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Time Allowed: 3 hours

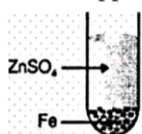
Maximum Marks: 80

General Instructions:

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 objective-type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answers to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Section A

1. What happens in the test tube shown here? [1]

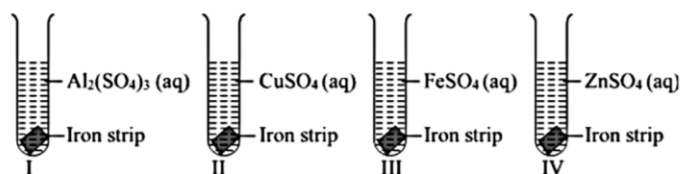


- | | | |
|----------------------------------|---------------------------------|--|
| a) H ₂ O will produce | b) SO ₂ will produce | |
| c) No reaction | d) FeO will produce | |
2. In the electrolysis of water, at which electrodes are hydrogen and oxygen collected? [1]
- | | |
|------------------------------|----------------------------------|
| a) graphite rods, metal rods | b) cathode, anode |
| c) anode, cathode | d) graphite rods, non-metal rods |
3. Which one of the following can be used as an acid–base indicator by a visually impaired student? [1]
- | | |
|-------------|--------------------|
| a) Litmus | b) Vanilla essence |
| c) Turmeric | d) Petunia leaves |
4. Which of the following compounds contain the functional group -OH? [1]
- A. Propane
 B. Propanol
 C. Ethanoic acid

D. Ethanol

- a) All of these
 b) B and D
 c) A and C
 d) B and C

5. A student adds one big iron nail each in four test tubes containing solution of zinc sulphate, aluminium sulphate, copper sulphate and iron sulphate. A reddish brown coating was observed only on the surface of iron nail which was added in the solution of:



- a) Aluminium sulphate
 b) copper sulphate
 c) Iron sulphate
 d) Zinc sulphate
6. Chemical formula of sulphurous acid is: [1]
 a) H_2SO_4
 b) H_2SO_3
 c) SO_3
 d) SO_2
7. Which one of the following is not in a liquid state at $10^{\circ}C$? [1]
 a) H_2O
 b) Glacial acetic acid
 c) C_2H_5OH
 d) Acetone
8. A leaf is boiled in alcohol before using iodine for starch test in order to: [1]
 a) Dissolve starch
 b) Make it react with the iodine
 c) Dissolve chlorophyll
 d) Soften the leaf
9. A trait in an organism is influenced by [1]
 a) Both maternal & Paternal DNA
 b) Paternal DNA only
 c) Neither maternal nor paternal DNA.
 d) Maternal DNA only
10. To perform an experiment to identify the different parts of an embryo of a dicot seed, first of all you require a [1]
 dicot seed. Select dicot seeds from the following group.
 Wheat, gram, maize, pea, barley, ground-nut.
 a) Gram, maize and ground-nut
 b) Wheat, gram and pea
 c) Gram, pea and ground-nut
 d) Maize, pea and barley
11. A cross between hybrid and a parent is known as [1]
 a) Back cross
 b) Test cross
 c) Monohybrid cross
 d) Reciprocal cross
12. To prepare a good temporary mount of the petunia leaf peel showing many stomata, the student has to get the [1]
 peel from the
 a) lower surface of the leaf
 b) tip of the leaf

- c) point of attachment of the leaf to its petiole. d) upper surface of the leaf
13. Strength of the magnetic field at a point in the space surrounding the magnet is measured by: [1]
 a) Thickness of the magnet b) Length of the magnet
 c) Resistance of it d) Number of lines crossing a given point
14. The heat produced by passing an electric current through a fixed resistor is proportional to the square of: [1]
 a) time for which current is passed b) magnitude of resistance of the resistor
 c) temperature of the resistor d) magnitude of current
15. The function of an ecosystem involves: [1]
 a) Energy flow and nutrient movement b) Energy flow only
 c) Nutrient flow only d) None of these
16. The percentage of solar radiation absorbed by all the green plants for the process of photosynthesis is about: [1]
 a) 10% b) 8%
 c) 5% d) 1%
17. **Assertion (A):** Copper vessels get covered with green coating in rainy season. [1]
Reason (R): It is because of the formation of copper carbonate.
 a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
 c) A is true but R is false. d) A is false but R is true.
18. **Assertion (A):** Clones of offspring of an organism formed an asexual reproduction. [1]
Reason (R): Clones have exact copies of DNA as their parent.
 a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
 c) A is true but R is false. d) A is false but R is true.
19. **Assertion (A):** When two long parallel wires, hanging freely are connected in series to a battery, they come closer to each other. [1]
Reason (R): Wires carrying current in opposite direction repel each other.
 a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
 c) A is true but R is false. d) A is false but R is true.
20. **Assertion (A):** The burning of substances at higher temperature to form ash is called incineration. [1]
Reason (R): Incineration greatly reduces the volume of waste.
 a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.
 c) A is true but R is false. d) A is false but R is true.

