23. General Principles & Processes of Isolation of Elements – Multiple Choice Questions

1. Occurrence

1. The most abundant element on earth crust is

(a) Hydrogen (b) Oxygen

(c) Silicon (d) Carbon

2. Which of the following does not contain Mg

(a) Magnetite (b) Asbestos

(c) Magnesite (d) Carnallite

3. An important oxide ore of iron is

(a) Haematite (b) Siderite

(c) Pyrites (d) Malachite

4. Which of the following is ferrous alloy

(a) Invar (b) Solder

(c) Magnalium (d) Type metal

5. Which of the following is not present in mineral

(a) KNO_3 (b) $CaCO_3$

(c) $NaCl$ (d) CaO

6. Which of the following statement is incorrect

(a) Silver glance mainly contains silver sulphide

(b) Gold is found in native state

(c) Zinc blende mainly contain zinc chloride

(d) Copper pyrites also contain Fe_2S_3

7. Commercially important ore of lead from which it is extracted is

(a) Siderite (b) Haematite

(c) Galena (d) None of these

8. Which one of the following is the most abundant element in the universe

(a) Nitrogen (b) Hydrogen

(c) Oxygen (d) Silicon

9. Which of the following metal is sometimes found native in nature

(a) Al (b) Cu

(c) Fe (d) Mg

10. All ores are minerals, while all minerals are not ores because

(a) The metal can't be extracted economically from all the minerals

(b) Minerals are complex compounds

(c) The minerals are obtained from mines

(d) All of these are correct

11. Corundum is an ore of

(a) Copper (b) Boron

(c) Aluminium (d) Sodium

12. The ores of aluminium and tin normally occurs in the form of

(a) Sulphides (b) Oxides

(c) Carbonates (d) Sulphates

13. Which metal is found in free state

(a) Iron (b) Gold

(c) Aluminium (d) Sodium

14. Of the following substances the one which does not contain oxygen is

(a) Bauxite (b) Epsom salt

(c) Cryolite (d) Dolomite

15. A number of elements are available in earth's crust but most abundant elements are.....

(a) Al and Fe (b) Al and Cu

(c) Fe and Cu (d) Cu and Ag

16. Titanium containing mineral found in our country is

(a) Bauxite (b) Dolomite

(c) Chalcopyrites (d) Ilmenite

17. Composition of azurite mineral is

(a) $CuCO_3CuO$ (b) $Cu(HCO_3)_2.Cu(OH)_2$

(c) $2CuCO_3.Cu(OH)_2$ (d) $CuCO_3.2Cu(OH)_2$

18. Calamine is

(a) $ZnSO_4$ (b) ZnO

(c) $Zn(NO_3)_2$ (d) $ZnCO_3$

19. Formula of Feldspar is

(a) $K_2O.Al_2O_3.6SiO_2$

(b) $K_2O_3.Al_2O_3.6Si_2.O_2.2H_2O$

(c) $Al_2O_3.2SiO_2.2H_2O$

(d) $3MgO.4SiO_2.H_2O$

20. Sapphire is mineral of

(a) Cu (b) Zn

(c) Al (d) Mg

21. Match the following

List I		List II	
(A)	Feldspar	(I)	$[Ag_3SbS_3]$
(B)	Asbestos	(II)	$Al_2O_3H_2O$
(C)	Pyragyrite	(III)	$MgSO_4.H_2O$
(D)	Diaspore	(IV)	$KAlSi_3O_8$
		(V)	$CaMg_3(SiO_3)_4$

