

6. State your practical experience in surface and underground haulage. Should you fix the engine or motive power on the surface or underground? Describe the tail-rope and endless-rope systems, and say which you prefer.

7. Describe all the safety appliances and attachments you consider necessary from the winding-engine to the cages, signals, &c., and state what inspections are necessary to be made of colliery machinery. Explain in detail how ropes and chains should be examined.

SUBJECT No. 7.—*On Geology, Surveying, and making Plans.*

1. Give a section of the strata in which coal-seams are found in any New Zealand colliery with which you are practically acquainted, and state your opinion as to the geological period to which the rocks belong.

2. Show by sketches the effect of anticlinal and synclinal folds, and what is meant by "up-throw," "downthrow," and "overlap" faults.

3. Why are coals classified as hydrous and anhydrous?

4. Candidates to produce a plan showing the workings of a colliery with the surface taken up for at least 20 acres in the vicinity of the shaft or adit, and the workings in different-coloured ink. The connection of surface with underground must be shown and described in the event of there being only one shaft. The levels and main headings must have assumed traverse calculated in detail, and showing latitude and departure for each bearing. The plan to be candidate's own work, and to be accompanied by field-book.

5. Sketch as accurately as possible the following bearings, and calculate the latitude and departure, and give the course and length of the 6th set to tie with the start of 1st set:—

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| 1. N. 40° W., 400 links. | 4. S. 10° E., 500 links. |
| 2. N. 10° E., 500 " | 5. S. 40° E., 300 " |
| 3. S. 65° E., 400 " | |

6. How would you proceed to make a survey with fast needle? Describe process of plotting same.

7. State what precautions you would take to avoid errors from a variation of the magnetic meridian in extending new work on an old plan.

SUBJECT No. 8.—*Arithmetic, and a Knowledge of "The Coal-mines Act, 1891."*

1. The diameter of a shaft after walling with 9 in. brick is 10 ft.: how many cubic yards of ground will have to be taken out in sinking the shaft to a depth of 150 yards?

2. How many gallons of water will a pump of the following dimensions throw in twelve hours, allowing 10 per cent. for loss: Diameter of pump, 18 in.; length of stroke, 8 ft.; number of strokes per minute, 8?

3. How many feet must a ton be raised in one minute to give 100-horse power effective?

4. How much would be required to pay colliers for hewing 3,325 tons 19 cwt. at 2s. 3½d. per ton? And how much more if compelled to advance hewing-rate 7½ per cent.?

5. State requirements of Coal-mines Act as to—

- (a.) The duties and responsibilities of the manager;
- (b.) The duties and responsibilities of under-manager; and
- (c.) Fireman.

6. State the requirements of the Coal-mines Act as to—

- (a.) Fencing disused places;
- (b.) Refuge-holes on haulage-roads;
- (c.) Safety lamps and signals.