SUBJECT 7.—GEOLOGY, SURVEYING, AND MAKING PLANS.

1. Give the definition of "rocks," and state what you understand by the terms "aqueous," "igneous," and "metamorphic"; also what is meant by "stratification" and "cleavage." And give section of any coal-seam of which you have had experience in the Dominion, with the rocks overlying and immediately underlying the seam.

2. Describe the action of dislocations, faults, and dykes, giving sketches in the following order:—

(*a.*) Anticline and syncline;
(*b.*) Slip fault;
(*c.*) Overlap fault;
(*d.*) Trough fault; and
(*e.*) Dyke.

3. Describe and show by sketches how you would proceed to connect the survey of the surface with the underground workings.

4. In the following survey—

A to B, N. 22° 12′ W., 217 links
B to C, N. 17° 48′ E., 389 "
C to D, N. 12° 23′ W., 192 "
D to E, N. 16° 37′ W., 284 "

what is the bearing from A to E, and what is the distance? This question must be answered by computation (only), accompanied by traverse sheet.

5. Plot the following survey to a scale of one chain to an inch, find the closing course and distance, and take out the acreage in acres and decimals:—

S. 45° W., 180 links
S. 38° E., 252 "
N. 61° E., 208 "
S. 17° W., 112 links
N. 76° E., 295 "
N. 28° W., 130 "

6. From the following level readings plot a section to a horizontal scale of 50 ft. to 1 in. and a vertical scale of 10 ft. to 1 in.

Station.	Distance. Ft.	Back Sight.	Fore Sight.	Station.	Distance. Ft.	Back Sight.	Fore Sight.
1	... 0	2·94	3·40	4	... 300	9·21	8·30
2	... 100	4·60	8·20	5	... 400	2·20	0·40
3	... 200	7·21	8·40	6	... 500	3·10	0·56

Assume own datum.

SUBJECT 8.—ARITHMETIC, AND A KNOWLEDGE OF "THE COAL-MINES ACT, 1905."

1. A gravity plane has an inclination of 8°; it is 2,000 ft. long: what is the total rise and grade? State it in per 100 ft.

2. A company contracted to put down a borehole at 5s. per foot for the first 100 ft., 15s. for the second 100 ft., and 10s. additional for each succeeding 100 ft.; the hole was 1,000 ft. deep: what was the cost?

3. The cost of hewing coal by hand in a thin seam is 2s. 9d. per ton; by using coal-cutting machines the cost is reduced 33⅓ per cent.; the daily output is 950 tons, and of this quantity 420 tons are produced by the machines: what is the saving per ton on the gross output?

4. The excavated circumference of a shaft is 62·832 ft., and 13,962 cubic yards of *débris* have been excavated: what is the depth of the shaft, and the cost of sinking same at £12 per running foot?

5. Assume an area of 20 acres of coal 10 ft. thick, of which 30 per cent. has been won in the first working, and from the remaining 70 per cent. 45 per cent. is won: what is the total weight of coal won, assuming a cubic yard equals 18 cwt.; what is the weight in tons lost; and what is the monetary loss to the mine-owner if the profit realised on the coal raised equals 1s. 9d. per ton?

6. What is the average annual profit of a colliery when a shareholder entitled to two-sevenths of the profits receives as his share for 3 years and 3 months the sum of £5,981 2s. 9d.?

7. Briefly state the requirements of the Coal-mines Act as to—

(*a.*) Ventilation,
(*b.*) Explosives,
(*c.*) Signalling,
(*d.*) Machinery,
(*e*) Plans of mines,
(*f.*) Safety-lamps,
(*g.*) Examination of mines,
(*h.*) Withdrawal of workmen.

SECOND-CLASS.

SUBJECT 1.—PROSPECTING, SHAFT-SINKING, TUNNELLING, AND OPENING OUT A COLLIERY.

1. How would you prospect for coal in a new coalfield, and by what indications would you be guided? Describe fully.

2. Describe the general equipment required for sinking a shaft, the precautions required in firing shots in shafts, and such safety appliances as are required for the protection of the workmen engaged.

3. Having bottomed shafts, upcast and downcast, where large feeders of gas are given off, what precautions would you take in driving your winning-places to insure the safety of the men; at what distance would you make crosscuts; and how would you prevent an accumulation of gas at the face? Give sketches showing arrangements.