The correct answer is

	(A)	(B)	(C)	(D)
(a)	IV	V	II	I
(b)	IV	V	I	II
(c)	IV	I	III	II
(d)	II	V	IV	I

22. The ore carnallite is represented by structure

(a) $Na_2Al_2O_3$ (b) Na_3AlF_6

(c) $KCl.MgCl_26H_2O$ (d) Fe_3O_4

23. 'Lapis–Lazuli' is a blue coloured precious stone. It is mineral of the class

(a) Sodium–alumino silicate (b) Zinc cobaltate

(c) Basic copper carbonate (d) Prussian blue

24. "Electron" is an alloy of

(a) *Mg* and *Zn* (b) *Fe* and *Mg*

(c) *Ni* and *Zn* (d) *Al* and *Zn*

2. Concentration

1. Froth floatation process is used for the concentration of

(a) Oxide ores (b) Sulphide ores

(c) Chloride ores (d) Amalgams

2. Magnetic separation is used for increasing concentration of the following

(a) Horn silver (b) Calcite

(c) Haematite (d) Magnesite

3. Cyanide process is used in the extraction of

(a) *Au* (b) *Ag*

(c) Both (a) and (b) (d) *Cu*

4. An ore of tin containing $FeCrO_4$ is concentrated by

(a) Magnetic separation (b) Froth floatation

(c) Electrostatic method (d) Gravity separation

5. The method of concentrating the ore which makes use of the difference in density between ore and impurities is called

(a) Levigation (b) Leaching

(c) Magnetic separation (d) Liquefaction

6. How is ore of aluminium concentrated

(a) Roasting (b) Leaching

(c) Froth floatation (d) Using Wilfley table

7. Wolframite ore is separated from tinstone ore by the process of

(a) Roasting (b) Electromagnetic

(c) Smelting (d) Calcination

8. The chief impurity present in red bauxite is

(a) SiO_2 (b) Fe_2O_3

(c) K_2SO_4 (d) NaF

9. Cassiterite is concentrated by

(a) Levigation

(b) Electromagnetic separation

(c) Floatation

(d) Liquefaction

10. Froth floatation process for the concentration of ores is an illustration of the practical application of

(a) Adsorption (b) Absorption

(c) Coagulation (d) Sedimentation

11. Copper pyrites are concentrated by

(a) Electromagnetic method (b) Gravity method

(c) Froth floatation process (d) All the above methods

12. Froth–floatation method is successful in separating impurities from ores because

(a) The pure ore is lighter than water containing additives like pine oil, cresylic acid etc

(b) The pure ore is soluble in water containing additives like pine oil, cresylic acid etc

(c) The impurities are soluble in water containing additives like pine oil, cresylic acid etc

(d) The pure ore is not as easily wetted by water as by pine oil, cresylic acid etc

13. Leaching is a process of

(a) Reduction (b) Concentration

(c) Refining (d) Oxidation

14. The function of potassium ethyl xanthate in froth floatation process is to make the ore

(a) Attracted towards water (b) Water repellent

(c) Lighter (d) Heavier

15. Extraction of gold and silver involves leaching the metal with CN^- ion. The metal is recovered by...

(a) Displacement of metal by some other metal from the complex ion

(b) Roasting of metal complex

(c) Calcination followed by roasting

(d) Thermal decomposition of metal complex

16. Which metal is most difficult to be extracted from its oxide

(a) Cs (b) Ag

(c) Zn (d) Mg

17. Extraction of silver is achieved by initial complexation of the ore (Argentite) with X followed by reduction with Y, X and Y respectively are

(a) CN^- and Zn (b) CN^- and Cu

(c) Cl^- and Zn (d) Br^- and Zn

3. Roasting & Calcination

1. Roasting is generally done in case of the following

(a) Oxide ores (b) Silicate ores

(c) Sulphide ores (d) Carbonate ores

2. Heating of pyrites in air for oxidation of sulphur is called

(a) Roasting (b) Calcination

(c) Smelting (d) Slagging

3. The reaction $2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$ in the metallurgical process of zinc is called

(a) Calcination (b) Cupellation

(c) Smelting (d) Roasting

4. Roasting is done in

(a) Blast furnace (b) Open hearth furnace

(c) Electric furnace (d) None of these

5. Roasting of copper pyrites ores is for the following purposes

(a) To burn off sulphur, arsenic, antimony etc. as oxides and converts all the iron and copper to their oxides

(b) To burn off arsenic, antimony etc. as oxides and burn off sulphur so that enough of it remains to combine with all the copper

(c) To burn off sulphur partially to leave enough to combine with arsenic, antimony etc. and to convert all the iron and copper to oxides

(d) To melt arsenic and antimony sulphides etc. and remove them by liquation and to burn off sulphur partially to leave enough to combine with copper and iron

