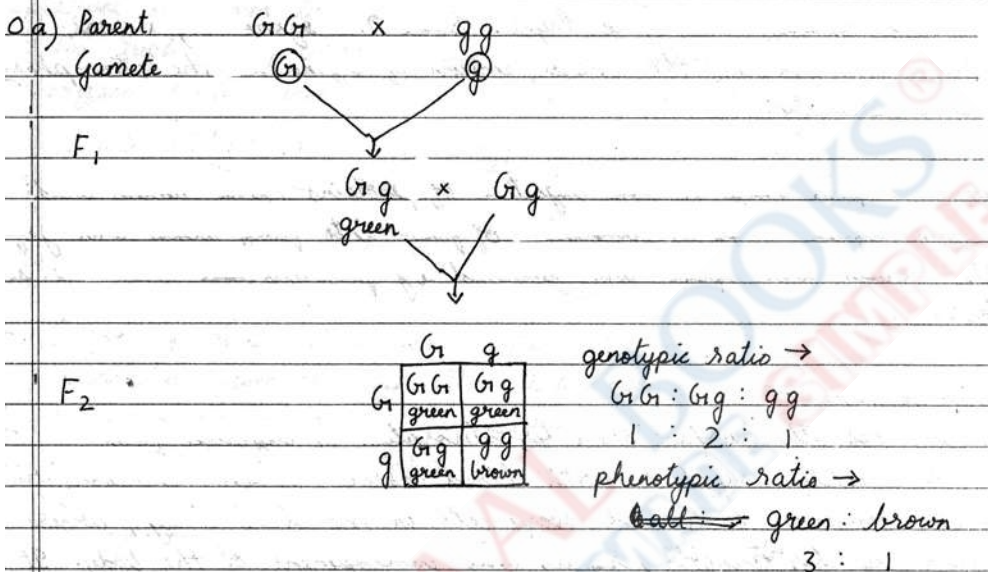
(a) List your observations regarding

- (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 ?

3

Ans.



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  $G_1 G_1$  and  $G_1 g$  = 1 : 2 ✓

b) Based on the findings, 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) Classify the following as homologous or analogous pairs :

- (i) Broccoli and Cabbage
- (ii) Ginger and Raddish
- (iii) Fore limbs of birds and lizard
- (iv) Wings of a bat and Wings of a bird

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

3



Ans.

- 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 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. ✓

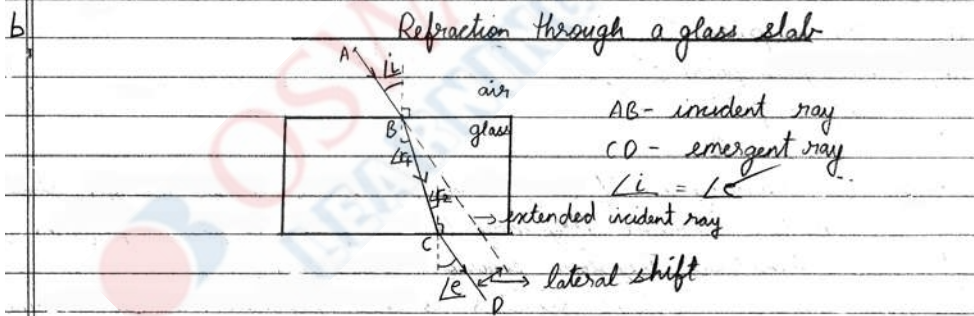
Thus basic structural design is main feature to classify organs as homologous or analogous.

22. (a) State Snell's law of refraction of light.

(b) When a ray of light travelling in air enters obliquely into a glass slab, it is observed that the light ray emerges parallel to the incident ray but it is shifted sideways slightly. Draw a labelled ray diagram to illustrate it. 3

Ans.

a) Snell's law of refraction states that the ~~ratio~~ ratio of sine of angle of incidence to ~~sin~~ sine of angle of refraction is a constant ~~called refraction~~ 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.



23. (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.

3

Ans.

