

Lecture 42: Self Assessment questions

- 1a) Explain the role of a basic oxidising slag in steelmaking. (04)
- 1b) Carry-over of the basic oxidising slag from the converter is undesirable to the transfer ladle. Why? How is it possible to minimise the carry-over of slag? (08)
- 1c) Explain the influence of lance height and the number of nozzles in the lance on the decarburization and dephosphorization reactions in the LD Converter. (08)
- 2a) Explain the procedure for charging sponge iron in an electric arc furnace. Discuss the advantages and limitations of using sponge iron as a charge material. (06)
- 2b) Discuss the basis of technological development in the electric arc steelmaking? Explain in detail the contribution of chemical energy in electric steelmaking in reduction of electric consumption. (08)
- 2c) What are the advantages of external desiliconization of hot metal prior to steelmaking (06)
- 3a) Draw a neat sketch of the setup for the continuous casting of steel. (06)
- 3b) What are the metallurgical controls adopted in the tundish. How do you avoid dead zones in the tundish? (08)
- 3c) Explain the effects of melt superheat and the rate of withdrawal on the quality of the concast billet. (06)
- 4a) Explain the cause of pipe formation during solidification. How can it be prevented? (05)
- 4b) Describe the mechanism of solidification of killed steel. (05)
- 4c) What are the principle objectives of oxidizing and reducing periods in electric arc furnace steelmaking? (08)
- 4d) Enumerate the factors that determine the consumption of electrode in EAF steelmaking. (02)
- 5a) What do you understand by complex deoxidation of steel melt? What are the advantages of complex deoxidation over simple deoxidation (08)
- 5b) Give the evolution philosophy of combined blown steelmaking. What are the operational benefits of this technology? (06)

5c) Explain the sequence of elimination of impurities between top blown and bottom blown converter steelmaking. (06)

6. Choose the correct answer

i) The most powerful deoxidizer for steel is

- (a) Silicon
- (b) Magnesium
- (c) Aluminium
- (d) Chromium

ii) Calcium carbide injection is done

- (a) To remove hydrogen gas
- (b) To increase calcium content of steel
- (c) To modify inclusions
- (d) To remove sulphur from hot metal

iii) Calcium silicide injection into liquid steel is done mainly for

- (a) Deoxidation
- (b) Inclusion modification
- (c) Dehydrogenation
- (d) Dephosphorization

iv) Hydrogen in liquid steel is dissolved

- (a) In the form of tiny gas bubbles
- (b) In atomic form
- (c) In molecular form
- (d) In ionic form

v) In a good rimming steel

- (a) Carbon and silicon content should be low
- (b) Silicon content should be low but carbon content should be high
- (c) Both Carbon and silicon content should be high
- (d) Silicon content should be high but carbon content should be low

vi) Activity of P_2O_5 in the steelmaking slag is lowered by

- (a) Increase in slag basicity
- (b) Decrease in slag basicity
- (c) Increase in bath temperature
- (d) None of the above

vii) Sulphide inclusion in steel may be modified by

- (a) Ca-Si injection
- (b) CaF_2 injection
- (c) Iron ore fines injection
- (d) Injection of passivated Mg granules

viii) Oxygen lance nozzles are made of

- (a) Copper
- (b) Ceramic materials
- (c) Same type of steel as that of lance
- (d) Graphite

ix) Circulation degassing of liquid steel is carried in

- (a) VAD refining process
- (b) VOD refining process
- (c) RH process
- (d) Stream degassing process

x) Complete deoxidation of liquid steel is necessary for the production of

- (a) Killed steel
- (b) Semi-killed steel
- (c) rimming steels
- (d) Capped steels

xi) In a Fe-Cr-C system, the temperature for preferential decarburization during oxygen lancing is lowered by

- (a) A reduction in the partial pressure of CO
- (b) On increasing the partial pressure of CO
- (c) An increase in the Cr content in the bath
- (d) Decrease in the Cr content in the bath

xii) Minimum segregation occurs in an ingot of

- (a) Rimming steel
- (b) Semikilled steel
- (c) Killed steel
- (d) None of the above

xiii) Dephosphorization is favoured by

- (a) High temperature and a basic oxidizing slag
- (b) Low temperature and a basic oxidizing slag
- (c) Low temperature and an acidic oxidizing slag
- (d) Low temperature and a reducing basic slag

xiv) Austenitic stainless steel is prepared in

- (a) AOD Converter
- (b) OBM converter
- (c) Ladle furnace
- (d) Open hearth furnace

xv) Mould oscillation is used in continuous casting of steel

- (a) To heal cracks formed on the surface of the casting
- (b) To obtain good mixing of liquid inside the mould
- (c) To float out inclusions
- (d) To avoid rhomboidity of steel

7) State *true* or *false*

- (a) The viscosity of slag increase with decreasing basicity of slag
- (b) The rail steel is produced in Bhilai steel plant
- c) Complete solidification of the slag occur in the continuous casting mould
- d) Fireclay bricks are not resistant to attack by iron oxide
- e) Calcium is a weak alumina inclusion modifier
- f) Inclusion engineering involves removal of inclusions from steels
- g) It is desirable to have martensite in steel for toughness
- h) Springback phenomenon is associated with the hot working of steel
- i) In electric steelmaking foaming of slag is desirable
- j) Rimming reaction in steel is due to evolution of hydrogen during solidification.

8) Give specific answer to the following

- I. Differentiate between pig iron, cast iron and steel
- II. Why big ingots with circular cross section are not cast?
- III. What is the current level of steel production in India
- IV. Name the integrated steel plants in India in public sector
- V. Name five mini steel plants in India
- VI. Why are Laval nozzles used in steelmaking/
- VII. What are the functions of argon gas in R-H degassing process
- VIII. Is electric steelmaking autogeneous? Explain in brief
- IX. What are conditions of producing rimming steel ingots
- X. Give parameters to judge quality of sponge iron for its usage in electric steelmaking
- XI. How does preheating of scrap decrease electric consumption in electric steelmaking

- XII. Why is it necessary to inject carbon in electric steelmaking?
- XIII. What are the future prospects of steel industry in India?
- XIV. What is the cause of Mn reversion in LD steelmaking
- XV. Why is it necessary to modify alumina inclusions in steel?
- XVI. Is excessive addition of aluminium for deoxidation of steel harmful from metallurgical point of view?
- XVII. What is teelmaking?
- XVIII. What is the mechanism of decrease in viscosity of pure liquid silica on addition of CaO
- XIX. Define basicity of slag from ionic slag model
- XX. Why is it necessary to have excess lime in slag in converter steelmaking?