

2. Compute the area of the mining claim A B C D E.
3. The angles of elevation from A to B and B to C, allowing for height of instrument and signals, are $4^{\circ} 15'$ and $3^{\circ} 27'$ respectively: what is the height of station C above station A, in feet?

SUBJECT 6.—*General and Applied Geology.*

1. Define and illustrate by diagrams—Normal fault, reversed fault, trough fault, anticline.
2. Give a brief description of the geological features of any coalfield with which you are familiar.
3. Name and define the different classes of coal. Give their approximate composition.
4. A prospecting association has an option over 3,000 acres of nearly flat open country supposed to be coal-bearing. There are rock- but no coal-outcrops, and a bore just outside the area has passed through a coal-seam of good quality at a depth of 400 ft. State fully what geological and other data ought to be obtained before any attempt to mine coal is made. How far apart ought prospecting-bores to be? Assume New Zealand conditions.
5. Give a table showing the sequence of the geological formations in New Zealand, or Australia, or Great Britain.
6. Define the following classes of rock: Conglomerate, grit, sandstone, shale, limestone, fireclay.
7. State the characteristics of a good coal-roof. Which of the rocks mentioned in question 6 would you prefer as a roof, and why?

QUESTIONS FOR MANAGERS' SECOND-CLASS CERTIFICATES OF COMPETENCY.

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

1. Under what conditions would you adopt the retreating longwall system of working? Sketch a district worked on this method, showing the packs, the timbering, and course of ventilation; state also the quantity of coal you would expect to get daily from such a district. Assume condition as to thickness of seam, &c.
2. Supposing you were working a seam of coal with naked lights and found it necessary to introduce safety-lamps, what rules and regulations would be required to be conformed to?
3. What advantages are secured by the use of tapered props?
4. Describe, with sketches, how you would proceed to clear a road through a heavy fall, the top and sides being broken.
5. Give sketches showing a panel system of working coal, stating dimensions of panel, and showing how pillars are extracted.
6. State your experience of the working of boring-machines, "Calyx" or diamond drill, and state conditions most suitable for the respective machines.
7. What are the principal things to be attended to in order to secure workers in coal-mines against accidents from falls of roof and sides? What rules would you suggest as a guide to the workers?
8. The following is a section near the surface where it is proposed to sink a shaft: soil, 2 ft.; clay, 5 ft.; quicksand, 12 ft.; and rock, 4 ft.: describe, with sketches, how you would sink through this, stating the appliances you would use, the finished size of shaft to be 14 ft. in the clear.

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. Describe what you consider a good class of pump for application to the pumping of water from the dip workings of a mine; and if required to deal with 100 gallons per minute from a tunnel dipping at the rate of 1 in 6 for 200 yards, what size of pump would you apply, and how would you transmit power to actuate it?
2. If required to drive a heading for the purpose of entering old workings (abandoned), what precautions would you adopt to guard against accident from (a) water and (b) noxious gases? Also state nature of appliances you would use.
3. What size hauling-engine would you apply, and where would you erect it, to have 100 tons per hour on an incline dipping from the shaft at a grade of 1 in 5? Give full particulars, including size of rope, &c.
4. Having to wind 100 tons per hour from a shaft 1,000 ft. deep, give size of engine and size of rope you would apply.
5. State under what conditions you would apply compressed air in preference to electricity in underground workings.
6. Describe a suitable electric-lighting plant for surface application at a colliery, giving the power required to supply current for 150 c.p. lamps, and stating the voltage you consider suitable having regard to safety.
7. What do you understand is meant by "potential" and "potential difference"?
8. What precautions do you consider should be taken to ensure safety in the installation of electric plant for use in the underground workings of coal-mines?