

FIRST DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT B.—*On the Timbering of Shafts, Adits, Main Drives, or Levels, Passes, Stopes, and generally on the Systems of timbering Mines, and also in filling up Old Workings.*

1. Show by sketch how you would fit timber frames for a shaft 16ft. by 8ft. 6in., also how you would slab the shaft behind the frames if the ground was loose and liable to run.
2. Show how you would fit a set of timber for a main drive. Give the dimensions of the timber, the size of the sets, and describe how you would timber the drive if the ground was liable to swell.
3. Describe how you would timber passes, giving the size of timber you would use and the dimensions of a travelling-pass, size of mullock-pass, and the distance between the travelling- and mullock-passes.
4. Show the breaking-strain on a prop, 6ft. long, of kauri, 9in. in diameter, also on a cap-piece of the same timber 14in. in diameter and 7ft. between the supports, if cap were uniformly loaded. Show by calculation how you arrive at the result.
5. Show how you timber stopes where the lode was 30ft. wide and a bad roof.
6. Show by sketch how you would set the timber in a shaft whose dimensions were 12ft. long and 5ft. wide, the planking being 3in. thick, and the shaft divided into three divisions, if neither pins nor battens were used at the corners or at centres.
7. Describe how you would timber a main level through ground liable to run; also what provision would you make to secure the timber to prevent the sets coming down in the event of one set breaking.
8. Describe how you would timber a drive and secure it in going through quicksand, and give reasons fully.

SECOND DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT E.—*Ventilation of Mines.*

1. What is meant by natural ventilation? State the principle on which it is based.
2. If you could not get natural ventilation, what means would you adopt to dilute the air in a mine which was highly charged with carbonic-acid gas?
3. What is the greatest percentage of carbonic-acid gas in a mine you consider safe to work in without injuriously affecting the health of the workmen, and how would you ascertain this percentage?
4. Give the weight of a cubic foot of atmospheric air at 32° Fahr. and at 150° Fahr.
5. What is meant by friction in air-courses, and how do you calculate it? Is there any difference of friction in an air-course 3ft. by 8ft. and one 4ft. by 6ft., each air-course being 1,000ft. long? If so, give reason why, and show the difference by calculation.
6. If you had a fan capable of producing 9,000 cubic feet of air per minute, and had to divide this quantity in three divisions from an air-course 6ft. by 5ft. and 900ft. long, first division being 3ft. by 5ft. and 1,000ft. long, second division being 4ft. by 5ft. and 800ft. long, and third division being 4ft. by 4ft. and 1,200ft. long, show by calculation the quantity of air passing in each division, the pressure in each division being the same.
7. Show by sketch how you would construct a water blast for ventilating an adit.

SECOND DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT F.—*Tapping Water in Mines, and Mode of constructing Dams in Underground Working.*

1. In sinking a shaft through rock you meet with a stratum from which a large influx of water came: state how you would dam that water back to prevent it getting down to a lower level.
2. In constructing a cross-cut from a shaft you meet a watercourse from which a larger supply of water was coming than the pumping machinery was capable of lifting: show by sketch how you would dam that water back, supposing the rock through which the cross-cut was constructed was solid rock.
3. If a dam had to be constructed in a drive which was 6ft. high and 5ft. wide to be capable of withstanding a head of water of 200ft., describe how you would construct it, and show by calculation the pressure in tons against the face of the dam.
4. In driving toward a place where there is supposed to be a lodgment of water, what precautions would you take—first, if the drive was in an alluvial drift; second, if the drive was in schistose rock? Describe fully.

SUBJECT G.—*On Blasting and the Use of Explosives.*

1. Describe examples of quick-shattering explosives, as contrasted with slow or rending explosives.
2. What is the composition of dynamite?
3. What precautions have to be taken in transporting and using dynamite cartridges at ordinary temperatures?
4. How does extreme cold affect dynamite, and what precautions have to be observed when the air-temperature is under 40° Fahr.?
5. State any advantages of ammonite and roburite over dynamite.
6. Describe fully (with details) the preparation of a shot-hole for blasting.