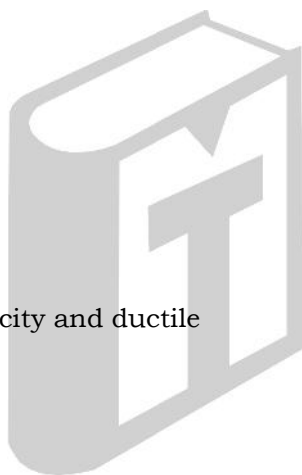


GSEB Batch : 10 th Std. Eng. Medium	MAHESH TUTORIALS SUBJECT : Science & Technology(011) Third Preliminary Exam Model Answer Paper	Date: Marks : 100 Time: 3 Hrs.
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PART - A

1. (a) Arrangement of atoms
2. (b) Friction
3. (a) non-mechanical
4. (d) Diamond
5. (d) Violet
6. (b) Subtractive
7. (b) Less Convergence
8. (b) Negative
9. (b) 10^3
10. (c) A semiconductor
11. (b) Insulator
12. (a) From the N pole towards the S pole of a magnet.
13. (a) DC current
14. (d) Zero
15. (b) 76 yrs
16. (a) East, West
17. (c) 22.5
18. (a) $13^\circ 20'$
19. (d) Detergent solution
20. (a) Acid
21. (c) $[H_3O^+] > 10^{-7} M$
22. (a) Protein
23. (c) Good conductor of electricity and ductile
24. (a) Sulphide
25. (c) Slag
26. (b) 22
27. (c) Neutral
28. (c) (a-3), (b-4), (c-2), (d-1)
29. (d) Not flammable
30. (b) Coal gas
31. (c) Sulphur
32. (d) CNG
33. (b) Aldehyde
34. (a) Acetic acid
35. (a) To remove nail polish
36. (c) Life processes
37. (b) Pure
38. (d) Kidney
39. (d) Phloem
40. (a) Cortex ; Medulla
41. (b) Geotropism
42. (b) Reflex action
43. (d) Hydra
44. (d) reproductive cells does not involve in it.
45. (b) 25%
46. (a) ^{14}C
47. (b) Herbivores
48. (b) Frog
49. (a) 1731
50. (d) Deforestation



PART - B
SECTION - A

Answer the following questions : [2 marks]

1. Important parameter that determines the functioning of the nano material is the surface area (SA) to volume (V) ratio. It is known that the reaction takes place at the surface of a chemical or material.
- ⇒ Greater the surface area for the same volume, greater is the reactivity.
 - ⇒ For nano structured material SA to V ratio, is large, which improves the reactivity drastically. This is the reason for showing different physical properties by the same material at the nano scale.
 - ⇒ The surface area of nano materials is larger as compared to its volume.
 - ⇒ Hence, phenomena like sticking and friction are dominant and are more important at nano scales as compared to larger dimensions. Hence, the laws applicable for larger dimensional materials do not apply for nanostructures.
 - ⇒ The properties like sticking and friction are extremely important at the nano dimensional scales. However, they may not be visible or dominant at the macro or micro level.
 - ⇒ Hence, nanotechnology plays by different rules.

OR

1. Carbon forms complex molecules by bonding with other elements, especially, oxygen, hydrogen, and nitrogen (e.g. nucleic acid, enzymes, proteins, carbohydrates, etc).
- ⇒ It is also a major constituent in the conventional sources of energy.
 - ⇒ Material containing carbon exhibit a wide spectrum of properties due to following reasons:
 - i. Carbon can bond with many different types of atoms including other carbon atoms by forming covalent bonds.
 - ii. Each carbon atom can extend itself to form such covalent bonds with four other atoms at a time. This helps to form long chains of atoms. This characteristic results in varieties of carbon allotropes, namely diamond, graphite, graphene, amorphous and glassy carbon and fullerenes, all showing different properties.
 - iii. Another important property is that it is only carbon which bonds strongly to other carbon atoms and also by sharing different number of electrons. In fact, this strong cohesion is responsible for most stable bio-chemical compounds necessary for life. This is the reason why carbon is considered as a basis for the chemistry of life.

2.