6. A metal obtained directly by roasting of its sulphide ore is

(a) Cu (b) Pb

(c) Hg (d) Zn

7. Calcination is used in metallurgy for removal of

(a) Water and sulphide (b) Water and CO_2

(c) CO_2 and H_2S (d) H_2O and H_2S

8. Which of the following processes involves smelting

(a) $ZnCO_3 \rightarrow ZnO + CO_2$

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

(c) $2PbS + 3O_2 \rightarrow 2PbO + 2SO_2$

(d) $Al_2O_3.2H_2O \rightarrow Al_2O_3 + 2H_2O$

9. A substance which reacts with gangue to form fusible material is called

(a) Flux (b) Catalyst

(c) Ore (d) Slag

10. Which of the following taking place in the Blast furnace is endothermic

(a) $CaCO_3 \rightarrow CaO + CO_2$

(b) $2C + O_2 \rightarrow 2CO$

(c) $C + O_2 \rightarrow CO_2$

(d) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

11. Refractory metals are used in construction of furnaces because

(a) They can withstand high temperature

(b) They are chemically inert

(c) Their melting point is high

(d) None of these

12. Inner layer of blast furnace is made of

(a) Graphite bricks (b) Silica bricks

(c) Fire - clay bricks (d) Basic bricks

13. Which of the following substance can be used for drying gases

(a) $CaCO_3$ (b) Na_2CO_3

(c) $NaHCO_3$ (d) CaO

14. Extraction of gold (Au) involves the formation of complex ions 'X' and 'Y'

$$Gold\ ore \xrightarrow[CN^-, H_2O, O_2]{Roasting} HO^- + 'X' \xrightarrow{Zn} 'Y' + Au$$

'X' and 'Y' are respectively

(a) $Au(CN)_2^-$ and $Zn(CN)_4^{2-}$ (b) $Au(CN)_4^{3-}$ and $Zn(CN)_4^{2-}$

(c) $Au(CN)_3^-$ and $Zn(CN)_6^{4-}$ (d) $Au(CN)_4^-$ and $Zn(CN)_3^-$

15. The reduction of zinc oxide with coke occurs at temperature

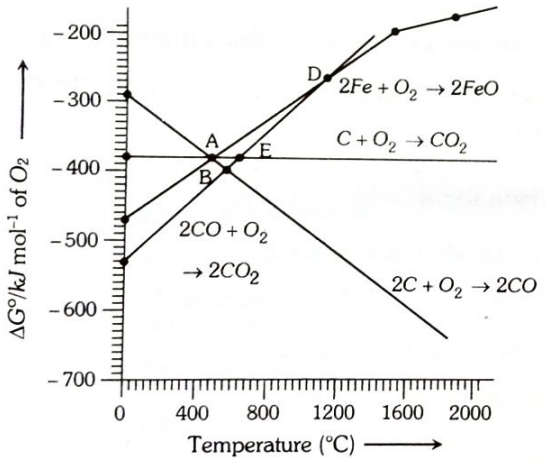
(a) Greater than that for CuO

(b) Less than that for CuO

(c) Less than that for Ag_2O

(d) Equal to that for CuO

Direction (Q. Nos. 16-18) Answer the questions on the basis of figure



16. Choose the correct option of temperature at which carbon reduces FeO to iron and produces CO

(a) Below temperature at point A

(b) Approximately at the temperature corresponding to point A

(c) Above temperature at point A but below temperature at point D

(d) Above temperature at point A

17. Below point 'A' FeO can .....

(a) Be reduced by carbon monoxide only

(b) Be reduced by both carbon monoxide and carbon

(c) Be reduced by carbon only

(d) Not be reduced by both carbon and carbon monoxide

18. For the reduction of FeO at the temperature corresponding to point D, which of the following statements is correct

(a) ΔG value for the overall reduction reaction with carbon monoxide is zero

(b) ΔG value for the overall reduction reaction with a mixture of 1 *mol* carbon and 1 *mol* oxygen is positive

(c) ΔG value for the overall reduction reaction with a mixture of 2 *mol* carbon and 1 *mol* oxygen will be positive

(d) ΔG value for the overall reduction reaction with carbon monoxide is negative

19. The major products of the following reaction

$ZnS(s) + O_2(g) \xrightarrow{heat}$ are

(a) ZnO and SO_2 (b) $ZnSO_4$ and SO_3

(c) $ZnSO_4$ and SO_2 (d) Zn and SO_2

4. Reduction to Free Metal

1. Purpose of smelting of an ore is

(a) To oxidise it

(b) To reduce it

(c) To remove vaporisable impurities

(d) To obtain an alloy

2. The substance which is mixed with the ore for removal of impurities is termed as

(a) Slag (b) Gangue

(c) Flux (d) Catalyst

3. Reverberatory furnace is employed in the metallurgical process mainly for

(a) Reduction of oxide ores

(b) Smelting of sulphide ores

(c) Conversion of chloride to sulphate

(d) Getting magnetic materials

4. Which statement is correct

(a) Gangues are carefully chosen to combine with the slag present in the ore to produce easily fusible flux to carry away the impurities

(b) Slags are carefully chosen to combine with the flux present in the ore to produce easily fusible gangue to carry away the impurities

(c) Gangues are carefully chosen to combine with the flux present in the ore to produce easily fusible slag to carry away the impurities

(d) Fluxes are carefully chosen to combine with the gangue present in the ore to produce easily fusible slag to carry away the impurities

