

Based on the given material, a special test will be conducted in the 1st week of June.

Ln.1 Metallurgy

- The most abundant metal in earth's crust is
a) Mn b) Na c) Al d) Ca
- Choose the incorrect statement among the following.
i) Metals having least chemical reactivity occur as native elements.
ii) Metals having high reactivity occurs in combined state.
iii) All the minerals are ores.
iv) Mineral which contains low percentage of metal is called ore.
a) (i) and (ii) b) (ii) and (iii) c) (i) and (iii) d) (iii) and (iv)
- Match list-I with list-II and choose the correct answer code.

List-I	List-II	A	B	C	D
A. Bauxite	1. CuFeS ₂	a) <u>3</u>	4	2	1
B. Haematite	2. PbS	b) 4	3	2	1
C. Copper Pyrite	3. Al ₂ O ₃ .nH ₂ O	c) 3	1	2	4
D. Galena	4. Fe ₂ O ₃	d) 2	4	1	3
- Ores having high specific gravity is separated from the gangue by _____ process.
a) froth floatation b) Gravity separation c) Smelting
d) Cyanide leaching
- _____ is used as the depressing agent in froth floatation process.
a) Sodium cyanide b) Sodium ethyl xanthate
c) Potassium cyanide d) Pine oil
- Froth floatation is used to concentrate _____ ores.
a) Oxide b) Sulphide c) Sulphate d) halide
- Gold can be recovered by Zinc from the leached solution is called _____.
a) concentration b) leaching c) cementation d) separation
- In acid leaching insoluble sulphide is converted into soluble _____ and _____.
a) Sulphate and sulphur b) Sulphide and Sulphate
c) Sulphur and oxide d) Sulphate and oxide

- Tinstone can be separated from the wolframite impurities by _____ process.
a) leaching b) magnetic separation c) roasting d) reduction
- Name the method used for refining of copper metal.
a) Leaching b) Smelting c) Electrolytic refining
d) Gravity separation
- The composition of copper matte is _____.
a) Cu₂S and PbS b) PbS + FeS c) FeS + ZnS d) Cu₂S + FeS
- Metals of high purity can be obtained by _____ method.
a) Zone refining b) Roasting c) Smelting d) Reduction
- The important ore of mercury is _____.
a) Chinnabar b) Zinc blende c) Malachite d) Cerrusite
- The purity of blister copper is _____.
a) 90% b) 97% c) 98% d) 89%
- The ignition mixture used in aluminothermic process is _____.
a) magnesium + barium b) bariumperoxide + alumina
c) magnesium + Barium peroxide d) alumina + magnesium
- Consider the following statements and choose the correct statement(s).
i) Ellingham diagram helps us to select a suitable reducing agent.
ii) If the metal oxide is more stable, then oxygen combines with the reducing agent.
iii) We cannot infer the relative stability of different metal oxides at a given temperature.
a) (i) and (ii) b) all c) (i) only d) (i) and (iii)
- The standard free energy change for the reduction of one mole of FeO is _____.
a) -56 KJ mol⁻¹ b) -65 KJ mol⁻¹ c) +75 KJ mol⁻¹ d) +65 KJ mol⁻¹
- Gibbs free energy change for the electrolysis process is given by the expression
a) $\Delta G^0 = nFE^0$ b) $\Delta G^0 = \Delta H^0 - T\Delta S^0$ c) $-\Delta G = -nFE^0$ d) $\Delta G^0 = -nFE^0$
- Low boiling volatile metals can be purified by _____.
a) liquation b) electrolytic refining c) Distillation d) Zone refining
- Highly pure metal can be obtained by _____ process.
a) zone refining b) reduction c) distillation d) liquation

21. Semi conductor materials like silicon, galium can be purified by _____.
- a) reduction b) distillation c) liquation d) zone refining
22. Choose the incorrect statement(s) among the following:
- i) Van Arkel method is based on the thermal decomposition of metal compounds.
- ii) Metals like Zirconium and titanium cannot be purified by Van Arkel method.
- iii) Aluminium is the most abundant metal.
- a) (i) and (ii) b) (i) and (iii) c) (ii) only d) all

23. Match list-I with list-II and choose the correct answer code.

List-I	List-II	A	B	C	D
A. Aluminium	1. increasing the efficiency of solar cells	a) 4	3	2	1
B. Zinc	2. for making wires	b) 3	4	2	1
C. Copper	3. design of chemical reactors	c) 2	3	4	1
D. Gold	4. die-casting	d) 3	2	1	4

24. _____ is used to make pipes, valves and pumps.
- a) Brass b) Copper c) Cast iron d) Gold
25. The compound which is used in making luminous paints.
- a) Zinc Sulphide b) Zinc oxide c) Zinc carbonate
d) Zinc Sulphate
26. The alloy of iron which is resistant to corrosion is _____.
- a) nickel steel b) Stainless steel c) chrome steel
d) cast iron
27. The compound used in the manufacture of paints, rubber, cosmetics is _____.
- a) Zinc sulphide b) Nickel steel c) Brass d) Zinc oxide
28. The less electropositive impurities in the anode can be collected as _____ in electrolysis.
- a) anode mud b) cathode mud c) slag d) gangue
29. The temperature at which nickel tetra carbonyl decomposes to give pure metal is _____.
- a) 450 K b) 460 K c) 640 K d) 650 K
30. Choose the correct statement(s) among the following.
- i) During electrolysis, the metal in the anode loses electrons.
- ii) Zone refining is based on the principle of fractional crystallisation.