No	Series connection	Parallel connection
1	Current through each resistor is the same.	Current through each resistor is different.
2	Voltage in each resistance is different.	Voltage in each resistance is same.
3	The equivalent resistance of the resistors R_1, R_2, \dots, R_n connected in a series is given as, $R=R_1+R_2+ \dots R_n$.	The equivalent resistance of the resistors R_1, R_2, \dots, R_n connected in a parallel arrangement is given as $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}$
4	The equivalent resistance is greater than each of the resistors connected in series.	The equivalent resistance is lesser than the least value of the resistors in a parallel connection.
5	The total current decreases in the circuit in such an arrangement.	The total current increases in the circuit in such an arrangement.
6	Power loss increases.	Reduces power loss.

3. Cracking means to break large organic molecules and to prepare small molecules.
- ⇒ When alkanes containing more number of carbon atoms is heated at suitable

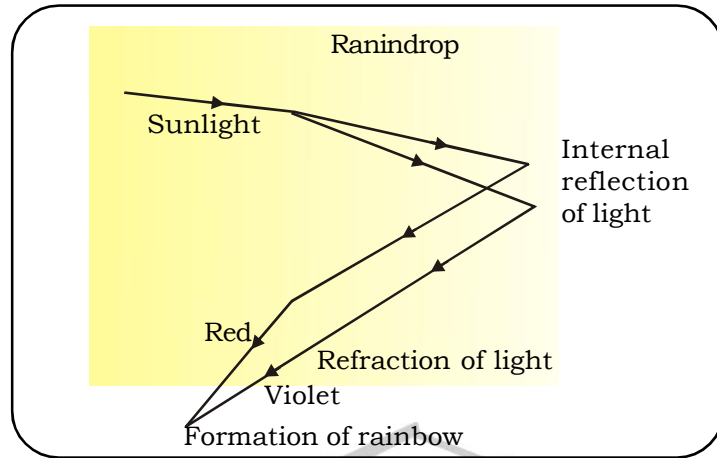
⇒	$\text{CO}_2 + \text{H}_2\text{O} \longrightarrow \text{H}_2\text{CO}_3$ <p style="text-align: center;"> Carbon dioxide Carbonic Acid </p>	1
SECTION - B		
Answer the following questions : [2 marks]		
6.	The deoxygenated blood from various organs passes through superior and inferior vena cava and reaches the right atrium.	1/2
⇒	At the same time, the oxygenated blood from the lungs passes through pulmonary veins and reaches the left atrium.	1/2
⇒	At this time both the atria contract where the deoxygenated blood from the right atrium is poured into the right ventricle and the oxygenated blood from the left atrium is poured into the left ventricle.	1/2
⇒	Now both the ventricles contract and deoxygenated blood from the right ventricle reaches the lungs through pulmonary arteries.	1/2
⇒	Oxygenated blood from the left ventricle is distributed to all parts of the body except lungs through aorta.	1/2
⇒	Since the blood circulates twice through the heart it is called double circulation.	1/2
7.	The nerve cell is the structural and functional unit of nervous system.	1/2
⇒	The nerve cell has 3 components -	1/2
	(a) Cell body	
	(b) Dendrites	
	(c) Axons	
⇒	The cell body has cytoplasm and nucleus.	1/2
⇒	Nerve fibres i.e short & long fibres stretch out from cell body.	
⇒	Dendrites - are the short fibres on the cell body.	
⇒	Axon - are the long fibres on the cell body.	
⇒	Insulating myelin sheath made up of fat & protein protects axons.	
⇒	Messages acquired at the dendrite sets off a chemical reaction creating an electric impulse called nerve impulse.	1/2
⇒	Dendrite pick up message from the receptors pass it to cell body then to axon.	
⇒	Axon pass the message to another nerve cell through synapse.	
⇒	Synapse - is a very small gap present between the two nerve cells.	1/2
8.	The main compounds behind the depletion of ozone layer are:	1/2
	(i) Addition of Cl ⁻ in air	1/2
	(ii) Chloroflouro carbon(CFC)	1/2
	(iii) Freon used in refrigerator and air conditioners.	1/2
9.	Fossils- The impressions of dead plants or animals that lived in the past.	1/2
→	Plants or animals when die are decomposed by micro organisms in the presence of moisture and oxygen.	1/2
→	Due to some environmental conditions bodies do not decompose completely.	1/2
→	Such body parts of the plants or animals become fossils.	1/2
OR		
9.	Homologous organs- have the same internal structure but different functions.	1/2
→	Example bones of forelimb of frog, lizard, bird, etc.	
→	All these organs are similar in their internal structure but perform different types of function.	1/2
→	This indicates that they have evolved from a common ancestral animals which had a same basic internal structure.	1/2
10.	Deforestation has many serious effects-	1/2
→	It induces changes in the regional and global climate.	1/2
→	Due to deforestation the rainfall decreases.	1/2
→	Loss of forest cover causes increase in soil erosion, decrease in the fertility of land, increase in the amount of CO ₂ and temperature.	1/2
→	This leads to green house effects.	1/2