Section B

21. Which of the following hydrocarbons undergo addition reactions: [2]
 C_2H_6 , C_3H_8 , C_3H_6 , C_2H_2 and CH_4 .

22. If a woman is using a copper-T, will it help her in protecting sexually transmitted diseases. [2]
 23. Why before carrying out the test for the presence of starch in a leaf on exposure to sunlight, the leaf is put in alcohol contained in a beaker and boiled over a water bath? [2]

OR

What is lymph?

24. A concave mirror produces three times magnified real image of an object placed at 10 cm in front of it. Where is the image located? [2]
 25. What is the environment significance of the increasing Antarctica ozone hole? [2]

OR

Why are crop fields known as artificial ecosystem?

26. Draw a neat diagram to show refraction of a light ray through a triangular glass prism. Mark angle of incidence, angle of emergence, incident ray, refracted ray, emergent ray and the angle of deviation. [2]

Section C

27. State three reasons for the following facts: [3]
 i. Sulphur is a non-metal.
 ii. Magnesium is a metal.

One of the reasons must be supported with a chemical equation.

28. i. Predict the reaction, if any, between [3]
 a. zinc and silver nitrate solution,
 b. magnesium and iron (II) chloride solution,
 c. copper and magnesium sulphate solution.

Write the equations, with its physical form symbols, for the reaction.

- ii. A lump of element X can be cut by a knife. During its reaction with water, X floats and melts. What is X? Explain.

OR

How will you get metal from concentrated ore?

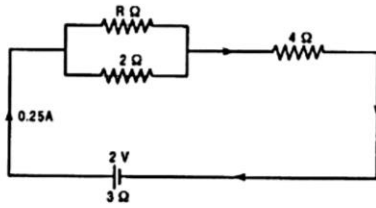
29. a. Define excretion. [3]
 b. Name the basic filtration unit present in the kidney.
 c. Draw excretory system in human beings and label the following organs of excretory system which perform following functions;
 i. form urine.
 ii. is a long tube which collects urine from kidney.
 iii. store urine until it is passed out.

30. Two plants, A with white flowers and B with red flowers were crossed. The F_1 progeny shows all red flowers and F_2 has three red and one white. Categorise the trait as dominant and recessive. [3]

31. Sudha finds out that the sharp image of window pane of her science laboratory is formed at a distance of 15 cm from the lens. She now tries to focus the building visible of her outside the window instead of the window pane without disturbing the lens. In which direction will she move the screen to obtain a sharp image of the building? What is the approximate focal length of this lens? [3]

32. The following circuit diagram shows three resistors 2Ω , 4Ω , $R\Omega$ connected to a battery of e.m.f. 2V and internal resistance 3Ω . A main current of 0.25 A flows through the circuit. [3]

- a. What is the P.D. across $4\ \Omega$ resistor.
 b. Calculate P.D. across the internal resistance of the cell.



33. i. Several electric bulbs designed to be used on a 220V electric supply line are rated 10W. How many lamps can be connected in parallel with each other across the two wires of 220V line if the maximum allowable current is 5A? [3]
 ii. A heater coil connected to 200 V has a resistance of $80\ \Omega$. If the heater is plugged in for the time t such that 1 kg of water at 20°C attains a temperature of 60°C . Find the power of the heater and the heat absorbed by water.

Section D

34. Discuss the formation of covalent bonds in molecules of: [5]
 i. Methane
 ii. Carbon tetrachloride
 iii. Water

OR

What is the difference between the chemical composition of soaps and detergents? State in brief the action of soaps in removing an oily spot from a shirt. Why are soaps not considered suitable for washing where water is hard?

35. Draw a well labeled diagram of female reproductive system and mention its parts. [5]

OR

What are hormones? State their role in the working of the human body. Or Define 'Hormone'. What are the general functions of 'hormones'?

36. Differentiate between a concave mirror and a convex mirror. [5]

OR

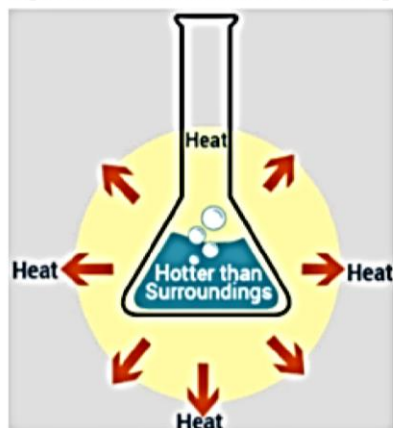
An object 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram and find the position, size and the nature of the image formed.

Section E

37. **Read the text carefully and answer the questions:** [4]

The dissolving of an acid or a base in water is a highly exothermic reaction. Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating. Look out for the warning

sign on the can of concentrated sulphuric acid and on the bottle of sodium hydroxide pellets.



- (i) What is the exothermic reaction?
- (ii) Write an example of an exothermic reaction.

OR

How will you obtain sulphuric acid from an acidic oxide?

