

5. Describe a safe method of sinking through wet alluvial ground having 15 ft. of running sand. In opening out a level from the shaft where the headings over the auriferous wash are composed of boulders and loose gravel, how would you timber the ground to secure the shaft to provide for the safety of the men, and what method would you adopt in blocking out the wash-drift?

6. Give size of a working shaft to haul 200 tons per day, and show by sketch where the pump and ladder-way should be.

7. In driving through bad ground, show how you would fix face-boards; and how you would stay the main and false sets.

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FIRST DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT B.—*The Timbering of Shafts, Adits, Main Drives or Levels, Passes, Stopes, and generally the Systems of timbering Mines and filling up Old Workings.*

1. Show the best method of fitting frames in a main shaft having pumping, winding, and ladder compartments. If planks are used, how would you fit them, and what size, to show strength and workmanship?

2. What size would you have the main level, and how would you fit the sets and stay them in place? In what kind of ground would you use sole-pieces, and what workable grade would you allow for haulage and drainage?

3. Show by sketch how you would timber double and single passes, and what provision you would make for the safety of men going to and coming from the stopes.

4. Show how you would timber stopes on a reef 10 ft. wide, and the distance between each pass; also how you would provide for filling the stopes, and the number of stopes you consider safe to be left open.

5. Show by sketch how you would arrange the full and empty trucks to pass each other at the chamber; also in the main level.

6. In putting an uprise through loose ground state how you would timber it, and the precaution necessary for the safety of the men.

7. Show by calculation the breaking strain and also the safe load on a cap-piece of black-birch timber 5 ft. long and 12 in. in diameter between the supports; also the crushing strain on a prop 6 ft. long and 12 in. in diameter of the same class of timber.

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SECOND DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT E.—*The Ventilation of Mines and Composition of Gases.*

1. Name the different gases likely to be met in working metalliferous mines, their weight and composition compared to common air, and how you would distinguish them to give the percentage deleterious to workmen.

2. State the general principles on which ventilation is based, and show how you would find the amount of air passing through an air-course. An air-course was carrying 20,432 cubic feet per minute, and you had to divide it into three splits of equal perimeters but different lengths—

No. 1, 200 yards long;

No. 2, 400 yards long;

No. 3, 600 yards long:

Calculate the amount of air passing through each air-course.

3. How would you calculate the difference in weight per square foot, the thermometer 50 degrees at the downcast and 150 degrees at the upcast; barometer reading 30 at a depth of 600 ft.?

4. State the quantity of carbonic-acid gas given off by each workman, by a candle, by explosives, and from other sources per hour, and the quantity of air per minute required to remove deleterious effects to workman.

5. Describe the best method of ventilating a mine by natural ventilation, and give the different appliances used for mechanical ventilation.

6. How would you treat a person overcome by gas in a mine in the absence of a doctor?

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SECOND DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT F.—*Tapping Water in Mines, and the Mode of constructing Dams in Underground Workings to keep the Water back.*

1. Show by calculation the pressure there is on a dam 10 ft. long and 8 ft. high, built in a drive, holding water back to a height of 150 ft. Show by sketch how you would construct such a dam of timber; also of brick and concrete.

2. If water was met with in driving a crosscut from the main shaft, what method would you adopt to prevent the water going down the main shaft to where men were sinking?

3. In driving a drainage-tunnel through solid rock to tap water, known to be of great pressure, what precaution would you take to insure the safety of the men?

4. What precaution would you take in tapping water underground in old alluvial workings where the ground is likely to be caved in; and state fully the method you would adopt to drain the water off without risk to property and danger of the men?