SECTION - C

Answer the following questions : [3 marks]

11. A rainbow is a natural spectrum visible in the sky after rainshower. It is caused by the dispersion of sunlight by tiny water droplets present in the atmosphere.

⇒ A rainbow is always formed in the direction opposite to that of sun. The water droplets act like small prisms. They disperse the incident light first, then reflect it internally and finally refract it again while it comes out of the rain drops as shown in the figure.



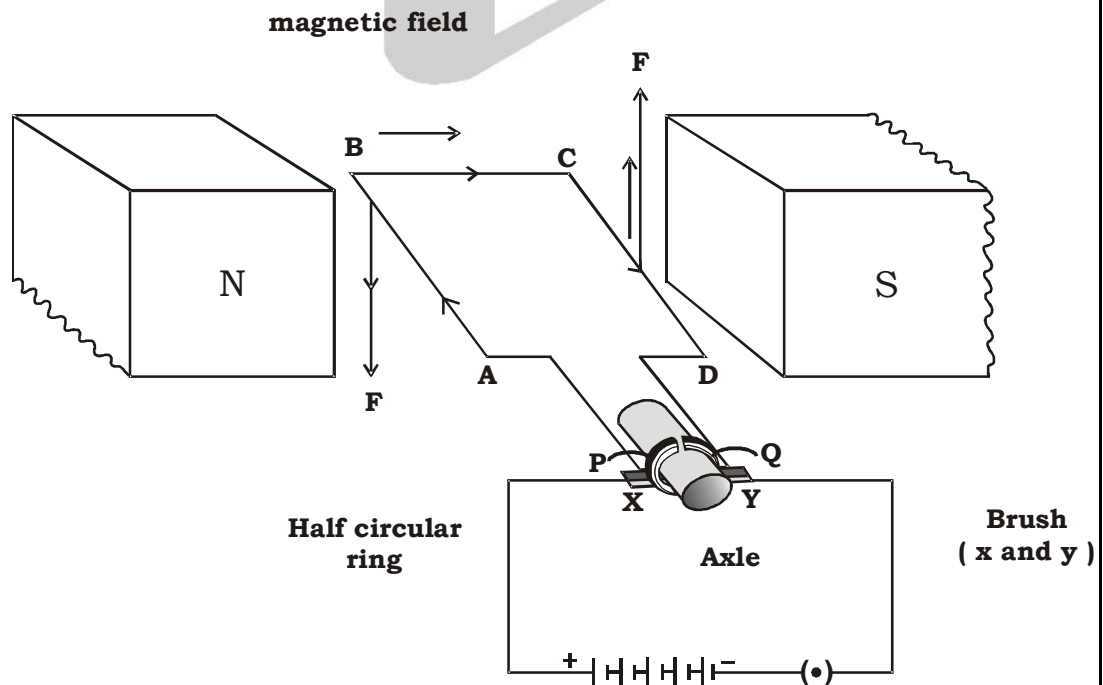
⇒ The different colours of light enter into our eye due to the dispersion and internal reflection of light.

⇒ Looking from lower to higher order, colours from violet towards red is known as primary rainbow.

⇒ Sometime a second rainbow is seen in the sky. The order of colours in this upper rainbow is reverse to the primary rainbow. This second rainbow is called secondary rainbow.

⇒ Rainbow is also seen on a sunny day at a water fall when sun is behind the observer.

12.