- a) i) bifocal & bifocal lenses are used  
 ii) A bifocal lens consists of a concave lens at the top to help in distant vision and a convex lens at the bottom to help in near vision. A ~~for~~ bifocal lens consists of both a concave and convex lens.

b)  $P = +3D$

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

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

To correct near vision she needs a lens of focal length  $33.33 \text{ cm}$  (convex lens)

$$P = -3D$$

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

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

To correct distant vision, she needs a lens of focal length  $-33.33 \text{ cm}$  (concave lens).

24. 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.

3

Ans.

i) Magnetic field lines are close together when ~~the~~ 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.

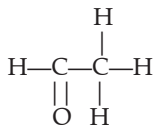
ii) When current is passed through a solenoid, it gains a magnetic field. One end of the solenoid acts as the north pole while the other behaves like the south pole. Thus when freely suspended, it behaves like a freely suspended magnet and points in north-south direction.

iii) A fuse is a protective device which melts when current above a specified value passes through it and hence breaks the ~~see~~ 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

25. (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.



Ans.

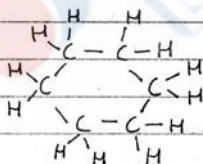
Soaps	Detergents
→ Composition - Sodium or potassium salts of long chain carboxylic acids.	Sodium salts of sulphonic acids or ammonium salts with chloride or bromide ends.
→ Action in hard water • React with $\text{Ca}^{2+}$ and $\text{Mg}^{2+}$ ions in hard water to form white sticky precipitate called scum. • less lather formed • not effective in hard water	• The charged particles do not react with $\text{Ca}^{2+}$ and $\text{Mg}^{2+}$ ions in hard water, so no scum is formed. • same lather formed as in normal water • effective even in hard water.

b Ethanol reacts with sodium metal to form <sup>sodium ethoxide</sup> ~~a metal salt~~ and hydrogen



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

c Cyclohexane -  $\text{C}_6\text{H}_{12}$



d The compound is ethanal.

5

26. A metal 'M' is stored under kerosene. It vigorously catches fire, if a small piece of this metal is kept open in air. Dissolution of this metal in water releases great amount of energy and the metal catches fire. The solution so formed turns red litmus blue.
- (a) Name the metal 'M'  
 (b) Write formula of the compound formed when this metal is exposed to air.  
 (c) Why is metal 'M' stored under kerosene?  
 (d) If oxide of this metal is treated with hydrochloric acid, what would be the products?

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(e) Write balanced equations for :

- (i) Reaction of 'M' with air.
- (ii) Reaction of 'M' with water.
- (iii) Reaction of metal oxide with hydrochloric acid.

5

OR

(a) Write electron dot structures of Ca (At. No. 20) and O (At. No. 8).