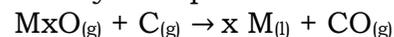
- iii) Reduction with carbon can be applied to the metals which do not form carbides with carbon at the reduction temperature.
- a) (i) and (ii) b) (ii) and (iii) c) (i) and (iii) d) all

II. 2 Marks:

1. What is collectors used in froth floatation process? Name any one collector.
- Substance which enhance the non-wettability of mineral particles are collectors. Eg: Xanthates
2. What is the role of depressants in the froth floatation process?
- Depressants are used to separate two sulphide ores from coming together by dissolving one of them.
3. What is slag?
- The fusible substance formed by combination of gangue and flux is called slag.
4. What is the thermodynamic criterion for the extraction of metal?
- The free energy change for net reduction must be negative.
5. How is Ellingham diagram helpful in the metallurgy process?
- In Ellingham diagram elements present below in the diagram reduce elements above in the diagram. Thus it helps in selection of suitable reducing agent as well as optimum temperature.
6. What is the role of limestone in the metallurgy of iron?
- Limestone decomposes to form CaO which removes silica impurity of the ore as slag.
7. What is the role of cryolite in the metallurgy of aluminium?
- Cryolite lowers the melting point and increases conductivity of alumina.
8. What is Ellingham diagram?
- The graphical representation of Gibbs energy of formation of oxide with temperature is known as Ellingham diagram.
9. What are the limitations of Ellingham diagram?
- *It does not say about the rate of the reaction.
*It presumes that reactant and product are in equilibrium but it is not always true.
10. What is distillation? Name the metals purified by distillation.
- Impure metal is heated in a furnace. Metal vapourises and vapours condense leaving impurities behind. Zinc is purified by distillation.

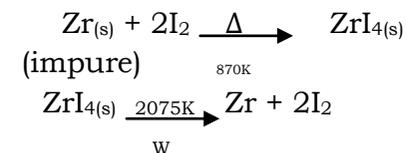
11. Define liquation. Name the metal purified by liquation.
In this method pure metal is heated at inclined hearth of a furnace. Metal melts and flows down. Impurities are left behind. Tin is purified by liquation.
12. What is the principle behind zone refining?
This is based on the principle that impurities are more soluble in the melt than in solid state of the metal.
13. What is vapour phase refining?
In this method metal is converted into volatile compound and vapours are collected which are then decomposed to give pure metal.
14. Name the method by which Ti, Zr are purified.
Ti and Zr are purified by Van Arkel process.
15. Zinc and not copper is used for the recovery of Silver from the complex $[\text{Ag}(\text{CN})_2]^-$. Discuss.
Zinc is a very powerful reducing agent and readily displaces silver present in the complex.
$$\text{Zn} + 2[\text{Ag}(\text{CN})_2]^- \rightarrow [\text{Zn}(\text{CN})_4]^{2-} + 2\text{Ag}$$
No doubt copper is also more reducing than silver but is not so effective as zinc. Moreover, zinc is cheaper than copper.
16. What are the elements present in anode mud in the electrorefining of metals?
Antimony, Selenium, Tellurium, Silver, Gold and Platinum are present in anode mud in the electro refining of metals
17. Give one use of each of the following (i) nickel steel (ii) chrome Steel (iii) Stainless steel
(i) Nickel steel – used for making cables and automobile parts
(ii) Chrome Steel – used for cutting tools and crushing machines.
(iii) Stainless steel – used in making surgical instruments and utensils.
18. Graphite is used as anode and not diamond. Assign reason.
In graphite there are free electrons present in the layers which help in electrical conductivity. But in diamond, no free electrons are present. As such, diamond is a bad conductor of electricity and diamond cannot constitute anode.
19. The reduction of metal oxide is easier if the metal formed is in liquid state. Explain.

The reduction of a metal oxide with a reducing agent such as coke may be represented as



In case the metal formed as a result of reduction is a liquid, ΔS^0 will be higher than when it is in the solid state. Under the conditions $\Delta G^0 = \Delta H^0 - T\Delta S^0$ will become more negative and the reduction will be easier.

20. What is the role of silica in the extraction of copper?
FeO is gangue in copper extraction. SiO_2 acts as flux to remove FeO by chemical reaction in the form of slag.
$$\text{FeO} + \text{SiO}_2 \rightarrow \text{FeSiO}_3$$
21. Write the principle behind froth floatation.
It is based on the principle that mineral particles become wet by oil where as gangue particles by water.
22. Write the composition of copper matte.
It contains Cu_2S and FeS .
23. Write the reaction involved in the extraction of silver after the silver ore has been leached with NaCN.
Reaction:
$$\text{Ag}_2\text{S} + 4\text{NaCN} \rightarrow 2\text{Na}[\text{Ag}(\text{CN})_2] + \text{Na}_2\text{S}$$
$$2\text{Na}[\text{Ag}(\text{CN})_2] + \text{Zn} \rightarrow \text{Na}_2[\text{Zn}(\text{CN})_4] + 2\text{Ag}$$
24. Describe the principle involved in Mond's process of refining of nickel.
Nickel when heated in stream of CO, forms volatile $\text{Ni}(\text{CO})_4$ which decomposes to pure nickel.
$$\text{Ni} + 4\text{CO} \xrightarrow{330-350\text{K}} \text{Ni}(\text{CO})_4 \xrightarrow{450-470\text{K}} \text{Ni} + 4\text{CO}$$
25. Write the reactions involved in the refining of Zirconium by Van Arkel method.
Zr is heated in iodine vapours at about 870K to form volatile ZrI_4 which is heated over tungsten filament at 2075K to get pure Zr.



STD: XII

Holiday Material
Maths

Theorem : 1.1 – 1.10

Ex: 1.3, 1.4 fully (Refer C.W, Note Book)