5. The final step for the extraction of copper from copper pyrite in Bessemer converter involves the reaction

(a) $4Cu_2O + FeS \rightarrow 8Cu + FeSO_4$

(b) $Cu_2S + 2Cu_2O \rightarrow 6Cu + SO_2$

(c) $2Cu_2O + FeS \rightarrow 4Cu + Fe + SO_2$

(d) $Cu_2S + 2FeO \rightarrow 2Cu + 2Fe + SO_2$

6. Which of the following fluxes is used to remove acidic impurities in metallurgical process

(a) Silica (b) Lime stone

(c) Sodium chloride (d) Sodium carbonate

7. Electrometallurgical process is used to extract

(a) *Fe* (b) *Pb*

(c) *Na* (d) *Ag*

8. Aluminium is prepared in large quantities by

(a) Heating cryolite in a limited quantity of air

(b) Reducing aluminium oxide with coke

(c) Reducing aluminium oxide with sodium

(d) Electrolysing aluminium oxide dissolved in fused electrolyte

9. Thermite process is used to extract metals

(a) When their oxides can't be reduced by carbon

(b) When their carbonates do not yield oxides by thermal decomposition

(c) When their sulphides can't be converted into oxides by roasting

(d) When their melting points are very high

10. Iron is obtained on a large scale from Fe_2O_3 by

(a) Reduction with *Al* (b) Reduction with *CO*

(c) Reduction with H_2 (d) Reduction with sodium

11. After partial roasting, the sulphide of copper is reduced by

(a) Reduction by carbon (b) Electrolysis

(c) Self–reduction (d) Cyanide process

12. In the metallurgical extraction of zinc from *ZnO* the reducing agent used is

(a) Carbon monoxide (b) Sulphur dioxide

(c) Carbon dioxide (d) Nitric oxide

13. The metal oxide which cannot be reduced to metal by carbon is

(a) Al_2O_3 (b) *PbO*

(c) *ZnO* (d) Fe_2O_3

14. Which process of reduction of mineral to the metal is suited for the extraction of copper from its ores with low copper content

(a) Metal displacement (b) Auto reduction

(c) Chemical reduction (d) Electrolytic reduction

15. Which of the following reactions is an example of autoreduction

(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) $Cu_2O + \frac{1}{2}Cu_2S \longrightarrow 3Cu + \frac{1}{2}SO_2$

16. In the extraction of copper from its sulphide ore, the metal is formed by the reduction of Cu_2O with

(a) *FeS* (b) *CO*

(c) Cu_2S (d) SO_2

17. 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*

18. When copper pyrites is roasted in excess of air, a mixture of *CuO* + *FeO* is formed. *FeO* is present as impurities. This can be removed as slag during reduction of *CuO*. The flux added to form slag is

(a) SiO_2 which is an acidic flux

(b) Lime stone, which is a basic flux

(c) SiO_2, which is basic flux

(d) *CaO*; which is basic flux

19. Flux is used to remove

(a) Silica

(b) Metal oxide

(c) All impurities from ores

(d) Silica and undesirable metal oxide

20. In blast furnace iron oxide is reduced by

(a) Silica (b) *CO*

(c) Carbon (d) Lime stone

21. To obtain chromium from chromic oxide (Cr_2O_3), the method used is

(a) Alumino-thermic process

(b) Electrolytic reduction

(c) Carbon reduction

(d) Carbon monoxide reduction

22. Bauxite ore is made up of $Al_2O_3 + SiO_2 + TiO_2 + Fe_2O_3$. This ore is treated with conc. $NaOH$ solution at 500 K and 35 bar pressure for few hours and filtered hot. In the filtrate the species present, are

(a) $NaAl(OH)_4$ only

(b) $Na_2Ti(OH)_6$ only

(c) $NaAl(OH)_4$ and Na_2SiO_3 both

(d) Na_2SiO_3 only

23. Roasted copper pyrite on smelting with sand produces

(a) $FeSiO_3$ as fusible slag and Cu_2S mattee'

(b) $CaSiO_3$ as infusible slag and Cu_2O mattee'

(c) $Ca_3(PO_4)_2$ as fusible slag and Cu_2S mattee'

(d) $Fe_3(PO_4)_2$ as infusible slag and Cu_2S mattee'

24. Name the metal that is purified by placing the impure metal on sloping hearth of a reverberatory furnace and heating that above its melting point in absence of air

(a) Mercury (b) Galium

(c) Zirconium (d) Copper

25. Cryolite is

(a) Na_3AlF_6 and is used in the electrolysis of alumina for lowering the melting point and increasing the conductivity of alumina

(b) Na_3AlF_6 and is used in the electrolysis of alumina for decreasing electrical conductivity

