1. DDT is-
(a) Biodegradable pollutant
(b) Non degradable contaminant
(c) Air pollutant
(d) An antibiotic

2. Gold Schmidt thermite process is used for -
(a) Welding of broken iron pieces
(b) Converting iron into steel
(c) Extraction of sulphur
(d) Reduction of metallic oxide by aluminium

3. During the process of electro-refining of copper some metals present as impurity settle as anode mud. These are :
(a) Sn and Ag (b) Pb and Zn
(c) Ag and Au (d) Fe and Ni

4. Which of the following is not an ore?
(a) Malachite (b) Calamine
(c) Salt cake (d) Cerussite

5. Which one of the following reactions represents a calcination reaction?
(a) $HgS + O_2$ $Hg + SO_2$
(b) $AgNO_3 + NaClAgCl + NaNO_3$
(c) $CuCO_3 .Cu(OH)_2CuO + CO_2 + H_2O$
(d) $Al_2O_3 + NaOHNaAlO_2 + H_2O$

6. Magnesium is extracted from ore carnallite by :
(a) The self-reduction process
(b) The carbon-reduction process
(c) The electrolytic process
(d) Treating the ore with aqueous NaCN and then reducing the mixture

7. Aluminium metal is purified by :
(a) Hooper's process (b) Hall-Heroult process
(c) Serpeck's process (d) Baeyer's process

8. Which does not represent correct method?
(a) $TiCl_2 + 2Mg \longrightarrow Ti + 2MgCl_2$: Kroll
(b) $Ni(CO)_4 \longrightarrow Ni + 4CO$: Mond
(c) $Ag_2CO_3 \longrightarrow 2Ag + CO_2 + \frac{1}{2} O_2$: Van Arkel
(d) $ZrI_4 \longrightarrow Zr + 2I_2$: Van Arkel

9. Magnetic separation process may be used for the concentration of :
(a) Chalcopyrite (b) Bauxite
(c) Haematite (d) Calamine

10. The metal which mainly occurs as oxide ore in nature is :
(a) Gold (b) Lead (c) Aluminium (d) Magnesium

11. The reason, for floating of ore particles in concentration by froth floatation process is that :
(a) They are light (b) They are insoluble
(c) They are charged (d) They are hydrophobic

12. A sulphide ore like ZnS is first roasted into its oxide prior to reduction by carbon because :
(a) A sulphide ore cannot be reduced to metal at all
(b) No reducing agent is found suitable for reducing a

sulphide ore.
(c) The Gibb's free energy of formation of most sulphides are greater than that for CS_2.
(d) A metal oxide is generally less stable than the metal sulphide.

13. In the metallurgy of iron, the upper layer obtained in the bottom of blast furnace mainly contains:
(a) $CaSiO_3$ (b) Spongy iron
(c) Fe_2O_3 (d) $FeSiO_3$

14. Which one of the following reactions occurs during smelting in the reduction zone at lower temperature (in iron metallurgy)?

(a) $CaO + SiO_2 \longrightarrow CaSiO_3$ (slag)

(b) $Fe_2O_3 + 3C \longrightarrow 2Fe + CO$

(c) $3Fe_2O_3 + CO \longrightarrow 2Fe_3O_4 + CO_2$

(d) $CO_2 + C \longrightarrow 2CO$

15. Which method of purification is represented by the equations

$$\underset{\text{(impure)}}{Ti + 2I_2} \xrightarrow{500\ K} TiI_4 \xrightarrow{1675\ K} \underset{\text{(Pure)}}{Ti + 2I_2}$$

(a) Cupellation (b) Poling
(c) Van Arkel (d) Zone refining

16. In a thermite process …….. is used as reducing agent.
(a) Zn (b) Al (c) Mn (d) Fe

17. Sometimes it is possible to separate two sulphide ores by adjusting the proportion of oil to water or by using depressants. When a depressant NaCN is added to an ore containing ZnS and PbS, what is the correct observation?
(a) NaCN prevents PbS from coming to the froth but allows ZnS to come with froth.
(b) NaCN prevents ZnS from coming to the froth but allows PbS to come with froth
(c) NaCN prevents frothing of both ZnS and PbS, hence no froth is formed.
(d) NaCN does not act as depressant hence a mixture of PbS and ZnS is found in froth.

18. How do you separate two sulphide ores by froth floatation method?
(a) By using excess of pine oil.
(b) By adjusting proportion of oil to water or using depressant.
(c) By using collectors and froth stabilizer like xanthates.
(d) By using some solvent in which one of the sulphides is soluble.