38. **Read the text carefully and answer the questions:**

[4]

You must have noticed many dramatic changes in your appearance as well as that of your friends as you approached 10-12 years of age. These changes associated with puberty are because of the secretion of testosterone in males and oestrogen in females. Do you know anyone in your family or friends who has been advised by the doctor to take less sugar in their diet because they are suffering from diabetes? As a treatment, they might be taking injections of insulin. This is a hormone that is produced by the pancreas.

- (i) Why is pancreas a dual gland?
- (ii) Name the hormone which is secreted by males and females during adolescence.
- (iii) What happens if Insulin is not secreted in the proper amount?

OR

From which cells of pancreatic islets insulin and glucagon hormone are secreted?

39. **Read the text carefully and answer the questions:**

[4]

A student fixes a sheet of white paper on a drawing board using some adhesive materials. She places a bar magnet in the centre of it and sprinkles some iron filings uniformly around the bar magnet using a salt sprinkler. On tapping the board gently, she observes that the iron filings have arranged themselves in a particular pattern.

- (i) What does this pattern of iron filings demonstrate?
- (ii) Draw a diagram to show this pattern of iron filings.
- (iii) How is the direction of the magnetic field at a point determined using the field lines? Why do two magnetic field lines not cross each other?

OR

How are the magnetic field lines of a bar magnet drawn using a small compass needle? Draw one magnetic field line each on both sides of the magnet.

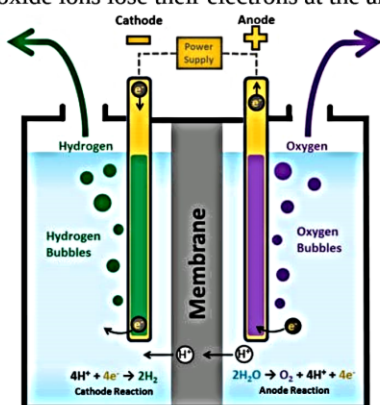
Section A

1. (c) No reaction

Explanation: No reaction takes place because Fe is less reactive than Zn
 $\text{Fe} + \text{ZnSO}_4 \rightarrow \text{No reaction}$

2. (b) cathode, anode

Explanation: According to electrolysis reaction, H^+ ions pick up electrons from the cathode and get reduced to H_2 gas, while oxide ions lose their electrons at the anode and get oxidized to oxygen gas.



3. (b) Vanilla essence

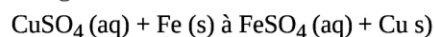
Explanation: An acid-base indicator shows a colour change from red to blue or blue to red which is not recognisable by a visually impaired student. To detect this change, the olfactory indicator is required which gives a particular odour during this colour change. So vanilla essence is used because of its fruity smell.

4. (b) B and D

Explanation: Ethanol and propanol are alcohols and contain the functional group -OH. Ethanol is $\text{C}_2\text{H}_5\text{OH}$ and propanol is $\text{C}_3\text{H}_7\text{OH}$. Ethanoic acid contains the carboxylic group (-COOH).

5. (b) copper sulphate

Explanation: The copper sulphate solution will turn green due to the formation of iron sulphate. A reddish brown coating of copper is formed on the nail. Iron is less reactive than aluminium and zinc. It is however, more reactive than copper. It displaces copper from its solution (displacement reaction). The less reactive copper comes out of the solution and more reactive iron goes into the solution.



6. (b) H_2SO_3

Explanation: H_2SO_3

7. (b) Glacial acetic acid

Explanation: The freezing point of pure ethanoic acid is 16.6°C (61.9°F). The freezing point of pure water is 0°C . The freezing point of pure ethyl alcohol ($\text{C}_2\text{H}_5\text{OH}$) is -114.1°C . The freezing point of pure acetone is -95°C . When ethanoic acid

(acetic acid) is cooled below 10°C , it freezes to form a colourless, ice-like solid. The solid looks like a glacier and hence pure ethanoic acid are called glacial ethanoic acid (or glacial acetic acid).

8.
(c) Dissolve chlorophyll
Explanation: Dissolve chlorophyll
9. (a) Both maternal & Paternal DNA
Explanation: As during fertilisation, sperm only gives nucleus, but ova gives nucleus as well as cytoplasm. Therefore, the mitochondrial DNA and other cytoplasmic factors are inherited directly from mother. there are some traits which are exclusively linked with Y- chromosome and they are inherited by the male child directly from father.
10.
(c) Gram, pea and ground-nut
Explanation: Gram, pea and ground-nut
11. (a) Back cross
Explanation: Backcrossing is a crossing of a hybrid with one of its parents or an individual genetically similar to its parent, in order to achieve offspring with a genetic identity which is closer to that of the parent. It is used in horticulture, animal breeding and in production of gene knockout organisms.
12. (a) lower surface of the leaf
Explanation: Stomata are mainly present on the lower surface of the leaf.
13.
(d) Number of lines crossing a given point
Explanation: Number of lines crossing a given point
14.
(d) magnitude of current
Explanation: The heat produced by passing an electric current through a fixed resistor is proportional to the square of the magnitude of the current.
15. (a) Energy flow and nutrient movement
Explanation: Different materials in an ecosystem are cycled in separate biogeochemical cycles. Essential nutrients like nitrogen, carbon, oxygen, and water are changed from one form to another in these biogeochemical cycles. Producers in an ecosystem fix up the solar energy and make it available for the next trophic levels.
16.
(d) 1%
Explanation:
The percentage of solar radiation absorbed by all the green plants for the process of photosynthesis is about one percent. The green plants (producers) use this solar energy for the process of photosynthesis, convert it into food energy and make the energy available to the rest of the ecosystem.
17. (a) Both A and R are true and R is the correct explanation of A.
Explanation: Copper vessel is covered with a green coating in the rainy season due to the attack of oxygen, carbon dioxide, and water vapors of the air on copper forming green-coloured basic copper carbonate. Thus both assertion and reason are true, and the reason is the correct explanation of the assertion.
18.
(b) Both A and R are true but R is not the correct explanation of A.
Explanation: Both A and R are true but R is not the correct explanation of A.
19.
(b) Both A and R are true but R is not the correct explanation of A.
Explanation: The wires are parallel to each other but the direction of current in it is in same direction so they attract each other. If the current in the wire is in opposite direction then wires repel each other.
20.
(b) Both A and R are true but R is not the correct explanation of A.
Explanation: Both A and R are true but R is not the correct explanation of A.

