

Use separate answer script for each half

Group A

Answer all questions

1. Say if the following statements are true (T) or false (F). Write nothing else. [10 x 1]
- In polymetallic sea nodules, the highest concentration is of Manganese
 - A “booster reaction” for metallothermic reduction of halides or oxides of reactive metals, helps both kinetically as well as thermodynamically.
 - In aluminium electrolytic cell the “Anode effect” occurs above 2% alumina in the electrolyte.
 - The same electrolyte composition is employed in electrolysis and electro refining of aluminium.
 - Secondary metals refer to metals that are less important.
 - Ferrochrome melts containing high levels of carbon can be decarburized by oxygen injection.
 - All fertile isotopes of nuclear metals can undergo fission reaction.
 - The imperial smelting process handles calcines of mixed lead and zinc sulphides.
 - Zinc cannot be produced by electrolysis of acidic aqueous solution because zinc displace hydrogen for being more reactive.
 - A bipolar cell means a cell with intermediate electrodes where opposite faces serve as positive and negative electrodes.
2. Discuss briefly for any five why the following statements are true [5x5]
- In india’s nuclear energy program, the Thorium deposits are of most vital importance.
 - Some oxides can be chlorinated only by indirect chlorination.
 - Extraction of Copper by mattle smelting practically needs no reductant.
 - There is series-parallel connection in the aluminium electrolytic cell.
 - The increase in GDP is not necessarily the best index of a country’s progress.
 - In Pidgeon’s process for Magnesium production dolomite will be preferred to Magnesite.
 - Ferro alloying elements are generally produced as ferro alloys and not in elemental form.
 - Scrap iron is added in lead blast furnace for higher lead recovery.
 - During bio leaching, bacterial colonies are not destroyed, rather they flourish.

Group B

Attempt any three. Two marks are reserved for neatness.

1. Justify the following: 2+2+2+3=11
 - a. Titanium implants can be made bioactive.
 - b. Most of the Titanium alloys cannot be age hardened except Boron and Copper
 - c. Copper can prevent bio-fouling very efficiently
 - d. Zn is added in Mg-Al alloys to improve strength.
 - e. Dezincification is not considered as a problem for Red alpha (α) brass.

2. Write short note on the following: 4+3+4=11
 - a. different heat treatments for different classes of Ti alloys
 - b. special features of Copper and its alloys that make it indispensable in the modern world.
 - c. Thixo casting and squeeze casting of aluminium alloys.

3.
 - a. State the purpose of RE additions in Mg alloys. 3+4+4=11
 - b. Classify alloy additions in Titanium based on their ability to influence the stability of different phases.
 - d. Titanium is a candidate material for the first wall of magnetically confined fusion reactors – give reason.

4.
 - a. For Mg alloys deformation is only restricted to $\{1000\}$ plane and $\langle 112\bar{0} \rangle$ direction 3+4+4=11
– comment
 - b. How pore formation during welding of Mg alloys can be avoided?
 - c. Comment on the microstructure control for Mg alloys through texture.

5. State the controlling factors for the following: 4+4+3=11
 - a. microstructural features that controls mechanical properties of Aluminium alloys
 - b. metallurgical factors that influence fatigue and creep properties of aluminium alloys
 - c. factors that affect melting of aluminium alloys