(c) Na_3AlF_6 and is used in the electrolytic refining of alumina

(d) Na_3AlF_6 and is used in the electrolysis of alumina for lowering the melting point of alumina only

26. Mark the wrong statement

(a) Wrought iron is prepared by heating cast iron in a reverberatory furnace

(b) The impurities present in cast iron are oxidised by air

(c) The impurities are oxidised by Fe_2O_3

(d) CO burns with blue flame and the Si, Mn and other impurities form slag with silica

27. When copper ore is mixed with silica, in a reverberatory furnace, copper matte is produced. The copper matte contains

(a) Sulphides of copper (II) and iron (II)

(b) Sulphides of copper (II) and iron (III)

(c) Sulphides of copper (I) and iron (II)

(d) Sulphides of copper (I) and iron (III)

28. In the metallurgy of aluminium .....

(a) Al^{3+} is oxidised to Al (s)

(b) Graphite anode is oxidised to carbon monoxide and carbon dioxide

(c) Oxidation state of oxygen changes in the reaction at anode

(d) Oxidation state of oxygen changes in the overall reaction involved in the process

29. Copper is extracted from copper pyrites by heating in a Bessemer converter. The method is based on the principle that

(a) Copper has less affinity for oxygen than sulphur at high temperature

(b) Copper has more affinity for oxygen than sulphur at high temperature

(c) Sulphur has less affinity for oxygen at high temperature

(d) Iron has less affinity for oxygen than sulphur at high temperature

30. In aluminium extraction by the Baeyer's process, alumina is extracted from bauxite by sodium hydroxide at high temperatures and pressures

$$Al_2O_{3(s)} + 2OH^-_{(aq)} \rightarrow 2Al_2O^-_{2(aq)} + H_2O_{(l)}$$

Solid impurities such as Fe_2O_3 and SiO_2 are removed and then $Al(OH)^-_4$ is reprecipitated

$2Al(OH)^-_4 \rightarrow Al_2O_3 3H_2O_{(s)} + 2OH^-_{(aq)}$. In the industrial world

(a) Carbon dioxide is added to precipitate the alumina

(b) Temperature and pressure are dropped and the supersaturated solution seeded

(c) Both (a) and (b) are practised

(d) The water is evaporated

31. Identify the reaction that does not take place in a blast furnace

(a) $2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$

(b) $CO_2 + C \rightarrow 2CO$

(c) $CaCO_3 \rightarrow CaO + CO_2$

(d) $CaO + SiO_2 \rightarrow CaSiO_3$

32. According to Ellingham diagram, the oxidation reaction of carbon to carbon monoxide may be used to reduce which one of the following oxides at the lowest temperature

(a) Al_2O_3 (b) Cu_2O

(c) MgO (d) ZnO

(e) FeO

33. From the Ellingham graphs on carbon, which of the following statements is false

(a) CO_2 is more stable then CO at less than 983 K

(b) CO reduces Fe_2O_3 to Fe at less than 983 K

(c) CO is less stable than CO_2 at more than 983 K

(d) CO reduces Fe_2O_3 to Fe in the reduction zone of Blast furnace

34. The incorrect statement among the following is

(a) Hydrogen is used to reduce NiO

(b) Zirconium is refined by van Arkel method

(c) The sulphide ore galena is concentrated by froth floatation

(d) In the metallurgy of iron, the flux used is SiO_2

35. In the conversion of zinc ore to zinc metal, the process of roasting involves

(a) $ZnCO_3 \rightarrow ZnO$ (b) $ZnO \rightarrow ZnSO_4$

(c) $ZnS \rightarrow ZnO$ (d) $ZnS \rightarrow ZnSO_4$

5. Refining of Crude Metal

1. Hydro-metallurgical process of extraction of metals is based on

(a) Complex formation (b) Hydrolysis

(c) Dehydration (d) Dehydrogenation

2. In electrolytic refining, the impure metal is used to make

(a) Cathode (b) Anode

(c) Electrolytic bath (d) None of these

3. Zone refining is used for the purification of

(a) Cu (b) Au

(c) Ge (d) Ag

4. In order to refine "blister copper" it is melted in a furnace and is stirred with green logs of wood. The purpose is

(a) To expel the dissolved gases in blister copper

(b) To bring the impurities to surface and oxidize them

(c) To increase the carbon content of copper

(d) To reduce the metallic oxide impurities with hydrocarbon gases liberated from the wood

