

**CBSE Class 12 physics**

**Important Questions**

**Chapter 6**

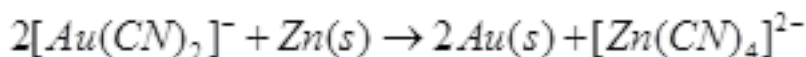
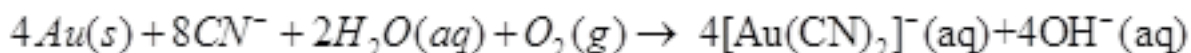
**General Principles and Processes of Isolation of Elements**

---

**3 Marks Questions**

**1. How are gold and silver extracted?**

**Ans.** Gold and silver are extracted by leaching the metal with  $\text{CN}^-$ . The metal is later recovered by displacement method in which zinc acts as reducing agent.



**2. Give two examples of metal refined by**

**a) Distillation**

**b) Liquation**

**c) Electrolytic refining**

**Ans.** a) Distillation – Zinc and Mercury

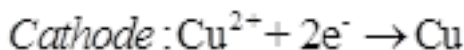
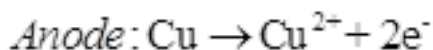
b) Liquation – Tin and Antimony

c) Electrolytic refining – Copper and Zinc

**3. Explain electrolytic refining of copper.**

**Ans.** Electrolytic refining of copper-

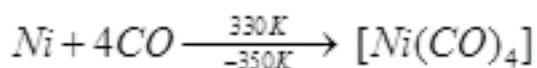
In this method impure copper acts as anode and a strip of the same metal in the pure form is used as cathode. The electrolyte is acidified solution of copper sulphate. The net result is the transfer of copper in pure form from the anode to cathode.



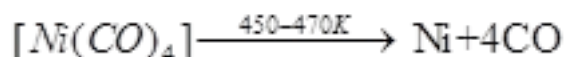
Impurities from the blister copper like antimony, selenium, tellurium, silver, gold and platinum deposit as anode mud.

**4. Write a short note on Mond's process.**

**Ans.** Mond's Process- In this process, nickel is heated in a stream of carbon monoxide to give a volatile complex, nickel tetra carbonyl.

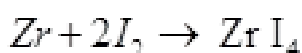


The carbonyl is heated to higher temperature



**5. Which method is used for refining of zirconium? Explain.**

**Ans.** Zirconium and Titanium are refined by van Arkel process, Here the crude metal is heated in an evacuated vessel with iodine.



The metal iodide is decomposed on a tungsten filament, electrically heated to about 1800K and pure metal is deposited on the filament.

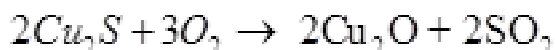


**6. What is the principle behind chromatography? Name some types of chromatographic techniques.**

**Ans.** The principle behind chromatography is that different components of a mixture are differently adsorbed on an adsorbent. Some of the chromatographic techniques are paper chromatography, column chromatography, gas chromatography etc.

**7. Explain the extraction of copper?**

**Ans.** The sulphide ores of copper are roasted to give oxides:



The oxide can then be easily reduced to metallic copper using coke.

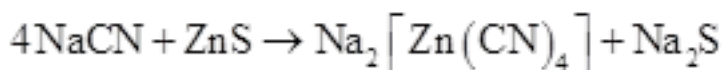


The impurities like iron oxide are removed as slag by reacting with  $\text{SiO}_2$ , added as flux.



### 8. What is the role of depressant in froth floatation process?

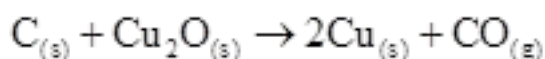
**Ans.** In the froth floatation process, the role of the depressants is to separate two sulphide ores by selectively preventing one ore from forming froth. For example, to separate two sulphide ores ( $\text{ZnS}$  and  $\text{PbS}$ ),  $\text{NaCN}$  is used as a depressant which selectively allows  $\text{PbS}$  to come with froth, but prevents  $\text{ZnS}$  from coming to froth. This happens because  $\text{NaCN}$  reacts with  $\text{ZnS}$  to form  $\text{Na}_2[\text{Zn}(\text{CN})_4]$ .



### 9. Why is the extraction of copper from pyrites more difficult than that from its oxide ore through reduction?

**Ans.** The Gibbs free energy of formation  $\Delta_f G$  of  $\text{Cu}_2\text{S}$  is less than that of  $\text{H}_2\text{S}$  and  $\text{CS}_2$ . Therefore,  $\text{H}_2$  and  $\text{C}$  cannot reduce  $\text{Cu}_2\text{S}$  to  $\text{Cu}$ .

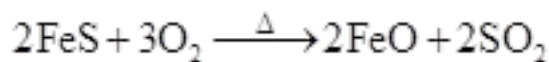
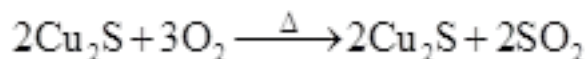
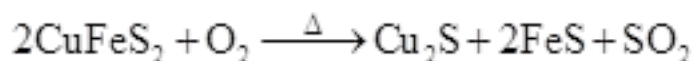
On the other hand, the Gibbs free energy of formation of  $\text{Cu}_2\text{O}$  is greater than that of  $\text{CO}$ . Hence,  $\text{C}$  can reduce  $\text{Cu}_2\text{O}$  to  $\text{Cu}$ .