19. Magnesium oxide is used for the lining in steel making furnace because
(a) MgO acts as an acidic flux to remove impurities of Si, P and S
(b) MgO acts as a basic flux to remove impurities of Si, P and S
(c) MgO acts as an oxidizing agent to remove impurities of oxides
(d) MgO does not react with any type of impurities

20. Ellingham diagram represent change of
(a) ΔG with temperature
(b) ΔH with temperature
(c) ΔG with pressure
(d) $(\Delta G - T\Delta S)$ with temperature

21. From the Ellingham graph between Gibb's energy and temperature out of C and CO which is a better reducing agent for ZnO?
(a) Carbon (b) CO
(c) Both of these (d) None of these

22. Which of the following slags is produced during extraction of iron?
(a) $CaSiO_3$ (b) $FeSiO_3$ (c) $MgSiO_3$ (d) $ZnSiO_3$

23. Mark the incorrect statement.
(a) Copper is extracted by smelting in a reveberatory furnace.
(b) Zinc is extracted by reduction of oxide with aluminium.
(c) Aluminium is extracted by electrolysis of its oxide.
(d) Iron is extracted by reduction of its oxide in blast furnace.

24. Which of the following metals is obtained by electrolytic reduction process?
(a) Fe (b) Cu (c) Ag (d) Al

25. Which of the following is not a method of refining of metals?
(a) Electrolysis (b) Smelting (c) Poling (d) Liquation

26. Chromatography is a useful method for purification of elements which are
(a) Very reactive
(b) Available in minute quantities
(c) Present in abundance
(d) Highly electropositive

27. Which of the following reaction is an example of auto reduction?
(a) $Fe_3O_4 + 4CO \longrightarrow 3Fe + 4CO_2$
(b) $Cu_2O + C \longrightarrow 2Cu + CO$
(c) $Cu^{2+}_{(aq)} + Fe_{(s)} \longrightarrow Cu_{(s)} + Fe^{2+}_{(aq)}$
(d) $Cu_2O + \frac{1}{2}Cu_2S \longrightarrow 3Cu + \frac{1}{2}SO_2$

28. Electrolytic refining is used to purify which of the following metals?
(a) Cu and Zn (b) Ge and Si (c) Zr and Ti (d) Zn and Hg

29. Match the column I with column II and mark the appropriate choice.

Column I		**Column II**	
(A)	Highly electropositive metals	(i)	Carbon reduction
(B)	Copper	(ii)	CO reduction
(C)	Iron	(iii)	Self reduction
(D)	Zinc	(iv)	Electrolysis

(a) (A) → (iv), (B) → (iii), (C) → (ii), (D) → (i)
(b) (A) → (iii), (B) → (ii), (C) → (i), (D) → (iv)
(c) (A) → (ii), (B) → (i), (C) → (iii), (D) → (iv)
(d) (A) → (i), (B) → (ii), (C) → (iii), (D) → (iv)

30. Mark the correct statements
(i) Mercury can be refined by the process of distillation
(ii) In poling the molten impure metal is stirred with green poles of wood.
(iii) In electrolytic refining of metals impure metal is made as cathode and a thin strip of pure metal is made as anode.
(a) (i) and (ii) (b) (i) and (iii)
(c) (ii) and (iii) (d) (i), (ii) and (iii)

1. (b)
DDT in non-biodegradable contaminents.

2. (d)
Cr_2O_3 & Mn_3O_4 are reduced to corresponding metal by heating with Al.

3. (c)
Anode mud contains Ag, Pt, Sb, Se, Te and Au as impurities.

4. (c)
Metal cannot be economically and conveniently extracted from salt cake (Na_2SO_4).

5. (c)
(C) Carbonate ores are calcined in absence of air to obtain the metal oxides.

6. (c)
It is obtained by electrolytic reduction of molten anhydrous $KCl.MgCl_2$ (other methods are not economical/ feasible for the extraction of Mg metal).

7. (a)
The Hooper process is a process for the electrolytic refining of aluminium. Impure Al forms the anode and pure Al forms the cathode of the Hooper's cell which contains three liquid layers. The bottom layer is molten impure Al, the middle is a fused salt layer containing sodium fluoride, aluminum fluoride and barium fluoride, and the top layer is pure Al. At the anode (bottom layer), Al passes with solution as aluminium ion (Al^{3+}), and at the cathode (top layer), these ions are reduced to the pure metal. In operation, molten metal is added to the bottom of the cell and pure aluminium is drawn off the top.