Section B

21. Unsaturated hydrocarbons like alkenes and alkynes undergo addition reactions and their general formula are C_nH_{2n} and C_nH_{2n-2} respectively.
 So, C_3H_6 and C_2H_2 undergo addition reactions.
22. Copper-T is a contraceptive method which prevents implantation of the zygote inside the uterus. It cannot prevent a woman from sexually transmitted diseases (STDs). STDs are transmitted by contact which cannot be prevented by copper-T.
23. The leaf is treated with alcohol so that it loses its green colour (chlorophyll pigment) and blue-black colour is easily visible (in presence of starch) after treatment with iodine.

OR

Lymph is the plasma and formed elements that have leaked out of the capillaries into extracellular environment. It carries food and wastes to the body cells outside the circulatory system. Lymph is formed from the fluid which leaks from blood capillaries and goes to the intercellular spaces in the tissues. This fluid is collected through lymph vessels and finally returns to the blood capillaries. Lymph also plays an important role in the immune system.

24. $u = -10$ cm. [u is always negative]

$$v = ?; m = -2 \text{ [Real image]}$$

$$m = \frac{-v}{u} \text{ or } -3 = \frac{v}{-10}$$

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

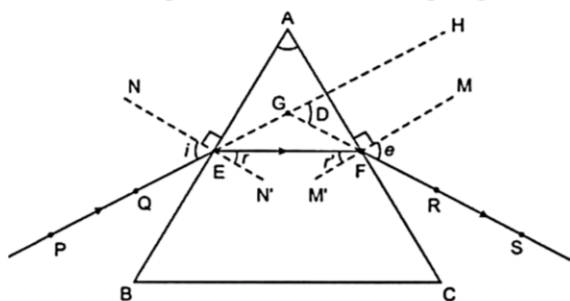
Image will be formed at 30 cm from the mirror on the side of the object.

25. In humans, the increased UV radiation increases the incidence of cataract and skin cancer (including melanoma) and diminishes the functioning of immune system.

OR

Artificial ecosystems are those ecosystems which are modified and managed by human beings. Crop fields are man-made. Here plants do not grow naturally rather most of the plants are grown by humans according to the season, type of soil, etc. Crop fields are not like wild forest area, which is left to the care of nature and can sustain itself. In crop fields, the land is managed, the soil is prepared for sowing seeds, then irrigated and further progress is also kept under observation for getting a good yield. This is why crop fields are known as an artificial ecosystem.

26. The labelled diagram has been shown in figure given below, in which



- PE → Incident ray
 $\angle i$ → Angle of incidence
 EF → Refracted ray
 $\angle r$ → Angle of refraction
 FS → Emergent ray
 $\angle e$ → Angle of emergence
 $\angle A$ → Angle of the prism
 $\angle D$ → Angle of deviation

Section C

27. i. Sulphur is a non-metal because of the following reason:
- It is a poor conductor of electricity.
 - Sulphur is neither malleable nor ductile.
 - Sulphur forms acidic oxide.
 $S + O_2 \rightarrow SO_2$
 $SO_2 + H_2O \rightarrow H_2SO_4$
- ii. Magnesium is metal because of the following reason.
- It is a good conductor of electricity.

- b. Magnesium is malleable nor ductile.
 c. It forms basic oxides
 $2\text{Mg} + \text{O}_2 \longrightarrow 2\text{MgO}$

28. i. a. Zinc is more reactive than silver. It will displace silver from silver nitrate solution and will form zinc nitrate in the solution.
 $\text{Zn(s)} + 2\text{AgNO}_3(\text{aq}) \rightarrow \text{Zn(NO}_3)_2(\text{aq}) + 2\text{Ag(s)}$
 b. Magnesium is more reactive than iron. It will displace iron from iron (II) chloride solution and will form magnesium chloride in the solution.
 $\text{Mg(s)} + \text{FeCl}_2(\text{aq}) \rightarrow \text{MgCl}_2(\text{aq}) + \text{Fe(s)}$
 c. Copper is less reactive than magnesium. It will not displace magnesium from magnesium sulphate solution and, hence, no reaction will take place.
 $\text{Cu(s)} + \text{MgSO}_4(\text{aq}) \rightarrow \text{No reaction}$
- ii. X is potassium (K). Potassium is a soft metal that's why it can be cut with a knife and it is lighter than water that's why it floats on the surface of water and the heat produced melts the potassium.