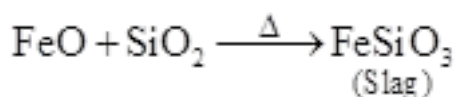
Hence, the extraction of copper from its pyrite ore is difficult than from its oxide ore through reduction.

### 10. State the role of silica in the metallurgy of copper.

**Ans.** During the roasting of pyrite ore, a mixture of FeO and  $\text{Cu}_2\text{O}$  is obtained.

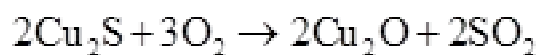


The role of silica in the metallurgy of copper is to remove the iron oxide obtained during the process of roasting as 'slag'. If the sulphide ore of copper contains iron, then silica ( $\text{SiO}_2$ ) is added as flux before roasting. Then, FeO combines with silica to form iron silicate, ( $\text{FeSiO}_3$ ) (slag).



#### 11. Why copper *matte* is put in silica lined converter?

**Ans.** Copper *matte* contains  $\text{Cu}_2\text{S}$  and FeS. Copper *matte* is put in a silica-lined converter to remove the remaining FeO and FeS present in the *matte* as slag ( $\text{FeSiO}_3$ ). Also, some silica is added to the silica-lined converter. Then, a hot air blast is blown. As a result, the remaining FeS and FeO are converted to iron silicate ( $\text{FeSiO}_3$ ) and  $\text{Cu}_2\text{S}$  is converted into metallic copper.

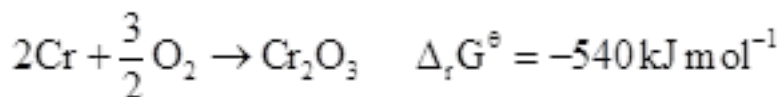
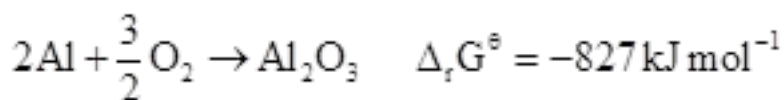


**12. The value of  $\Delta_f G^\ominus$  for formation of  $\text{Cr}_2\text{O}_3$  is  $-540 \text{ kJ mol}^{-1}$  and that of  $\text{Al}_2\text{O}_3$  is  $-827 \text{ kJ mol}^{-1}$ . Is the reduction of  $\text{Cr}_2\text{O}_3$  possible with Al?**

**Ans.** The value of  $\Delta_f G^\ominus$  for the formation of  $\text{Cr}_2\text{O}_3$  from Cr ( $-540 \text{ kJ mol}^{-1}$ ) is higher than

that of  $\text{Al}_2\text{O}_3$  from Al ( $-827 \text{ kJ mol}^{-1}$ ). Therefore, Al can reduce  $\text{Cr}_2\text{O}_3$  to Cr. Hence, the reduction of  $\text{Cr}_2\text{O}_3$  with Al is possible.

Alternatively,



Subtracting equation (ii) from (i), we have



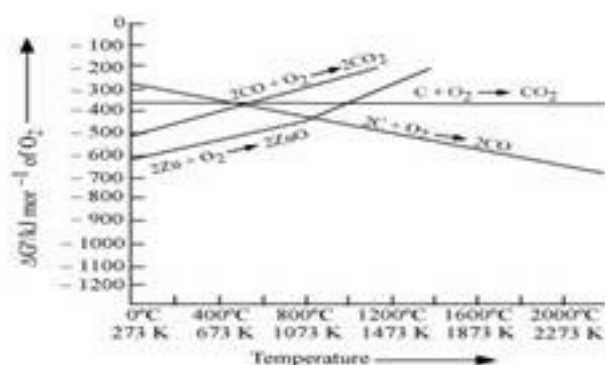
$$\Delta_r G^\ominus = -827 - (-540)$$

$$= -287 \text{ kJ mol}^{-1}$$

As  $\Delta_r G^\ominus$  for the reduction reaction of  $\text{Cr}_2\text{O}_3$  by Al is negative, this reaction is possible.

**13. Out of C and CO, which is a better reducing agent for ZnO?**

**Ans.**



Reduction of ZnO to Zn is usually carried out at 1673 K. From the above figure, it can be observed that above 1073 K, the Gibbs free energy of formation of CO from C and above 1273 K, the Gibbs free energy of formation of  $\text{CO}_2$  from C is lesser than the Gibbs free energy of formation of ZnO. Therefore, C can easily reduce ZnO to Zn.

On the other hand, the Gibbs free energy of formation of  $\text{CO}_2$  from CO is always higher than the Gibbs free energy of formation of ZnO. Therefore, CO cannot reduce ZnO. Hence, C is a better reducing agent than CO for reducing ZnO.