5. Gold is extracted by hydrometallurgical process based on its property

(a) Of being electropositive

(b) Of being less reactive

(c) To form complexes which are water soluble

(d) To form salts which are water soluble

6. Cupellation process is used in the metallurgy of

(a) Copper (b) Silver

(c) Aluminium (d) Iron

7. Van Arkel method of purification of metals involves converting the metal to a

(a) Volatile stable compound

(b) Volatile unstable compound

(c) Non volatile stable compound

(d) None of the above

8. A metal which is refined by poling is

(a) Sodium (b) Blister copper

(c) Zinc (d) Silver

9. Van-Arkel method of refining zirconium involves

(a) Removing all oxygen and nitrogen impurities

(b) Removing CO impurity

(c) Removing hydrogen impurity

(d) Removing silica impurity

10. In the extraction of chlorine by electrolysis of brine.....

(a) Oxidation of Cl^- ion to chlorine gas occurs

(b) Reduction of Cl^- ion to chlorine gas occurs

(c) For overall reaction ΔG^0 has negative value

(d) A displacement reaction takes place

11. Brine is electrolysed by using inert electrodes. The reaction at anode is.....

(a) $Cl^-(aq) \rightarrow \frac{1}{2}Cl_2(g) + e^-$; $E^{\ominus}_{Cell} = 1.36\,V$

(b) $2H_2O + (l) \rightarrow O_2(g) + 4H^+ + 4e^-$; $E^{\ominus}_{Cell} = 1.23\,V$

(c) $Na^+(aq) + e^- \rightarrow Na(s)$; $E^{\ominus}_{Cell} = 2.71\,V$

(d) $H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g)$; $E^{\ominus}_{Cell} = 0.00\,V$

6. IIT-JEE/ AIEEE

1. Which of the following is not an ore **[1982]**

(a) Bauxite (b) Malachite

(c) Zinc blende (d) Pig iron

2. Copper can be extracted from **[1978]**

(a) Kupfernickel (b) Dolomite

(c) Galena (d) Malachite

3. Among the following statements, the incorrect one is **[1997]**

(a) Calamine and siderite are carbonates

(b) Argentite and cuprite are oxides

(c) Zinc blende and pyrites are sulphides

(d) Malachite and azurite are ores of copper

4. Which ore contains both iron and copper **[2005]**

(a) Cuprite (b) Chalcocite

(c) Chalcopyrite (d) Malachite

5. Which of the following mineral does not contain Al **[1992]**

(a) Cryolite (b) Mica

(c) Feldspar (d) Fluorspar

6. Which of the following ore is best concentrated by froth-floatation method **[2004; 2016]**

(a) Galena (b) Cassiterite

(c) Magnetite (d) Malachite

7. Froth floatation process is used for concentration of **[1989]**

(a) Chalcopyrite (b) Bauxite

(c) Haematite (d) Calamine

8. Extraction of zinc from zinc blende is achieved by **[2007]**

(a) Electrolytic reduction

(b) Roasting followed by reduction with carbon

(c) Roasting followed by reduction with another metal

(d) Roasting followed by self-reduction

9. Which of the following factors is of no significance for roasting sulphide ores to the oxides and not subjecting the sulphide ores to carbon reduction directly **[2008]**

(a) CO_2 is thermodynamically more stable than CS_2

(b) Metal sulphides are less stable than the corresponding oxides

(c) CO_2 is more volatile than CS_2

(d) Metal sulphides are thermodynamically more stable than CS_2

10. Heating mixture of Cu_2O and Cu_2S will give **[2005]**

(a) $Cu + SO_2$ (b) $Cu + SO_3$

(c) $CuO + CuS$ (d) Cu_2SO_3

11. In the cyanide extraction process of silver from argentite ore, the oxidizing and reducing agents used are **[2012]**

(a) O_2 and CO respectively

(b) O_2 and Zn dust respectively

(c) HNO_3 and Zn dust respectively

(d) HNO_3 and CO respectively

12. In the manufacture of iron lime stone added to the blast furnace, the calcium ion ends in the form of **[1982]**

(a) Slag (b) Gangue

(c) Calcium metal (d) $CaCO_3$

13. The metallurgical process in which a metal is obtained in a fused state is called **[1978]**

(a) Smelting (b) Roasting

(c) Calcination (d) Froth floatation

14. The slag obtained during the extraction of copper from copper pyrites is composed mainly of **[2001]**

(a) $CaSiO_3$ (b) $FeSiO_3$

(c) $CuSiO_3$ (d) SiO_2

15. In alumino–thermite process, aluminium is used as **[1983]**

(a) Oxidising agent (b) Flux

(c) Reducing agent (d) Solder

16. Pb and Sn are extracted from their chief ore by **[2004]**

(a) Carbon reduction and self reduction

(b) Self reduction and carbon reduction

(c) Electrolysis and self reduction

(d) Self reduction and electrolysis

17. The cyanide process is used for obtaining **[2002]**

(a) Na (b) Ag

(c) Cu (d) Zn

18. In the context of the Hall – Heroult process for the extraction of Al, which of the following statements is false **[2015]**