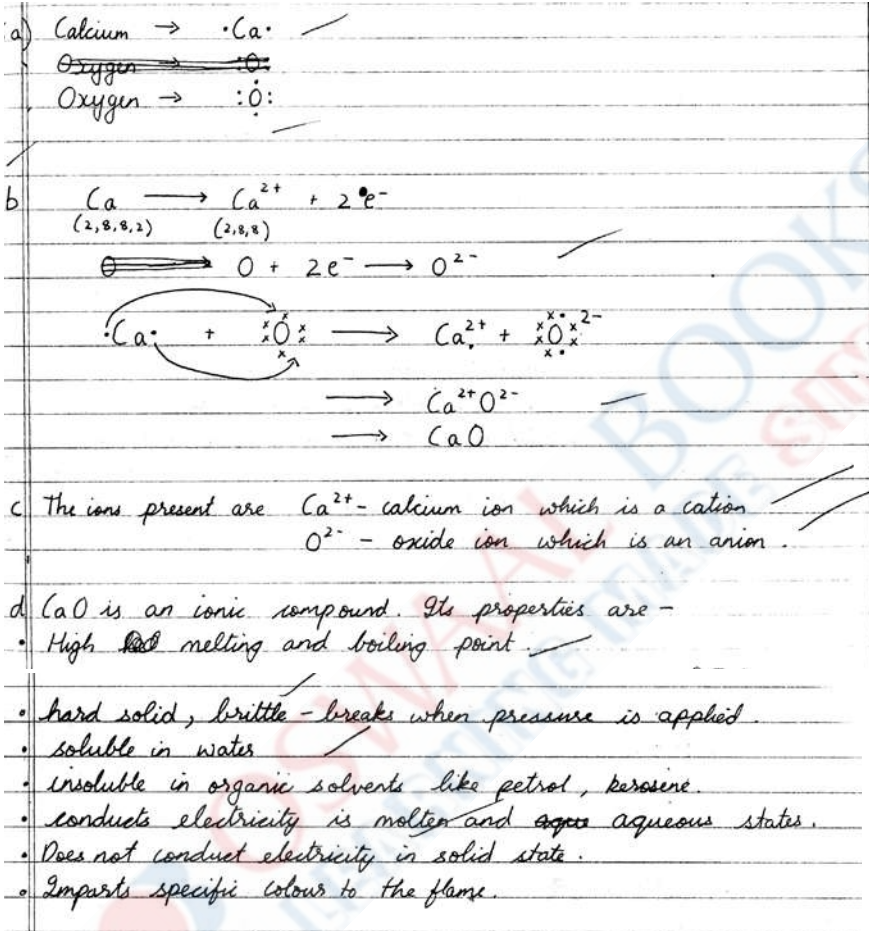
(b) Show the formation of calcium oxide by transfer of electrons.

(c) Name the ions present in this compound.

(d) List four important characteristics of this compound.

5

Ans.



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 develop a leak ?

5

Ans.

a) • 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) Suggest any two categories of contraceptive methods to control the size of human population which is essential for the prosperity of a country. Also explain about each method briefly.
- (b) Name two bacterial and two viral infections each that can get sexually transmitted.
- (c) List two advantages of using condom during sexual act. 5

OR

- (a) Draw a diagram to show spore formation in Rhizopus.
- (b) With the help of an example differentiate between the process of Budding and Fragmentation.
- (c) Why is vegetative propagation practiced for growing some type of plants? 5

- Ans. a) ~~Hormonal~~ Chemical methods - oral pills are taken which alters 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)

29. (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 m 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. 5

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 reason 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 find the position and size of the image. 5

Ans.

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)  $f = 10 \text{ cm}$      $u = -5 \text{ cm}$

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

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

$$= \frac{1}{10} + \frac{2}{10} = \frac{3}{10} \Rightarrow v = \frac{10}{3} \approx 3.33 \text{ cm}$$

$\Rightarrow v = -10 \text{ cm}$   
 $\Rightarrow$  Image is formed at the focus on the same side of object (behind object)

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

30. (a) An electric bulb is rated at 200 V; 100 W. What is its resistance ?
- (b) Calculate the energy consumed by 3 such bulbs if they glow continuously for 10 hours for complete month of November.
- (c) Calculate the total cost if the rate is ₹ 6.50 per unit.

OR

- (a) What is meant by the statement, "The resistance of a conductor is one ohm" ?
- (b) Define electric power. Write an expression relating electric power, potential difference and resistance.
- (c) How many  $132 \Omega$  resistors in parallel are required to carry 5 A on a 220 V line ? 5

Ans.

a)  $P = 100 \text{ W}$   
 $V = 200 \text{ V}$   
 $P = \frac{V^2}{R}$

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

Resistance of bulb =  $400 \Omega$  //

$$\begin{aligned} \text{b) Energy} &= (P \times t) \times 3 \\ \text{Time, } t &= 10 \times 30 \\ &= 300 \\ \Rightarrow \text{Energy} &= Pt \times 3 \\ &= 100 \times 300 \times 3 \\ &= 900 \times 100 \\ &= 90000 \text{ Whm} \\ &= 90 \text{ kWhm} // \\ \text{c) Total cost} &= \text{No. of units} \times \text{rate} \\ &= 90 \times 6.5 = ₹ 585 // \end{aligned}$$

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