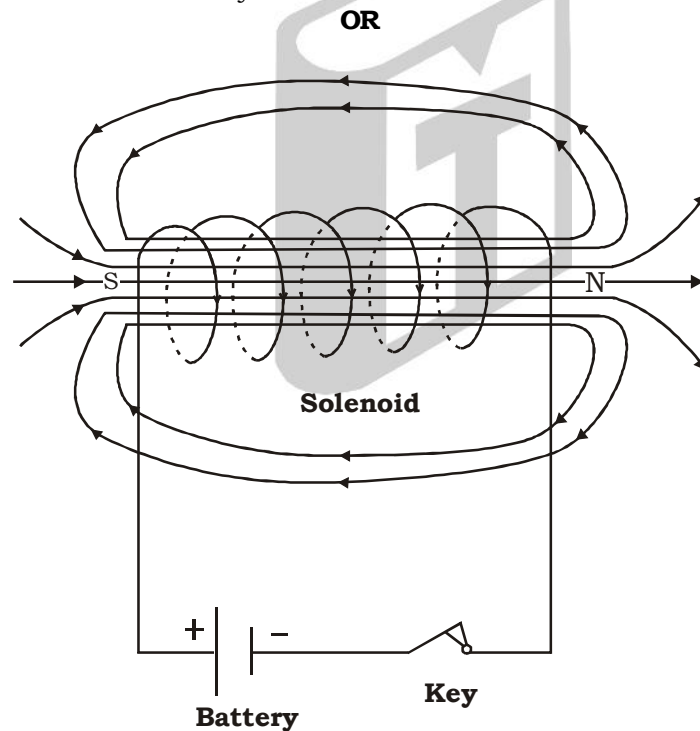
Construction of an electric motor

⇒ An electric motor is a device that converts electrical energy into mechanical energy.

⇒ The construction of an electric motor is as shown in Figure. A loop ABCD of an insulated copper wire is placed in a permanent magnetic field such that AB and CD remain perpendicular to the magnetic field.

- ⇒ The ends of this wire are connected to the two semicircular rings P and Q. The inner part of both the rings is insulated. ½
- ⇒ Both the rings are arranged on an axle such that they can rotate easily on it.
- ⇒ The outer position of the ring is in contact with a stationary brush X and Y. (In actual motor, a loop containing many terms is arranged on axis. This arrangement is called an armature).
- ⇒ The electric current flows through a loop ABCD by connecting a battery between the brushes X and Y. The current flowing through BC and AD is either parallel or antiparallel to magnetic field, so force does not acts on them.
- ⇒ But the currents flowing in wires AB and CD are perpendicular to the magnetic field, hence force act on them. ½
- ⇒ The direction of this force is obtained from Fleming's left hand rule. As shown in Figure, the force on AB acts in the downward direction and the force on CD acts in upward direction. As these two forces are in the mutual opposite directions, the loop ABCD is rotated.
- ⇒ After the completion of half rotation, the ring Q comes in contact with the brush X and the ring P with the brush Y, so that the direction of an electric current gets reversed.
- ⇒ Due to this, the direction of force acting on AB and CD is also reversed. As a result, the loop continues to rotate in the same direction. At the end of one rotation loop comes to the earlier position. ½
- ⇒ Thus, after every half rotation the direction of an electric current in a loop changes and loop rotates continuously.

12.



(b) Magnetic field of a solenoid

- As shown in Figure on passing an electric current through a solenoid, an electric current will flow in the same direction through N turns of a coil. ½
- ⇒ The magnetic field resulting per each turn will add on as the direction of an electric current in each turn will be the same.
 - ⇒ As solenoid has N turns, the magnetic field resulting by it is N times stronger than the magnetic field resulting by each circular coil.
 - ⇒ The magnetic field lines resulting by a solenoid are shown in Figure. ½
 - ⇒ It can be understood by comparing Figure that the magnetic field of a solenoid is just like a magnetic field of a bar magnet.
 - ⇒ Thus, one end of a solenoid behaves like north pole and the other end like a south pole. ½

