

SUBJECT 2.—*Working Coal and Timbering Underground Workings.*

1. What are the special dangers in working steep seams over those of flat seams? Describe the precautions you would adopt to guard against these special dangers.
2. How would you work a mine containing a seam 5 ft. thick with a strong roof and little packing material; dip about 1 in 4? Show by sketch the method of timbering the working-places.
3. Name the principal causes of accidents in mines. Give shortly the precautions necessary to avoid them.
4. How would you regulate the use and supply of timber in the workings of a colliery?
5. How would you proceed to draw the timber in abandoned workings, and what precautions would you take in connection with such work?

SUBJECT 3.—*Mine-gases, Spontaneous Combustion, and Ventilation.*

1. How would you detect the presence of firedamp, and how estimate the proportion present? Describe how you would proceed to search for firedamp in the working-faces and roads leading thereto.
2. What are the conditions which would influence you in deciding to increase the quantity of air above what the Coal-mines Act requires to circulate through the workings of a colliery?
3. What proportion of firedamp and air constitute the most explosive mixture, and at what proportion does the mixture cease to be explosive?
4. Have you had experience in dealing with underground fires? If so, give conditions, and say what you understand by the term "spontaneous combustion."
5. Ventilate the plan shown on annexed sheet, using the conventional reference signs to indicate your method.
6. Sketch a regulator, and state in what part of the workings you would fix it that it might be most effective, and state why. Sketch also an air-crossing, giving dimension for passing 30,000 cubic feet per minute over a main-haulage road.
7. State the general laws relating to friction of air in mines.

SUBJECT 4.—*Dealing with Old Workings and other Sources of Danger.*

1. What are the indications generally observed in the working-faces when approaching old workings, and what are the most essential precautions to be taken when working towards such?
2. State what you know of the present methods of firing shots, and which system you consider the best and safest; and say whether you would fire more than one shot at a time.
3. What do you understand by the term "blown-out shot"? What are the dangers to be feared from such, and what are the necessary precautions to prevent them?
4. Give your experience in working with safety-lamps, and say what type of lamp you consider best for detecting small percentages of firedamp.

SUBJECT 5.—*Mine Drainage and Haulage, and Appliances for Same.*

1. When a pump loses its water, what do you look for, and how do you remedy the defect? What is the maximum height that a pump can be fixed above the water to be pumped?
2. If you have a ram pump 12 in. diameter at the bottom of a shaft 200 ft. deep forcing water to the surface, what is the total pressure in pounds on the ram?
3. State what systems of haulage are in general use, and under what circumstances each is specially applicable. Describe the details of the system you are best acquainted with.
4. What are the appliances which should in all cases be provided for the prevention of serious accidents from overwinding?
5. If you have a roadway rising 1 in 13 from the winding-shaft, and over which it is required to convey 500 tons of coal per shift, describe the haulage system you would adopt.

SUBJECT 6.—*Practical Elementary Electricity.*

1. Name the laws governing the flow of electric currents.
2. A machine gives an electric pressure of 60 volts: what current will it send through a resistance of 5 ohms?
3. A machine has a pressure of 60 volts: what current will be developed by 80-horse power?
4. Under what conditions would you consider electric power the most suitable for application to work underground in a mine?
5. In electric shot-firing, what are the points to be carefully attended to by the fireman in order to prevent accidents?
6. What are the precautions to be carefully observed by those employed in connection with electric-power plants in order that accidents may be avoided?

SUBJECT 7.—*Arithmetic, and a Knowledge of the Coal-mines Act and Amendments, also First Aid to the Injured.*

1. In driving a heading 6 ft. high by 10 ft. wide and 150 yards long, the men are to be paid 4s. 6d. per cubic yard: what amount will be required to pay them?
2. If you had a feeder of 100 gallons of water per minute coming to your pumps, and you required 36 hours' standing lodge room, show by calculation the size of lodge room required.
3. If a water-gauge applied on separation-door gives a reading of 2.25 in., what would be the pressure per foot, and also total pressure against the door, the opening being 5 ft. 6 in. by 4 ft. 9 in.?
4. An air-current of 20,000 cubic feet per minute is passing through a roadway 8 ft. wide by 6½ ft. high: what is the velocity of the current per minute?