At anode : $Al \rightarrow Al^{3+} + 3e^-$

At cathode : $Al^{3+} + 3e^- \rightarrow Al$.

8. (c)
It is not called van Arkel method. Van Arkel method is used for the purification of Zr and Ti. Reaction (C) is simple thermal decomposition of Ag_2CO_3.

9. (c)
It is used to separate haematite ore as it is attracted by electromagnet.

10. (c)
Ore bauxite, $Al_2O_3 . 2H_2O$ of aluminium occurs as oxide ore in nature.

11. (d)
Potassium or sodium ethyl xanthate get attached with the particle of the sulphide ore and thus make them water repellant i.e. hydrophobic.

12. (c)
The Gibb's free energy of most sulphides are greater than that for CS_2. In fact, CS_2 is an endothermic compound. Therefore, the $\Delta_f G^0$ of M_xS is not compensated. So reduction of M_xS is difficult. Hence it is common practice to roast sulphide ores to corresponding oxides prior to reduction.

13. (a)
$CaO + SiO_2$ —® $CaSiO_3$ (slag) (Haematite ore contains silica as impurities).

Slag being lighter and insoluble in molten metal floats over and thus forms upper layer.

14. (c)
At lower temperature following reactions occur in blast furnace.

$3Fe_2O_3 + CO \longrightarrow 2Fe_3O_4 + CO_2$; $Fe_3O_4 + CO \longrightarrow 3Fe + 4CO_2$; $Fe_2O_3 + CO \longrightarrow 2FeO + CO_2$

15. (c)
Purification of Ti and Zr are performed by Van Arkel method as given in the question.

16. (b) : A mixture of oxide ore and aluminium powder is commonly called thermite. Oxides of Cr, Mn, Fe, etc. are reduced by Al.

$$Cr_2O_3 + 2Al \rightarrow 2Cr + Al_2O_3$$

$$3Mn_3O_4 + 8Al \rightarrow 2Cr + Al_2O_3$$

$$Fe_2O_3 + 2Al + Al_2O_3 + Fe$$

17. (b) : NaCN acts as a depressant it selectively prevents ZnS from coming to froth by forming a complex $Na_2[Zn(CN)_4]$ but allows PbS to come with froth.

18. (b) : By using depressants or adjusting proportion of oil to water, selective prevention of one sulphide ore from coming to the froth is possible.

19. (b) : MgO acts as a basic flux to remove impurities of Si, P and S through slag formation.

$$\underset{\text{Basic flux}}{MgO} + \underset{\text{Acidic Impurities}}{SiO_2} \rightarrow \underset{\text{Slag}}{MgSiO_3}$$

$$3MgO + P_2O_5 \rightarrow Mg_3(PO_4)_2$$

$$MgO + SO_2 \rightarrow MgSO_3$$

20. (a) : Ellingham diagram shows Gibbs energy (ΔG^o) change with temperature for the formation of a metal oxides.

21. (a) : The free energy of formation (ΔG^o) of CO from C becomes lower at temperatures above 1180 K whereas that of CO_2 from C becomes lower above $1270K$ than ΔG^o of ZnO. However ΔG^o of CO_2 from COis always higher than that of ZnO. Hence, C can reduce ZnO to Zn but not CO.

22. (a) : $CaO + SiO_2 \rightarrow CaSiO_3$

23. (b) : Zinc is extracted by reduction of oxide with coke.

24. (d) : Al is obtained by electrolytic reduction process.

25. (b) : Smelting is a process used for reduction of oxide to convert it into metal.

26. (b) : Chromatography is useful for purification of the elements which are available in minute quantities and the impurities are not very different in chemical properties from the element to be purified.

27. (d) : The sulphide ores of certain less electropositive metals like those of Hg, Pb, Cu, etc. when heated in air bring about the conversion of a part of the sulphide ore to oxide or sulphate which then reacts with the remaining sulphide to give the metal and SO_2 No external reducing agent is used is this process.

$$2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$$

$$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$$

28. (a) : Electrolytic refining is used to purify Cu and Zn.

29. (a) : (A) $\rightarrow$ (iv), (B) $\rightarrow$ (iii), (C) $\rightarrow$ (ii), (D) $\rightarrow$ (i)

30. (a) : In electrolytic refining of metals, impure metal is made as anode and a thin strip of pure metal is made as cathode.