

THIRD DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT I.—*A Knowledge of Underground Surveying, and the Making of Plans of Underground Workings, showing also the Dip or Inclination and Strike of the Reefs or Lodes.*

(a.) The candidate must produce a plan drawn to a scale not less than 5 chains to an inch, showing the surface boundaries of a mining claim not less than 20 acres in extent. The plan must also show the underground workings on the same plan, but in different-coloured inks. All traverse-lines on which the survey is based must be shown, with their bearings and lengths, all offsets to boundaries or other objects, together with the lines connecting the underground with the surface survey. The plan must have a north point, and the word "magnetic" or "true" written on it according to the meridian used. All traverses should be calculated from the starting-point. The plan must bear a certificate as follows: "I certify that the survey from which this plan has been drawn was done by myself, and that the plan is my own work also"; and it must be signed and dated. The area in acres must be shown.

(b.) The original field-notes of the survey must be produced, together with the tables of meridian and perpendicular distances (if any) for each traverse station in the survey; also produce a specimen of the method of calculations from which the positions have been derived. All of these must be signed by the candidate and dated.

(c.) Give a full description, in writing, of the method adopted in the survey, describing the initial point from which it was started, and show the close of the work, both in links or feet and the angular difference on closing. Describe how the inclined measurements were reduced to horizontal. State whether the true or what other meridian was used, and whether the same meridian was used both above and below ground.

(d.) Say what precautions were used to ascertain if the instrument was in adjustment, and how the length of the chain or tape was tested. What instrument was used for the angular measurements, and what for the linear measurements?

(e.) Draw a rough diagram to show how the surface and underground surveys were connected, and describe in writing the method adopted. State your opinion of the most accurate way of performing the above operation—first, when there is only one shaft; second, when there are two or more shafts.

THIRD DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT I—*continued.*

(f.) State whether the compass can be relied on for underground surveys, and give your reasons for the answer. If you had a choice of a compass or a theodolite, which would you use?

(g.) If you are obliged to make a magnetic underground survey, state what means you would use to check the correctness of the survey, and how you would know that the surface and underground survey are on the same meridian, or how you would reduce them to the same supposing one to be magnetic, the other true.

(h.) From the last station used in the underground survey, calculate the length and bearing of a line drawn thence to any one of the corners of the claim; or a line may be calculated from any one station of the surface survey to any one corner of the claim.

(i.) Describe in writing the adjustments of a plane theodolite and also of a miner's compass. (In both of these subjects the candidate will be examined by the Supervisor, who must furnish a separate report on each candidate's knowledge of the subject.)

(j.) Describe the method of plotting the plan, and how the area of the claim was ascertained, and what instruments were used.

(k.) What are the regulation marks that should define the boundaries of a claim under the Mines Act, and state sizes?

(l.) State where you learnt surveying, and who taught you, and how long you have had practice at surveying.

FOURTH DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT C.—*On the Drainage of Mines and Pumping Appliances.*

1. Describe any force-pump, mentioning the different parts in detail.
2. Has the depth that water is lifted anything to do with the quantity a pump will discharge?
3. What is the usual lift for plunger and draw-lift pumps?
4. How long will a double-acting pump take to pump 3,890 cubic feet of water? Diameter piston, 8in.; stroke, 12in.; revolutions, 85 per minute; 12 per cent. non-efficient.
5. What thickness of cast-iron pipe 12in. diameter head 900ft.?
6. Write down all you know of friction in pipes and work out an example by any rule you know.
7. What would be the weight of cast-iron pipe in question 5?
8. How far will a pulsometer pump force water?

SUBJECT D.—*On the Haulage in Shafts and in Underground Planes; also on the Strength of Hauling-ropes and -chains.*

1. What is the tensile strength of cast-iron, wrought iron, and steel?
2. What are the breaking-, proof-, and safe-working strains on $\frac{1}{2}$ in. close-link chain?
3. What is the breaking-strain and safe-working strain on a 3in. steel-wire rope made up of six strands, and twelve wires in a strand?