

SUBJECT 8.—*Practical Elementary Electricity.*

1. In the application of electricity to mining, what dangers have to be guarded against, and what precautions are adopted to avoid same?
2. What is induction in electrical transmission, and the causes of same?
3. Describe a system of electric signalling in mines, and explain the causes which enable it to operate.
4. Give the definition of the following electrical terms :—
  - (a.) E.M.F.
  - (b.) Ampere.
  - (c.) Volt.
  - (d.) Ohm.
  - (e.) Switch.
  - (f.) Cut-out.
5. Describe the action of a continuous-current dynamo.
6. How is E.M.F. transmitted to operate machinery underground?
7. What is the horse-power of a dynamo developing 120 amperes at 220 volts?
8. If the E.M.F. in a circuit is 90 volts, and electricity is flowing round at the rate of 45 amperes, what is the total resistance of the current?

SUBJECT 9.—*Arithmetic, and a Knowledge of "The Coal-mines Act, 1908," and Amendments; also, First Aid to the Injured.*

1. A quantity of coal is standing in wagons ready for shipment;  $\frac{1}{5}$  of it is owned by A colliery,  $\frac{2}{5}$  by B,  $\frac{1}{5}$  by C,  $\frac{1}{15}$  by D,  $\frac{1}{15}$  by E, and the remainder, which is 290 tons, by F: find the total quantity owned by each mine.
2. The daily output of a mine is 1,500 tons, 38 per cent. of which is small coal; 28 per cent. of the small is utilised for coke-making, yielding 65 per cent. of coke; the large coal is sold at 9s. 6d. per ton, the uncoked small at 3s. 9d. per ton, and the coke at 24s. 6d. per ton: what is the gross return upon a day's output?
3. A district of pillars measures 46 chains by 28 chains: how many tons of coal are contained therein if the seam be 7 ft. 6 in. high and 60 per cent. of the coal has been won? 30 cubic feet equal 1 ton.
4. A triangular reservoir, the sides of which are 8 chains, 6.75 chains, and 7.5 chains respectively, is filled with water to a depth of 15 ft.: how many gallons does it contain?
5. Twenty-four yards of roof in a 6-yard bord are brushed 6 ft. wide by 2 ft. high at the rate of 5s. per fathom: how many cubic yards of brushing are done, and what is the cost of same per ton of coal won? The seam is 4 ft. 6 in. high, and yields 1 ton to each 30 cubic feet.
6. Briefly state the requirements of "The Coal-mines Act, 1908," and its amendments, as to—
  - (a.) Ventilation.
  - (b.) Special rules.
  - (c.) Accidents in mines.
  - (d.) Persons employed in mines.
  - (e.) Ropes and chains.
  - (f.) Gunpowder and blasting.
  - (g.) Examination of mines.
7. State what ambulance training you have had, and what appliances should be kept in and about mines in case of accidents.
8. Describe how you would render first aid to a workman with a broken thigh.
9. Explain first-aid treatment and how you would act in cases of arterial bleeding, venous bleeding, and scalding.

EXAMINATION FOR SECOND-CLASS CERTIFICATES.

SUBJECT 1.—*Prospecting, Shaft-sinking, Tunnelling, and Opening out a Colliery.*

1. In prospecting a coalfield with no outcrops, what measures would you adopt to prove the seams?
2. Were you controlling sinking operations in a shaft, to what particular duties would you pay special attention?
3. Having sunk two shafts to a seam of coal, show by sketch how you would arrange your shaft-pillars, and state how you would ventilate your headings until the connection made between the shafts.

SUBJECT 2.—*Working of Coal and timbering underground.*

1. Describe the different systems of working coal, and show by sketches the methods of securing working-faces.
2. In driving a winning-place a soft dyke 15 ft. thick is met with: explain how you would secure this place permanently.
3. Describe how you would secure permanently a shaft siding 18 ft. by 8 ft. Give your ideas of the sizes of the material to be used.
4. How would you extract pillars, with a moderately soft roof, at a depth of 500 ft.?