SUBJECT 2.—*Working Coal and Timbering underground.*

1. Describe the mode of working any seam of coal with which you are acquainted, and show by sketches the position of the main levels and branch headings.
2. The greater number of accidents in coal-mines are due to falls of roof and sides: state what in your opinion is the cause of such accidents, and the steps you would take to prevent them.
3. What precautions should be adopted to prevent miss-shots?
4. In what system of working coal are chocks used in preference to props, and what are the advantages of using timber in this form?

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

1. What do you understand by the term "*diffusion* of gases," and what instances do you know that appear contrary to that principle?
2. A mine "damp" is composed of 5 per cent. of CO_2 and 95 per cent. of N: what damp is this, and where would it lodge in the mine?
3. A mixture of air and CH_4, in the most explosive proportions (no dust being present), passes along an airway 8 ft. by 6 ft. at a velocity of 3 ft. per second: what quantity of fresh air should be added so as to render it impossible to detect the gas by the flame of an ordinary safety-lamp burning mixed colza and mineral oil?
4. A given mass of air occupies 2 cubic feet at 60° Fahr.: what volume will it occupy at 90° Fahr., and what is the weight of the above mass of air if the barometer stands at 30 in.?
5. State what is the general efficiency of fans. If the horse-power of an engine is 52·84 and the water-gauge 4·7 in., what quantity of air would you expect to obtain?
6. Describe, with sketches, how you would erect a regulator in an airway. Under what conditions would you require it, and where should it be placed?
7. An underground fire has broken out, the result of a fall in your bord-and-pillar workings; the fire is situated near the intake; in the mine is a full shift of men, several of whom have been "gassed": state what precautions you would take during your examination of the fire. What would be your method of procedure to overcome it, and how would you treat those men who were affected by the gas?
8. Ventilate the accompanying plan, having due regard to the requirements of haulage. Use the conventional reference signs to indicate your method.

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

1. Describe how you would build a dam in a drive against a possible static head of 1,000 ft. It is found that the only place in a drive where it is possible to build the dam is in faulted and broken ground near a dyke: what special precautions would you use in such case, and how would you provide for the safety of your men during the building of the dam and after its completion? Give sketches.
2. In approaching old and extensive coal-workings, containing 50 fathoms of water, for safety what should be—
   (*a.*) The maximum width of the drive;
   (*b.*) The minimum length and largest diameter of boreholes;
   (*c.*) The angle of and distance apart of flank-holes.
3. To prevent accidents from falls,—
   (*a.*) To what height should the first lifts during high-pillar extraction be limited?
   (*b.*) What should be the maximum of width of bords and cut-throughs respectively, both when breaking away and subsequently?

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

1. What are the conditions which would cause you to decide to wind water from a shaft in preference to pumping?
2. What are the conditions rendering the fixing of a direct-acting pump at shaft-bottom preferable to putting a pumping-engine on the surface?
3. Give your experience of the haulage of coal by mechanical appliances, and describe the system which you consider the best under such conditions as are usual in mines.
4. Give sketches of the lay-out of a self-acting incline, and the appliances used in connection with such means of haulage.

SUBJECT 6.—*Practical Elementary Electricity.*

1. State the conditions under which you would consider the use of electrical machinery dangerous in a mine, and name the precautions which should be strictly observed by those employed in operating electrical plant.
2. Show by calculation the electrical horse-power required to drive a centrifugal pump raising 200 gallons a minute to a height of 250 ft.
3. Give your experience in connection with the firing of shots by electricity, and state what you would do in the event of a shot missing fire under this system.
4. How many units per hour and how many horse-power are developed in a circuit where 1,500 amperes are driven by 150 volts.