

ANNEXURE A.

QUESTIONS ASKED AT THE EXAMINATION HELD DURING DECEMBER, 1915, FOR MANAGERS' FIRST-CLASS CERTIFICATES OF COMPETENCY UNDER THE COAL-MINES ACT.

SUBJECT 1.—*Mining : Opening out a Colliery ; Working Coal ; Timbering ; Boring.*

1. Having to sink a shaft for the working of a seam of coal 6 ft. thick lying at a depth of 1,000 ft. and having a dip of 1 in 5, what size pillars would you leave for support of shaft? Give calculations and show by sketches the general arrangement of shaft-bottom to deal with an output of 1,000 tons per eight-hours shift.
2. A seam of coal 10 ft. thick and liable to spontaneous combustion is to be worked on the panel system. Make sketch-plan of workings showing position of shaft, the barriers to be left between panels, and position at which you would build stoppings in case of fire occurring in any panel; also show general course of ventilation from downcast shaft by return-air course to the upcast.
3. Describe and illustrate by sketches how you would open out longwall workings from a pair of shafts sunk in the centre of a lease of 800 acres: seam 5 ft. thick, roof strong shale, dip of strata 1 in 15; output per day from one shaft, 800 tons.
4. Describe with sketches how you would proceed to clear away a heavy fall with a rotten roof, and show what you consider the best system of timbering to apply to guard against side pressure as well as top weight.
5. Describe the process of sinking and walling a circular shaft 14 ft. diameter in the clear, 1,500 ft. deep, and dealing with 10,000 gallons of water per hour, met with at a depth of 300 ft.
6. Show by sketches the general surface arrangement of a colliery drawing 600 tons of coal per shift of eight hours, showing location of downcast and upcast shafts, and all requisite appliances for the handling and preparation of coal for market.
7. State your experience of boring, and describe the diamond drill, stating the conditions most favourable for its successful working.
8. Give your experience of extracting pillars in bord-and-pillar workings. Describe how the greatest protection from falls is to be secured, illustrating by sketches; also describe the work of drawing timber, the best appliances for use in such work, and any special precautions deemed necessary for the safety of men carrying out such work;

SUBJECT 2.—*Mechanics : Pumping-appliances and Mine-drainage ; Tapping Water and Dam-construction in Mines ; Winding in Shafts ; Hauling on Underground Planes ; Compressed-air and Steam-power Plants ; Strength of Materials ; Elementary Electricity.*

1. What size hauling-engines would be required to haul 100 tons of coal per hour by direct haulage up an incline 1,000 yards long rising 1 in 6, the effective steam-pressure being 70 lb. per square inch? Assume your own dimensions of tubs, ropes, rollers, &c.
2. Describe and illustrate by sketches how you would fit up a self-acting incline to run 250 tons a shift of eight hours, grade 1 in 5 and length 200 yards. State whether you prefer to run tubs in sets or by self-acting endless rope, and what safety appliances you would adopt.
3. Sketch a Lancashire boiler, showing the position of all fittings required with names of each, and state under what condition scale occurs and the dangers likely to arise from its pressure on the plates of a boiler.
4. If you found it desirable to ascertain the general condition of a winding-engine raising a large output from a deep shaft, describe carefully and in detail what you would require to be done to make the examination thorough and complete?
5. State your views regarding the use of compressed-air and electricity in coal-mines, stating the particular purposes for which one or other of these means of transmission is best suited, and the advantages and disadvantages of each.
6. What do you understand is meant by the term "potential" and "potential difference" in electrical appliances?
7. To light a mine with 200 lamps of 16 c.p. each what amount of mechanical energy would have to be available for conversion into electricity?
8. What load will break a beam of kauri, 12 in. by 10 in., 15 ft. long, between supports: load evenly distributed along the length of the beam? State also load required to break the beam if loaded in centre.

SUBJECT 3.—*Ventilation : Ventilation of Mines and Knowledge of Mine Gases ; Spontaneous Combustion of Coal, and Methods of Dealing with Underground Fires ; Rescue Apparatus ; Practical Knowledge of Gas-testing with a Safety-lamp.*

1. What do you consider a reasonable or ordinary velocity for air to be passed through a main air-way? What is the greatest velocity you consider practicable? What are the advantages of high velocity, and what, if any, are the disadvantages of a low velocity in a fiery mine?
2. If a tunnel 50 yards long by 60 ft. cross-sectional area was filled with a mixture of fire-damp and air at the most explosive point, what quantity of air would be required to dilute it so as to be non-explosive?