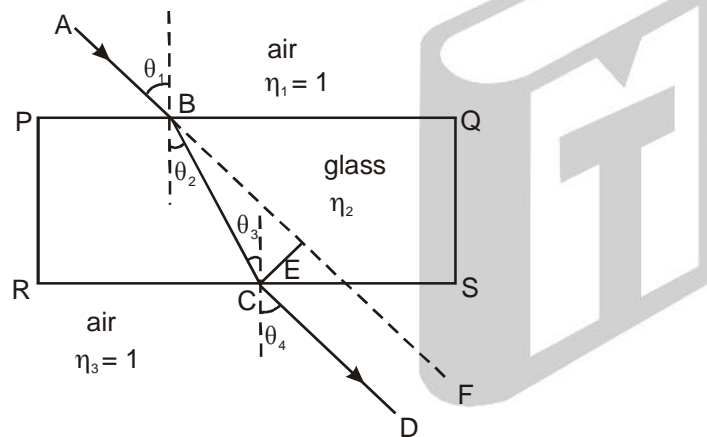
	<p>⇒ In the inner region of a solenoid the field lines are parallel that means the magnetic field is uniform at every point inside the solenoid.</p>	½
13.	<p>In recent times, hydrogen gas is widely used in industries. The production of hydrogen gas can be carried out from natural gas.</p> <p>⇒ The chief component in natural gas is methane. When natural gas mixed with vapour of water is passed on a nickel catalyst at the temperature 1073 K and 30 bar pressure, chemical reaction takes place and a mixture of carbon monoxide and dihydrogen gas is obtained. This gaseous mixture is called water gas.</p> $\text{CH}_{4(g)} + \text{H}_2\text{O}_{(g)} \xrightarrow[1073 \text{ K } 30 \text{ bar}]{\text{Ni}} \text{CO}_{(g)} + 3\text{H}_{2(g)}$ <p>⇒ By reaction of water gas again with vapour of water, more dihydrogen gas is produced and carbon monoxide is removed.</p> $\text{CO}_{(g)} + \text{H}_2\text{O}_{(g)} \rightarrow \text{CO}_{2(g)} + \text{H}_{2(g)}$ <p>⇒ To separate dihydrogen gas from this gaseous mixture, it is passed through water at 30 bar pressure because, carbon dioxide gas dissolves in water as it is soluble in water but dihydrogen gas is insoluble in water and so it can pass through and dihydrogen gas is obtained. This way it can be collected in gas jar.</p>	½ ½ ½ ½ ½
14.	<p>In a test tube, take solution of silver nitrate.</p> <p>⇒ Add solution of NaOH in such a proportion that stable brown black colour precipitates are obtained.</p> <p>⇒ Dissolve these precipitates by adding liquor ammonia. The resulting solution is Tollen's reagent.</p> <p>⇒ In another test tube take aldehyde and add Tollen's reagent to it.</p> <p>⇒ Place this test tube in a beaker containing hot water. Silver metal is separated by reduction of silver ion (Ag⁺) and gets deposited on the inner surface of the test tube which appears as a mirror.</p> <p>⇒ This test is known as silver mirror test.</p> <p style="text-align: center;">OR</p> <p>14. Polyester molecule possesses innumerable ester functional group containing repeating units.</p> <p>⇒ It is formed by combination of two hydroxyl and two carboxylic groups containing substances.</p>	½ ½ ½ ½ ½ ½ ½
	$n\text{HO}-\boxed{}-\text{OH} + n\text{HOOC}-\boxed{}-\text{COOH} \xrightarrow[\Delta]{\text{Polymerisation}} \text{HO}-\left[\boxed{}-\text{COO}-\boxed{} \right]_n-\text{COOH} + n\text{H}_2\text{O}$ <p style="text-align: center;">Compound containing hydroxy group Compound containing carboxylic group</p> <p style="text-align: center;">Polymer</p>	1
	<p>⇒ Where $\boxed{}$ shows hydrocarbon part.</p> <p>⇒ Polyester fibres are mixed with cotton fibres and used in textile industry.</p>	½ ½
15.	<p>The basic difference between asexual and sexual reproduction are :-</p>	

No	Sexual reproduction	Asexual reproduction
1	In this type of reproduction, two separate sex cells fuse to form a fertilized egg (zygote) that develops into a new individual.	In this type of reproduction, a single individual is involved, whose certain body part forms the new individual of the same kind.
2	The organisms involved are either bisexual or the two separate individuals are of opposite sex.	The sex of an organism does not play any role in the reproductive process.
3	The new individual follows law of inheritance and therefore, differs from its parent organisms.	The new organism has all the characters of the parent organism without any change in the heredity characters.
4	With changing environment, sexual reproduction is essential to sustain life.	With changing environment, asexual reproduction is not sufficient to sustain life.

SECTION - D

Answer the following questions : [5 marks]

16.

