Subject B.—*Amalgamation Machines.*

1. What is meant by the amalgamation of ores containing gold and silver ? How is amalgamation produced, and how are the metallic contents collected and made into a marketable condition ?

2. Describe the mechanical appliances that are used for amalgamation : (a) The quantity of ore that each pan can treat in twenty-four hours ; (b) the speed that each has to be driven at, and the quantity of quicksilver charged in each.

3. In using a pan for amalgamating purposes, what effect, if any, is produced by the use of salt and sulphate of copper in amalgamation of gold ?

4. How is amalgam removed from pans that are used for amalgamating purposes, and how are the metallic contents made into a marketable condition ? Describe fully.

Subject C.—*The Use of Quicksilver, and Methods of using it in connection with the Extraction of Gold and Silver from Ores.*

1. How is it ascertained when quicksilver is not in a fit state for the amalgamation of gold or silver ? What means should be taken to effect a remedy ?

2. What effect has the treatment of concentrates containing gold, silver, lead, antimony, and copper on quicksilver used for amalgamation, and how are the different metals separated ? Explain fully.

3. Describe how copper plates are coated with quicksilver, also how they are kept in good condition and the amalgam removed.

4. In using copper plates to cover amalgamating-tables, give the minimum thickness of plates you would use, and give reasons for same.

5. If crushed auriferous ore containing antimony were treated by amalgamation on amalgamating-tables, what effect would be produced by a current of electricity in contact with the quicksilver in the ripples ?

Subject D.—*Cyanide, Chlorination, and other Chemical Processes of recovering Gold and Silver from Ores.*

1. What is meant by the recovery of gold from ore by using cyanide solutions ? How is this effected ? (a.) How is the ore prepared to be in a fit state to be treated with KCN solutions ? (b.) How are KCN solutions made ? (c.) How do you ascertain the best strength of KCN solutions to use, and the length of time the ore requires to be treated with such solutions ?

2. In using 216 lb. of crude cyanide containing 75 per cent. of KCN in a sump solution containing 0·012 per cent. KCN, required the quantity of solution it would need to make up a solution of 0·2 per cent. KCN.

3. If 40 tons of sump solution contained 0·08 per cent. of KCN, required the quantity of stock solution containing 11 per cent. KCN to make up the sump solution to 0·15 per cent. KCN.

4. How is bullion extracted from KCN solutions, and how are the solutions separated from the gangue ; also, how is the bullion made into a marketable condition ? Describe fully.

5. If a circular vat had to be constructed to hold 200 tons of pulverized ore to a depth of 6 ft., required the diameter of the vat, taking the weight of the ore at 112 lb. per cubic foot.

6. If any of the workmen were suffering from hydro-cyanide poisoning, what steps would you take to alleviate the sufferer, and what antidote would you use ? Describe fully.

7. What is meant by the chlorination of ore containing gold ? How is it affected (a) by the Plattner process, (b) by the Newbury-Vautin process ; (c) how is the gold recovered and made into a marketable condition ?

8. What effect, if any, has the treatment of raw concentrates on KCN solutions ? What do you consider the most effective and economical method of extracting the gold from pulverized iron and arsenical pyrites ?

Subject E.—*Sampling and Testing of Ores.*

1. Describe the better-known methods of sampling, for assay, the quartz as it comes from the mine.

2. Describe the fire assay of a sample of quartz, and explain the chemistry of the various processes involved. How would you modify the assay if the sample consisted mainly of galena?

3. How would you estimate tin in a sample of low-grade ore?

4. What tests would you make in order to detect the following elements when occurring singly in rocks : Silver, lead, antimony, tin, chromium, zinc?

5. How would you prove the presence of the following elements in a sulphide ore : Arsenic, iron, mercury, bismuth?

Subject F.—*A Knowledge of Arithmetic and the Method of keeping Battery Accounts.*

1. The weekly wages in a crushing-mill, where 30 men and 11 boys are employed, amount to £150 7s. 6d. ; each boy gets $\frac{11}{18}$ of the wages of each man : how much did each man and boy receive ?

2. A Lancashire steam boiler is 30 ft. long and 7 ft. in diameter, having two furnace-tubes through it 2 ft. 6 in. in diameter : when lying horizontally how many imperial gallons of water would it take to fill the boiler to within 21 in. of the crown ?

3. A Pelton water-wheel 6 ft. in diameter under a head of 150 ft. is required to develop 40 horse-power : allowing the wheel to give 80 per cent. of the theoretical power of the water, how many cubic feet of water is required to give the horse-power, and what diameter of nozzle will it take to deliver this quantity on the wheel ?

4. The value of bullion is £13,450 16s. 7d. ; it contained gold 0·3437 fine, the balance being silver : taking gold at £4 3s. 6d. per ounce and silver at 2s. 1d. per ounce, how many ounces of gold and silver did the bullion contain ?

5. Show arithmetically the cube root of 0·00413 squared.