OR

Extraction of the metal from the concentrated ore. The metal is extracted from the concentrated ore by the following steps:

(i) Conversion of the concentrated ore into its oxide. This is usually done by calcination and roasting process. The method depends upon the nature of the ore. A carbonate ore is converted into oxide by calcination while a sulphide ore is converted into oxide by roasting.

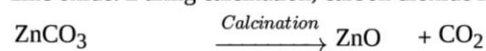
(ii) Conversion of oxide to metal by reduction process.

(i) Conversion of ore into metal oxide : It can be done by two methods

(a) Calcination : It is the process of heating the concentrated ore in the absence of air. The calcination process is used to removed volatile impurities, water from the hydrated ores and to convert carbonate ores into metal oxide.

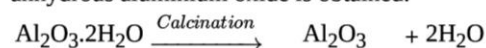
For example :

(i) Zinc occurs as zinc carbonate in calamine (ZnCO_3). The ore is calcinated (heated strongly) in the absence of air to convert it to zinc oxide. During calcination, carbon dioxide is expelled.



Zinc carbonate (Zinc Oxide)
 (Calamine ore)

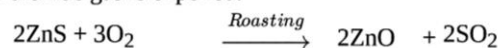
(ii) Aluminium occurs as $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ in its bauxite ore. When the bauxite ore is calcined, water vapours are expelled and anhydrous aluminium oxide is obtained.



Bauxite Ore (Aluminium Oxide)

b) Roasting : It is the process of heating the concentrated ore strongly in the presence of excess air. This process is used for converting sulphide ores to metal oxide.

For example, zinc occurs as sulphide in zinc blende (ZnS). It is strongly heated in excess of air when it forms zinc oxide and sulphur dioxide gas is expelled.

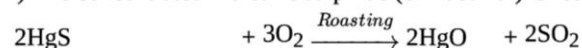


Zinc sulphide (Zinc blende ore) (Zinc Oxide)

ii) Conversion of metal oxide to metal : The metal oxide formed after calcination or roasting is converted into metal by reduction. Some of the methods commonly used for the reduction of metal oxides to metals are discussed below:

I) Reduction by heating in air : Metals low in the reactivity series can be obtained from their oxides by heating in air. For example, mercury is obtained from cinnabar (HgS) ore by this method. The method involves the following steps:

i) The concentrated mercuric sulphide (cinnabar ore) is roasted in air when mercuric oxide is formed.



Mercuric sulphide (Cinnabar ore) (Mercuric oxide)



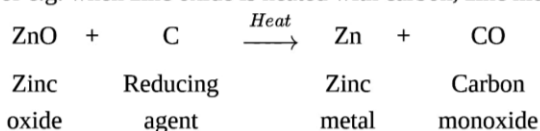
Mercuric oxide Mercuric metal

ii) Mercuric oxide is heated to about 300°C and it decomposes to give mercury metal.

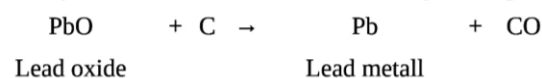
II) Chemical reduction : The metal oxides from calcination or roasting processes are reduced to free metal by using chemical agents like carbon, aluminium, sodium or calcium.

(a) Reduction with carbon : The oxides of moderately reactive metals like zinc, copper, nickel, tin, lead etc. can be reduced by using carbon as reducing agent. In this process, the metal oxide is mixed with coke and heated in a furnace. Carbon reduces the metal oxide to free metal.

For e.g. when zinc oxide is heated with carbon, zinc metal is produced.



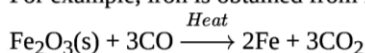
Similarly, lead is obtained from lead oxide by heating with carbon.



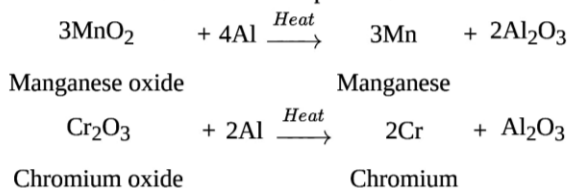
Coke is very commonly used as a reducing agent because it is cheap.

(b) Reduction with carbon monoxide : Metals can be obtained from oxides by reduction with carbon monoxide in the furnace.

For example, iron is obtained from ferric oxide by heating with carbon monoxide.