(a) CO and CO_2 are produced in this process

(b) Al_2O_3 is mixed with CaF_2 which lowers the melting point of the mixture and brings conductivity

(c) Al^{3+} is reduced at the cathode to form Al

(d) Na_3AlF_6 serves as the electrolyte

19. Which method of purification is represented by the equation

$$\underset{\text{Impure}}{Ti} + 2I_2 \xrightarrow{500K} TiI_4 \xrightarrow{1675K} \underset{\text{Pure}}{Ti} + 2I_2$$ **[2012]**

(a) Cupellation (b) Poling

(c) Van Arkel (d) Zone refining

7. NEET/ AIPMT/ CBSE-PMT

1. Cinnabar is an ore of **[1991]**

(a) Hg (b) Cu

(c) Pb (d) Zn

2. Which one of the following is an ore of silver **[1993]**

(a) Argentite (b) Stibnite

(c) Haematite (d) Bauxite

3. The most abundant metal in the earth crust is **[2000]**

(a) Na (b) Mg

(c) Al (d) Fe

4. Which one of the following is a mineral of irons **[2012]**

(a) Malachite (b) Cassiterite

(c) Pyrolusite (d) Magnetite

5. Identify the alloy containing a non–metal as a constituent in it **[2012]**

(a) Invar (b) Steel

(c) Bell metal (d) Bronze

6. "Metals are usually not found as nitrates in their ores"

Out of the following two (A and B) reasons which is/are true for the above observation

(A) Metal nitrates are highly unstable

(B) Metal nitrates are highly soluble in water

[2015]

(a) A and B are false (b) A is false but B is true

(c) A is true but B is false (d) A and B are true

7. Metal which can be extracted from all the three dolomite, magnesite and carnallite is **[1988]**

(a) Na (b) K

(c) Mg (d) Ca

8. Cassiterite is an ore of **[1999]**

(a) Mn (b) Ni

(c) Sb (d) Sn

9. Sulphide ores metals are usually concentrated by Froth Floatation process. Which one of the following sulphide ores offers an exception and is concentrated by chemical leaching **[2007]**

(a) Argentite (b) Galena

(c) Copper pyrite (d) Sphalerite

10. Which of the following statements, about the advantage of roasting of sulphide ore before reduction is not true **[2007]**

(a) Carbon and hydrogen are suitable reducing agents for metal sulphides

(b) The $\Delta_f G^0$ of the sulphide is greater than those for CS_2 and H_2S

(c) The $\Delta_f G^0$ is negative for roasting for sulphide ore to oxide

(d) Roasting of the sulphide to the oxide is thermodynamically feasible

11. In the extraction of copper from its sulphide ore, the metal finally obtained by the reduction of cuprous oxide with **[2012; 2015]**

(a) Iron (II) sulphide (b) Carbon monoxide

(c) Copper (I) sulphide (d) Sulphur dioxide

12. The following reactions take place in the blast furnace in the preparation of impure iron. Identify the reaction pertaining to the formation of the slag **[2011]**

(a) $CaO(s) + SiO_2(s) \rightarrow CaSiO_3(s)$

(b) $2C(s) + O_2(g) \rightarrow 2CO(g)$

(c) $Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(l) + 3CO_2(g)$

(d) $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

13. Aluminium is extracted from alumina (Al_2O_3) by electrolysis of a molten mixture of **[2012]**

(a) $Al_2O_3 + HF + NaAlF_4$ (b) $Al_2O_3 + CaF_2 + NaAlF_4$

(c) $Al_2O_3 + Na_3AlF_6 + CaF_2$ (d) $Al_2O_3 + KF + Na_3AlF_6$

14. Match items of Column I with the items of Column II and assign the correct code :

	Column – I		Column – II
(A)	Cyanide process	(i)	Ultrapure Ge
(B)	Froth floatation process	(ii)	Dressing of Zns
(C)	Electrolytic reduction	(iii)	Extraction of Al
(D)	Zone refining	(iv)	Extraction of Au
		(v)	Purification of Ni

Code : **[2016]**

	(A)	**(B)**	**(C)**	**(D)**
(a)	(iv)	(ii)	(iii)	(i)
(b)	(ii)	(iii)	(i)	(v)
(c)	(i)	(ii)	(iii)	(iv)
(d)	(iii)	(iv)	(v)	(i)