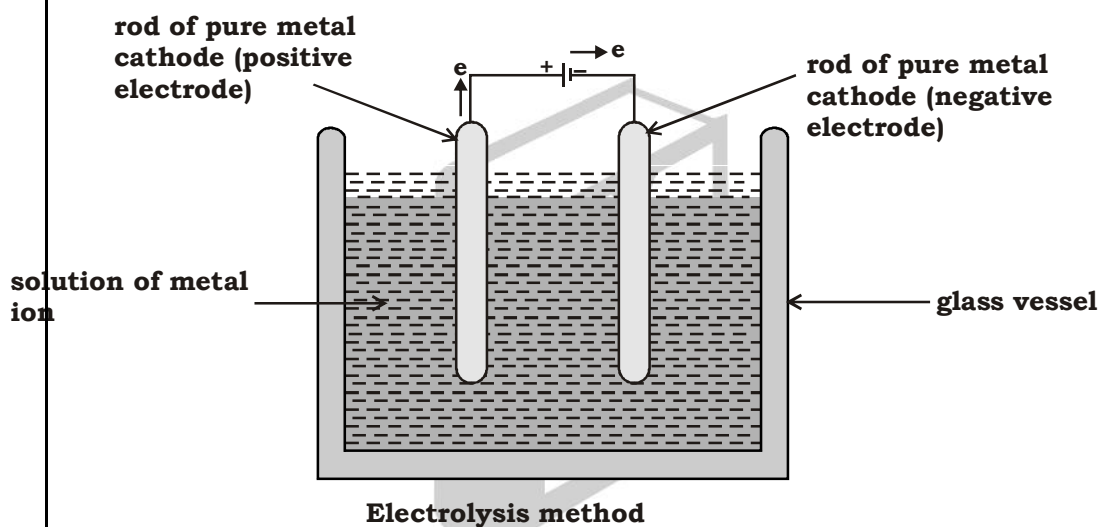
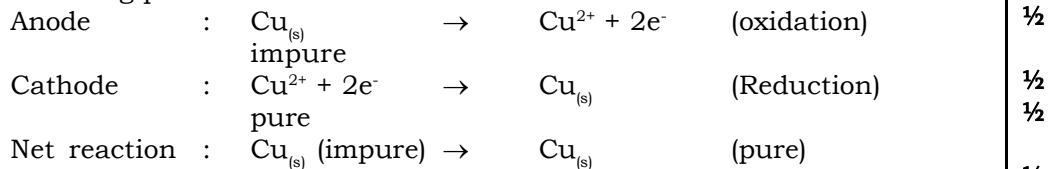


- ⇒ As shown in figure, a ray of light AB is incident at a point B on surface PQ at angle θ_1 . The ray gets refracted near point B and BC is a refracted ray. 1/2
- ⇒ This refracted ray BC is incident at point C on the surface RS of the rectangular slab at an angle θ_3 . Emergent ray CD emerges from rectangular slab after getting refracted in the air medium. 1/2
- ⇒ At the surface PQ, $\eta_1 = 1$ (\because Medium is air)
 - $\eta_1 \sin \theta_1 = \eta_2 \sin \theta_2$
 - $\therefore \sin \theta_1 = \eta_2 \sin \theta_2$ (1) 1/2
- ⇒ For second surface RS parallel to PQ.
 - $\therefore \eta_2 \sin \theta_3 = \eta_3 \sin \theta_4$
 - Here, $\theta_2 = \theta_3$ and $\eta_3 = 1$ for the air medium
 - $\therefore \eta_2 \sin \theta_2 = \sin \theta_4$ (2) 1/2
 - Comparing equation (1) and equation (2),
 - $\sin \theta_1 = \sin \theta_4$
 - $\theta_1 = \theta_4$ (3) 1/2
 - \therefore Angle of incidence = Angle of emergence.
- ⇒ It is clear that direction of emergent ray CD is parallel to the incident ray AB. 1/2
- ⇒ Here the emergent ray is displaced by perpendicular distance CE due to refraction. This kind of displacement is known as lateral shift. 1/2
- ⇒ The lateral shift in the diagram is equal to CE. It is proportional to perpendicular distance between two refracting surfaces. 1/2

17. The metals obtained after various metallurgical operations are usually not 100 % pure. So refining of metal is done to obtain about 100% pure metal after the removal of impurities from it. ½

Electrolysis :