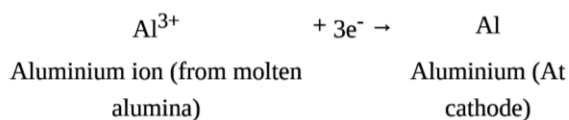
(c) Reduction with aluminium : Certain metal oxides are reduced by aluminium to metals. The method is known as aluminothermy or thermite process. For example, chromium, manganese, titanium, vanadium metals are obtained by the reduction of their oxides with aluminium powder.



Similarly, chromium is obtained by heating chromium oxide with aluminium powder.

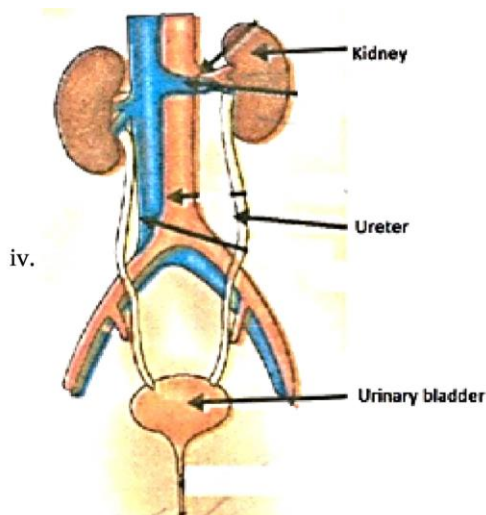
(d) Reduction by electrolysis or electrolytic reduction : The oxides of active metals are commonly extracted by the electrolysis of their fused salts using suitable electrodes. This is also called electrolytic reduction. The process of extraction of metals by electrolysis process is called electrometallurgy.

For e.g., aluminium oxide is very stable and aluminium cannot be prepared by reduction with carbon. It is prepared by the electrolysis of molten alumina (Al₂O₃). In this process pure alumina is dissolved in molten cryolite (Na₃AlF₆) in an iron tank lined with carbon. During electrolysis, the aluminium ions, Al³⁺ are reduced at cathode (by the electrons) to form aluminium.



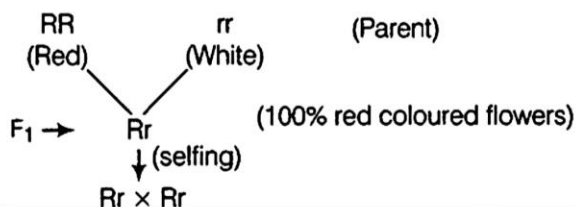
During electrolytic reduction of molten salts, the metals are always produced at the cathode (negative electrode).

29. a. Excretion is the process of removing harmful metabolic waste such as urea, uric acid and salts from our body.
 b. Nephron is the basic filtration unit present in the kidney.
 c. Diagram of Human Excretory System is shown below.
- i. kidney forms urine
 - ii. ureter is a long tube which collects urine from kidney.
 - iii. urinary bladder store urine until it is passed out.



iv.

30. When two plants, A with white flowers and B with red flowers were crossed, In F_1 generation all the plants have red coloured flowers and in F_2 generation the ratio of red : white is 3 : 1. The dominant trait is red colour in flowers. The recessive trait is white colour in flowers.



| Gametes | R | r |
|---------|---------|---------|
| R | RR(red) | Rr(red) |
| r | Rr(red) | rr(red) |

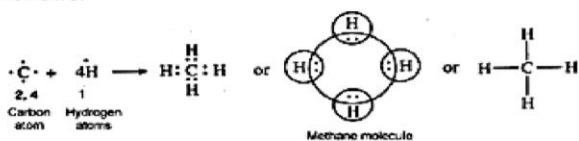
31. Let us assume that the window pane is between F_2 and infinity from this lens and this is a convex lens. We know that when the object is between infinity and F_2 , its inverted and real image is formed between $2F$ and $2F_2$. Now, the distant building is at infinity from the lens. Its image would be formed at $2F$. So, the screen needs to be moved towards the lens in order to get a sharp image. Its approximate focal length is 10 cm (less than image distance in earlier case).

32. Current in the circuit = 0.25 A
 Current through 4Ω wire = 0.25 A
 a. P.D. across $4\Omega = 0.25 \times 4 = 1V$
 b. P.D. across $3\Omega = 0.25 \times 3 = 0.75 V$

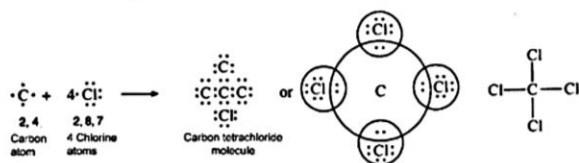
33. i. Let current through each bulb be I.
 $P = VI, 10 = 220 I$
 $I = \frac{1}{22} A$
 Let n such bulbs be connected in series.
 Current through n bulbs = 5A
 $n(\text{current in 1 bulb}) = 5$
 $n \frac{1}{22} = 5$
 $n = 110$
 110 such bulbs can be lighted within allowable limit of 5A.
- ii. \therefore Power of heater, $P = \frac{V^2}{R} = \frac{200 \times 200}{80} = 500W$
 \therefore Heat absorbed by water, $H = mC\theta_R$
 $= 1 \times 4200 \times 40$ [$\therefore \theta_R = 60^\circ - 20^\circ = 40^\circ C$, $C = 4200 J/kg^\circ C$]
 $= 168000 J$
 $= 168kJ$

