

ANNEXURE D.

QUESTIONS ASKED AT THE EXAMINATION HELD DURING DECEMBER, 1914, FOR MANAGERS' FIRST- AND SECOND-CLASS CERTIFICATES OF COMPETENCY UNDER THE MINING ACT.

SUBJECT I.—*Mining.*

1. A vertical shaft 14 ft. long by 6 ft. wide in the clear, three compartments, has been sunk to a depth of 850 ft.; the two winding-compartments are continuously used hauling ore and mullock from the 850 ft. level. Make out a working specification for a contract to sink the above shaft a further depth of 150 ft. of a similar size (labour only—*i.e.*, sinking, dressing timber, and putting it in position).
2. State the number of men you would employ, also how you would protect them against accident.
3. Show by sketch how the timber is fitted, the size used, the dimensions of each compartment, the distance of sets apart, also where you would place the bearing-set.
4. In stoping a lode, say, 25 ft. wide, how far apart would you place quartz passes and ladder-ways, in horizontal stopes, in rill stopes, and in shrinkage stopes respectively?
5. Describe how you would put up a rise, with safety to the miners, 100 ft. in firm shooting ground.
6. Show by sketch how a cylindrical quartz pass, 4 ft. inside diameter, is constructed with sawn timber.
7. Give the safe uniform load that a straight-grained piece of square rimu timber, 12 in. by 12 in., 20 ft. between rests, will sustain.
8. How many machine-holes would you bore in a vertical hard face of level or drive 7 ft. high by 5 ft. wide? Show sketch of cut-holes, front and side view.
9. What, in your opinion, is the safest way to fire ordinary safety-fuse to avoid accidents, having no electric exploder in use?
10. Explain how you would fire a round of holes in rotation with an electric exploder, so that they would not all explode simultaneously.
11. Name the explosives generally used in quartz-mines. In your experience, which one is the most economical and gives the best results in medium-hard laminated rock?
12. Describe what precaution you would take in driving near an abandoned mine where an accumulation of water is known to exist.

SUBJECT II.—*Mechanics.*

(*First-class Candidates only*).

1. State the essential qualifications of a brake for a winding-engine, and show by means of sketches two types of brakes commonly used.
2. Define the meaning of the terms "breaking-strain," "safe working-strain," "live load," "elastic limit," as applied to wire ropes.
3. State the effects of scale, sediment, and oil in a steam boiler, and what course should be taken to counteract the injurious effects.
4. Describe the construction of a water-blast for the ventilation of a level.
5. A Cornish plunger pump is required to lift 500 gallons per minute: give diameter of barrel, length of stroke, and speed per minute.
6. It being decided at a mine to install electric power for winding, operating pumps, air-compressing, &c., such electric power to be generated by water-power some distance from the site of mining operations, the head available at the water-power site being 300 ft., what particulars would you have to supply to hydro-electric firms so that they could give you a complete tender with specifications of plant? State the quantity of water they would require to operate the plant.
7. For what work in connection with mining operations is suction-gas power suitable, and under what conditions would you consider it more suitable than a steam plant?

SUBJECT III.—*Ventilation.*

1. Describe how dust and smoke, after blasting in mines where rock drills are used, may be immediately allayed.
2. Comment upon the anemometer, pitot tube, and powder-smoke for the measurement of mine-air velocity. State the limitations of each method.
3. What is the object of splitting the air in mines? To what general result is it conducive, and how is it effected?
4. A volume of gas at a temperature of 55° F. and with a barometric pressure of 30 in. occupies a space of 15,000 cubic feet. What would be the alteration in volume if the temperature were increased to 60° F. and the barometer dropped to 29 in.?
5. The downcast and upcast shafts are each 1,200 ft. deep; the temperature of the downcast is 60° F., upcast 100° F., barometer 30 in. What is the motive column and water-gauge?