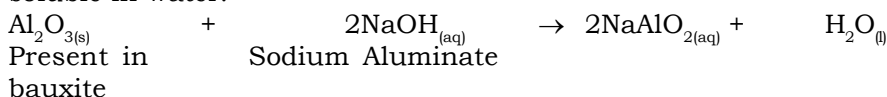
- ⇒ Metals like zinc, lead, aluminium, copper, silver and gold are refined by this process. ½
- ⇒ Metal salt solution or molten liquid of impure metal is taken as an electrolyte. ½
- ⇒ In this process impure metal is taken as an anode while pure metal is taken as a cathode. ½
- ⇒ Now, when current is passed through the solution, pure metal is deposited on cathode and impurities are collected at the bottom of an anode and it is known as anode mud. ½
- ⇒ Reactions taking place at the cathode and anode are as follows:



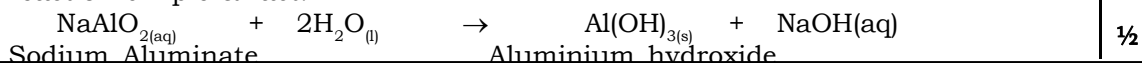
OR

17. On refining bauxite by Bayer's method, pure aluminium oxide is obtained which is called alumina. ½

- ⇒ Bauxite powder is taken & concentrated and (45%) sodium hydroxide solution is added. ½
- ⇒ It is heated in closed vessel at 433k temperature and 5 to 6 Bar pressure for 6 to 8 hours. ½
- ⇒ Aluminium oxide present in bauxite is converted into sodium aluminate which is soluble in water. ½



- ⇒ Iron oxide does not dissolve in sodium hydroxide. ½
- ⇒ Hence, it can be removed by filtration. ½
- ⇒ Silica forms sodium silicate which is soluble in water. ½
- ⇒ Thus sodium aluminate and sodium silicate are there in the filtrate. ½
- ⇒ Excess of water is added to it & continuously stirred. ½
- ⇒ Hydrolysis of sodium aluminate takes place. ½
- ⇒ Precipitates of aluminium hydroxide is obtained. ½
- ⇒ Sodium silicate remains as impurity in the solution. ½
- ⇒ Some precipitates of aluminium hydroxide are added from outside in order to make reaction simple & fast. ½



⇒	<p>The precipitates are washed repeatedly with water, dried & on heating at 1473 K temperature pure aluminium oxide is obtained.</p> $2\text{Al(OH)}_{3(s)} \rightarrow \text{Al}_2\text{O}_3(s) + 3\text{H}_2\text{O(g)}$ <p>Aluminium hydroxide Aluminate</p>	½ ½
⇒	About 99.5% pure alumina is obtained by Bayer's method.	
18.	<p>(i) The respiration which takes place in the presence of oxygen is called aerobic respiration.</p> <p>(ii) It takes place in the cell so it is called cellular respiration or internal respiration.</p> <p>(iii) In this respiration the food i.e. glucose is completely oxidized and broken down into CO₂ and H₂O resulting into release of large amount of energy.</p> <p>(iv) Some of the energy released is stored into ATP whereas some is used in performing metabolic processes in the body.</p> <p>(v) The overall equation of the respiration can be given as follows:</p>	1 1 1 1 1
	$\text{Glucose} \xrightarrow[\text{In cytoplasm}]{\text{Glycolysis}} 2\text{Pyruvic acid} \xrightarrow[\text{(In mitochondria)}]{\text{Oxygen Krebs cycle}} 6\text{CO}_2 + 6\text{H}_2\text{O}$ <p style="text-align: right;">+ 38 ATP Energy</p>	1
	OR	
18.	The process of a respiration in the following parts of a plant	
(a)	Roots :	
⇒	The roots hairs are in contact with air in the soil.	½
⇒	The roots of a plant take O ₂ for respiration by diffusion from soil particles.	½
⇒	Oxygen diffuses into root hair and reaches all cells of the root for respiration.	½
⇒	The CO ₂ produced in the cell of the root during respiration moves out from root hair by diffusion.	½
(b)	Stem and leaves :	
⇒	The stem of herbs have stomata, so through diffusion the gaseous exchange takes place.	1
⇒	The hard and woody stem of big plants has Lenticles for respiration.	1
⇒	The leaves of plants have stomata for gaseous exchange.	1
	~~~~~ <b>All the Best</b> ~~~~~	