Section D

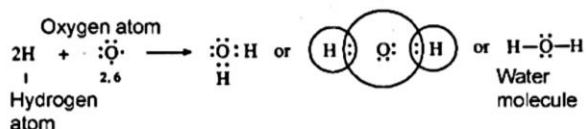
34. i. Covalent bonds in methane (CH_4) molecule: The atomic number of carbon is 6. Its electronic configuration is 2, 4. This means that carbon atom has four valence electrons. These are shared by the electrons of four hydrogen atoms. As a result, the carbon atom gets linked to four hydrogen atoms by four covalent bonds. The formation of methane molecule may be shown as follows:



ii. Covalent bonds in carbon tetrachloride (CCl_4) molecule: The atomic number of carbon is 6. Its electronic configuration is 2, 4. The four electrons present in the valence shell of carbon atom are shared by the unpaired electrons of four chlorine atoms (2, 8, 7). Thus, carbon atom gets linked to four chlorine atoms by four covalent bonds. The formation of carbon tetrachloride molecule may be shown as follows:



iii. Covalent bonds in water (H_2O) molecule: The atomic number of oxygen is 8. Its electronic configuration is 2, 6. This means that oxygen atom has six valence electrons. In order to have eight electrons in its valence shell oxygen atom shares two electrons with the electrons of two hydrogen atoms. Thus, oxygen atom gets linked to hydrogen atoms by two covalent bonds. The formation of water molecule may be shown as follows:



OR

Soaps are sodium or potassium salts of fatty acids having -a COONa group of long-chain carboxylic acids. whereas detergents are sodium or potassium salts of sulphonic acids having - SO_3Na and - SO_4Na groups.

The cleansing action of soap: Soap molecules have two ends one is long hydrocarbon chain hydrophobic i.e, water-repelling and the other is polar water-loving i.e, hydrophilic end.

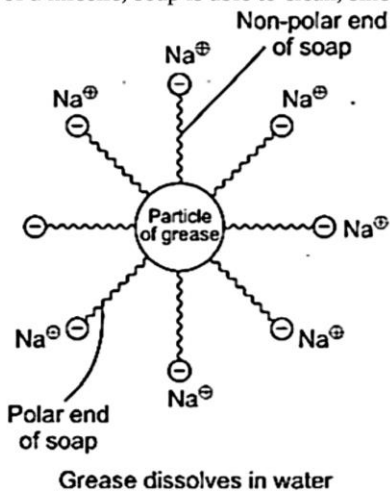


Long Hydrocarbon chain
(Hydrophobic end)
(Water-repellent)

Polar end
(Hydrophilic)
(Water-loving)

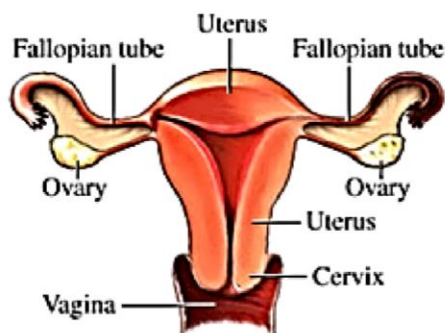
When soap is dissolved in water, the molecules associate together as clusters called micelles in which water molecules, being polar in nature, surround the ions and the hydrocarbon part of the molecule attracts grease, oil, and dirt.

Inside water, clusters of molecules are formed in which the hydrophobic tails are in the interior of the cluster and ionic ends are present on the surface of the cluster. This formation is called micelle formation. To wash away the loosened dirt particles in the form of micelles from the surface of the cloth, it is either scrubbed mechanically or agitated in the washing machine. In the form of a micelle, soap is able to clean, since the oily dirt is being collected in the centre of the micelle.



35. a. A pair of ovaries- ovaries produces ova and female sex hormone. One egg is produced every month by one of the ovaries. Ova are picked up by the funnel shaped fallopian tubes.
 b. Fallopian tubes- There are two fallopian tubes. It carries ova from ovary to the uterus. Fertilization occurs in fallopian tubes.
 c. Uterus- Pear shaped hollow muscular organ. Fertilized ovum remains attached to the uterus wall.
 d. Vagina- It is a narrow muscular tube. Its upper end is connected to the cervix of the uterus and lower end opens outside through an opening. It is a place for copulation.

Female Reproductive System



OR

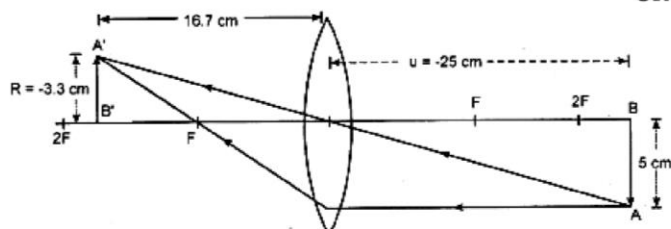
Selye in 1948 defined hormones as "Physiological and organic compounds produced by certain cells (endocrine glands) for the sole purpose of directing the activities of distant parts of the same organism." They are also referred to as "chemical messengers". They have excitatory effects on some organs and inhibitory effects on others.