15. Extraction of gold and silver involves leaching with CN^- ion. Silver is later recovered by **[2017]**

(a) Liquation (b) Distillation

(c) Zone refining (d) Displacement with Zn

16. Considering Ellingham diagram, which of the following metals can be used to reduce alumina **[2018]**

(a) Fe (b) Zn

(c) Mg (d) Cu

17. Method used for obtaining highly pure silicon used as a semiconductor material is **[1994]**

(a) Oxidation (b) Electrochemical

(c) Crystallization (d) Zone refining

18. Zone refining is based on the principle that..... **[2003]**

(a) Impurities of low boiling metals can be separated by distillation

(b) Impurities are more soluble in molten metal than in solid metal

(c) Different components of a mixture are differently adsorbed on an adsorbent

(d) Vapours of volatile compound can be decomposed in pure metal

8. AIIMS

1. Which of the following is a carbonate ore **[2005]**

(a) Pyrolusite (b) Malachite

(c) Diaspore (d) Cassiterite

2. Which of the following ores does not represent the ore of iron **[2002]**

(a) Haematite (b) Magnetite

(c) Cassiterite (d) Limonite

3. $(Ag + Pb)$ alloy $\xrightarrow[\text{Zinc is added}]{\text{Melt and}}$ $(Ag + Pb + Zn)$ melt

$\xrightarrow{\text{Cool}}$ $\xrightarrow[\text{Layer } Y]{\text{Layer } X}$ Select correct statement based on above scheme **[2008]**

(a) Layer X contains Zn and Ag

(b) Layer Y contains Pb and Ag but amount of silver in this layer is smaller than in layer X

(c) X and Y are immiscible layer

(d) All are correct statements

9. Assertion and Reason

Read the assertion and reason carefully to mark the correct option out of the options given below :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(c) If assertion is true but reason is false.

(d) If the assertion and reason both are false.

(e) If assertion is false but reason is true.

1. Assertion : Iron is found in the free state in nature. **[AIIMS 2001]**

Reason : Iron is highly reactive element.

2. Assertion : Zinc is used and copper is not used in the recovery of Ag from the complex $[Ag(CN)_2]^-$.

Reason : Zinc is a powerful reducing agent than copper.

3. Assertion : Leaching is a process of reduction.

Reason : Leaching involves treatment of the ore with a suitable reagent so as to make it soluble while impurities remains insoluble.

4. Assertion : Wolframite impurities are separated from cassiterite by electromagnetic separation.

Reason : Cassiterite being magnetic is attracted by the magnet and forms a separate heap.

5. Assertion : Lead, tin and bismuth are purified by liquation method.

Reason : Lead, tin and bismuth have low m.p. as compared to impurities.

23. General Principles & Processes of Isolation of Elements – Answers Keys

1. Occurrence

1	b	2	a	3	a	4	a	5	a
6	c	7	c	8	b	9	b	10	a
11	c	12	b	13	b	14	c	15	a
16	d	17	c	18	d	19	a	20	c
21	b	22	c	23	a	24	a		

2. Concentration

1	b	2	c	3	c	4	a	5	a
6	b	7	b	8	b	9	b	10	a
11	c	12	d	13	b	14	b	15	a
16	c	17	a						

3. Roasting & Calcination

1	c	2	a	3	d	4	a	5	c
6	c	7	b	8	b	9	a	10	a
11	a	12	d	13	d	14	a	15	a
16	d	17	a	18	a	19	a		

4. Reduction to Free Metal

1	b	2	c	3	a	4	d	5	b
6	b	7	c	8	d	9	a	10	b
11	c	12	a	13	a	14	b	15	d
16	c	17	a	18	a	19	d	20	b
21	a	22	a	23	a	24	a	25	a
26	b	27	c	28	b	29	b	30	c
31	a	32	b	33	c	34	d	35	c

5. Refining of Crude Metal

1	a	2	b	3	c	4	d	5	c
6	b	7	a	8	b	9	a	10	a
11	a								

6. IIT-JEE/ AIEEE

1	d	2	d	3	b	4	c	5	d
6	a	7	a	8	b	9	d	10	a
11	b	12	a	13	a	14	b	15	c
16	b	17	b	18	d	19	c		

7. NEET/ AIPMT/ CBSE-PMT

1	a	2	a	3	c	4	d	5	b
6	b	7	c	8	d	9	a	10	a
11	c	12	a	13	c	14	a	15	d
16	c	17	d	18	b				

8. AIIMS

1	b	2	c	3	d				

9. Assertion & Reason

1	e	2	a	3	e	4	c	5	a