

2. How would you secure the sides of a sinking pit through a thick bed of quicksand at a considerable depth from the surface? Describe briefly the various methods you might adopt.
3. In opening up a new seam of coal state fully what considerations would influence you in deciding whether to work by long-wall or pillar and stall.
4. What is meant by a ventilation district and main-haulage road?
5. What precautions would you enforce to insure safety to men when firing shots in a sinking pit?

SUBJECT 2.—*The Various Methods adopted in securing Shafts and Workings in a Mine, showing Relative Efficiency of each Class of Material used.*

1. How would you ventilate the space below the scaffold when bricking-in a sinking pit?
2. Make sketches showing the best mode of setting timber in main roads to resist top and side pressure.
3. State your experience regarding the effects of pack-walls and of solid pillars of coal on roofs or tops of different descriptions.
4. What pillar of coal would you leave for the protection of a pumping-shaft in a seam 6ft. thick, dipping 1ft. in 3ft., the depth of shaft being 1,200ft.?
5. State what, in your opinion, are the two most serious classes or sources of accidents in mines, giving reasons for same.

FIRST DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT 3.—*The Various Methods of hewing and cutting Coal of Different Classes, and securing Ground while so engaged.*

1. Give a sketch of a full-sized district—(1) Border and pillar; (2) long-wall, showing how to ventilate the working-faces.
2. With a bad roof, how would you proceed to take out chocks?
3. If necessary to build stoppings in intake and return roads to seal off a fire at the far end, how would you proceed, and what precautions would you take?
4. Describe the various modes of getting thick coal—(1) Bituminous; (2) brown coal.
5. What are the conditions and precautions under which shot-firing may be permitted in a fiery mine?

SUBJECT 4.—*Various Methods of ventilating, and Constructions of Air-ways.*

1. The barometer at the top of a shaft is 30.3in., the thermometer is 65° F., the depth of shaft 700ft., and the thermometer at the bottom stands 75° F.: say what is the difference of the pressure at the top and bottom of shaft, and the difference in the reading of the barometer?
2. What are the natural laws affecting the ventilation of mines, and how is the safety of a mine affected by the variations of the atmospheric pressure?
3. What is meant by splitting the air, and how does it affect the general ventilation of a mine, and what limit is there to practising it?
4. Describe fully the lamp you consider the safest for use in fiery mines, and state what the Act requires with respect to the "construction of safety-lamps."
5. Which is the most difficult to ventilate, an upbrow or downbrow place? What forces are against you, and what in your favour?

SECOND DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT 5.—*On Area of Airway, the Velocity and Division of Currents, and Deductions to be made for Friction.*

1. If 20,000 cubic feet of air circulate through a mine by the expenditure of 64,000 units of work, what quantity would circulate if the units of work were increased to 343,000.
2. There are three airways in a colliery—A being 3,000ft. long, 6ft. by 5ft.; B being 4,000ft. long, 6ft. by 6ft.; C being 2,000ft. long, 5ft. by 5ft.: the total quantity of air passing in the three airways is 50,000 cubic feet per minute: what quantity will each airway take?
3. In a colliery giving off CH₄ and CO₂ freely, what system of ventilation would you adopt to meet each case, and what proportion should they bear to one another?
4. Sketch furnace and dumb-drift suitable for passing 50,000 cubic feet of air per minute, marking principal dimensions thereon.
5. What is the comparative friction of the air when travelling at the same velocity through an airway 8ft. square and one 12ft. by 5ft. 4in.

SUBJECT 6.—*On the Nature and Composition of Explosives and Dangerous Gases met with in Coal-mines, and on Spontaneous Combustion.*

1. Give the composition of gelignite in detail.
2. What gases are most common in coal-mines? State their composition, and where most likely to be found.
3. Under what system would you work a mine liable to spontaneous combustion, and how would you deal with a job fire in such a mine?
4. A current of 2,000 cubic feet per minute is at explosive point: how much fresh air must be mixed with it to prevent it showing a cap?
5. What, in your opinion, is the best way of avoiding the risk of a "dust explosion" underground?