Functions of hormones:

- 1) Hormones stimulate the tissue activity.
- 2) Hormones regulate growth and reproduction.
- 3) Hormones control metabolism.
- 4) Hormones synthesize, store and utilize substances like glucose.
- 5) Hormones conserve water and minerals.

| 36. Concave Mirror | Convex Mirror |
|---|--|
| A concave mirror is made by silvering the outer surface of a part of a hollow sphere and reflection takes place from the inner surface. | A convex mirror is made by silvering the inner surface of a part of a hollow sphere and reflection takes place from the outer bulging surface. |
| Concave mirrors are converging mirrors. The light rays incident on a concave mirror converges after reflection. | A convex mirror is a diverging mirror. The light rays incident on a convex mirror diverges after reflection. |
| The image formed by it is real as well as virtual depending on the position of the object from the mirror. | The image formed by it is always virtual for all positions of the object in front of the mirror. |

OR



$h = 5 \text{ cm}$; $h' = ?$, $u = -25 \text{ cm}$ [Object distance is always negative]

$v = ?$; $f = +10 \text{ cm}$ [convex lens]

Using $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ or $\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$

$$\frac{1}{v} = \frac{1}{-25} + \frac{1}{10} = \frac{-2 + 5}{50} = \frac{3}{50}$$

$v = 16.7 \text{ cm}$

$m = \frac{h'}{h} = \frac{v}{u}$ or $h' = h \frac{v}{u}$

$$h' = 5 \frac{3}{-25} = \frac{-250}{75} = -3.3 \text{ cm}$$

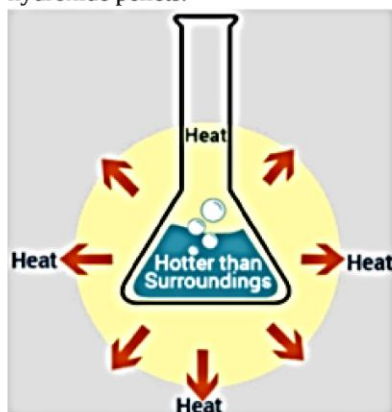
$h' = -3.3 \text{ cm}$

Negative sign shows image is inverted, real, diminished (3.3 cm) and at 16.7 cm on the right side of lens.

Section E

37. Read the text carefully and answer the questions:

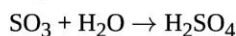
The dissolving of an acid or a base in water is a highly exothermic reaction. Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating. Look out for the warning sign on the can of concentrated sulphuric acid and on the bottle of sodium hydroxide pellets.



- (i) An exothermic reaction is a chemical reaction that releases energy through light or heat.
- (ii) Mixing of acid with water is a highly exothermic reaction.

OR

When sulphur trioxide (acidic oxide) is dissolved in water, an exothermic reaction takes place with the formation of sulphuric acid.



38. Read the text carefully and answer the questions:

You must have noticed many dramatic changes in your appearance as well as that of your friends as you approached 10-12 years of age. These changes associated with puberty are because of the secretion of testosterone in males and oestrogen in females. Do you know anyone in your family or friends who has been advised by the doctor to take less sugar in their diet because they are suffering from diabetes? As a treatment, they might be taking injections of insulin. This is a hormone that is produced by the pancreas.

- (i) Pancreas is a dual gland because it acts as both an endocrine and exocrine gland. As endocrine, it secretes hormones like insulin, glucagon. As an exocrine gland, it releases enzymes like trypsin, lypase, amylase etc.
- (ii) Testosterone in males and oestrogen in females is the hormone that is secreted during adolescence.
- (iii) If Insulin is not secreted in the proper amount then it causes diabetes.

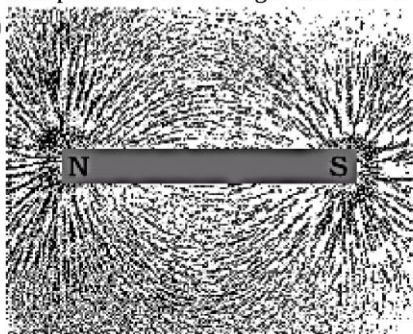
OR

Glucagon and Insulin are secreted from alpha and beta cells of islets of the pancreas respectively.

39. Read the text carefully and answer the questions:

A student fixes a sheet of white paper on a drawing board using some adhesive materials. She places a bar magnet in the centre of it and sprinkles some iron filings uniformly around the bar magnet using a salt sprinkler. On tapping the board gently, she observes that the iron filings have arranged themselves in a particular pattern.

- (i) This pattern of iron fillings demonstrate the magnetic field lines.
- (ii)



- (iii) The direction of a magnetic field at a point is determined by placing a small compass needle. The N - pole of compass indicates the direction of magnetic field at that point.
 Two magnetic field lines do not intersect each other because if there was point of intersection, The compass needle would point towards 2 directions.

OR

