UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

SECOND SEMESTER EXAMINATIONS, MAY 2018

COURSE NO: MN 270
COURSE NAME: **EXTRACTIVE METALLURGY**
CLASS: **MN II** TIME: 3 HOURS

Name**:** _____Index Number: _____

1. In pyrometallurgy, extraction is achieved through physical or chemical transformations in the materials.

2. Pyrometallurgical processes include drying, calcining, Roasting, adsorption, smelting and refining.

3. Fuels are not materials which are burned or altered in order to obtain energy to produce heat.

4. Agglomeration is a process by which coarser grain materials are converted into finer grains.

5. Briquetting, nodulising, coning, pelletising and sintering are processes by which fine grain materials are converted into coarser lumps.

6. In extractive Metallurgy, materials are dried to remove mechanically held or chemically combined water with the minerals.

7. Roasting of a substance is done when the substance is heated above its fusion temperature in the presence of air.

8. During hearth roasting, the entering ore drops from hearth to hearth and the sulphide ore particles are roasted as they come into contact with the dropping gases.

9. Industrially, the vertical hearth furnace can roast between 1000-2000 tons of material per day.

10. Fluidised bed roaster (FBR) is a reactor (device) that is used to carry out a variety of multiphase physical reactions of ores and concentrates.

11. In blast roasting, the air circulation in the multi hearth roaster is always forced through the charge.

12. To obtain a good roasted product during roasting, the particles should be relatively coarse to enhance the rate of reaction.

13. In smelting, the material is charged in the liquid form and the product from a smelter is always in the solid state.

14. During matte smelting, metallic oxides and slags are the major components formed.

15. Fluxes are compounds which increase melting point of slag forming constituents in order to enhance easy melting and floating.

16. A slag is the substance that forms the top layer after smelting and is glasslike in nature which is hammered off and normally contains siliceous or oxide and sulphide materials.

17. Refractory materials are used in linings for furnaces, kilns, incinerators and reactors and are chosen according to the conditions they face.

18. In a heap leap process, the ore is not porous which ensures proper dissolution and extraction of mineral values.

19. Pressure leaching is normally used for ores of oxide minerals that require high temperatures and pressures.

20. Pressure leaching is relatively cheap due to the need to set up equipment to take care of the high temperature and pressure.

21. The pregnant solution from leaching is purified to get rid of wanted substances that may have been co-leached.

22. During drying, the ore or substance is heated below the normal boiling point of water at atmospheric pressure.

23. During hydrometallurgical processes, solution purification is done by adsorption, crystallization, elution, solvent extraction, ion exchange, ion flotation and cementation.

24. Adsorption is the concentration or purification of ions or molecules of the mineral of interest in a liquid phase into activated carbon in a solid phase.

25. During extractive metallurgical processes, the rate of adsorption depends on the area of the materials used as adsorbents.

26. In hydrometallurgy, the driving force for crystallisation is the saturation-point of minimum dilution.

27. Electro-winning is the electrolytic extraction of metal from an electrolyte containing solid metal by the passage of electrical current.

28. Electro-refining is said to be the process by which pure metal is refined using electrolytic methods.

29. Electro-plating refers to the depositing a sound metallic coating with the required characteristics into a conducting surface by means of electrolysis.

30. Electroplating is used to improve the nature of metallic and non-metallic materials.

31. Electroplating is used to improve the abrasion resistance of steel balls, restore worn out parts of a material and to provide protection against corrosion.

32. One of the strong properties of gold which is exploited in its recovery is its solubility in acidic or alkaline solutions in oxidising environments.

33. In processing of free milling ores, about 95 % of the gold is recovered by simple direct cyanidation at 80 % passing 75 μm particle size and its associated minerals include silica, hematite, sulphides, magnetite and illmenite.

34. In the treatment of refractory (complex) ores, gravity concentration or direct cyanidation recovers significant (above 95%) portions of the gold.

35. Feed to bioreactors is mainly flotation concentrate and the processing time is between 3 and 5 h and dissolved oxygen levels are kept below 2 ppm.

36. Gold is transferred chemically from the solid state to the liquid state by cyanidation and the gold ions found in the cyanidation solution are always in the form of complexes.

37. Carbon in leach (CIL) is mainly used in treating ores with a insignificant portion of carbonaceous materials in the ore.

38. Carbon fouling is the increase in the activity of carbon due to the adsorption of certain substances in the process stream.

39. The smelting of gold material involves the melting of the low-grade concentrate material and the removal of the base metal and other impurities so as to produce Au-Ag bullion.

40. The quality of silica-borax flux does not depend on amount of base metals and other impurities present.

SECTION B

(Answer Any Two Questions)

Question 1

a. As the Metallurgical Trainee at the CIL section of Hopeful Gold Mine, what factors will you consider during electrowinning on your shift?
b. List the factors which affect gold adsorption using activated carbon in a processing plant
c. What are the conditions under which gold is dissolved in a gold processing plant?
d. Carefully draw the flowsheet of your processing plant (Hopeful Gold Mine) if your plant treats free milling ore.

Question 2

a. Name the factors that will influence your choice of a refractory in an extractive metallurgical furnace design.
b. Give four functions of slags which are important in smelting processes.
c. Distinguish between a slag, speiss and a matte. State the specific gravity and the compounds that are responsible for each.
d. List the common methods of roasting you studied in extractive metallurgy.
e. Write down four calcination processes and give examples of each.

Question 3

a. Define drying as is considered in extractive metallurgy and state how it is usually carried out.
b. Define the term "fuel" and indicate how fuels are classified with examples.
c. What are the essential properties of fuels?
d. List the choices that are considered in lixiviant selection in a hydrometallurgical leaching process.
e. Briefly explain the following in terms in electrometallurgy;

i. Electro-winning
ii. Electro-refining
iii. Electroplating

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