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**COMMONWEALTH PUBLIC SERVICE.**  
**FOURTH DIVISION.**

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Examination No. 4460.—8th September, 1956.

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**FOR APPOINTMENT OR TRANSFER AS TECHNICIAN-  
IN-TRAINING, POSTMASTER-GENERAL'S DEPART-  
MENT, WESTERN AUSTRALIA.**

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**ELEMENTARY SCIENCE.**

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*Time allowed : One and a half hours.*

*Perusal time : Ten minutes.*

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Maximum marks 300 ; Pass marks 180.

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Answer SIX questions only.

All questions of equal value.

Chemical Equations should be given where possible.

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1. (a) Sketch a lever to give a mechanical advantage of five, and a wheel and axle to give a mechanical advantage of four. Show the direction, magnitude and point of application of the forces in each case.  
(b) A lever 24 ft. long balances when weights of 5 lb. and 1 lb. are hung at its ends. Find the position of the fulcrum assuming the lever is weightless.
2. Given three single pulleys, show by means of a sketch how you would use all of them to obtain a mechanical advantage of four. If the effort is moved 20 ft. how far will a load of 20 lb. be moved ? If the machine is perfect, how much work is done on the load and how much work is done by the effort ?

[TURN OVER.]

3. (a) Define force and pressure.  
(b) Describe an experiment to show that pressure increases with the depth.  
(c) How, if at all, does the pressure on the bottom of a jug filled with water depend on whether the jug has vertical or sloping sides?
4. (a) State three methods of reducing friction.  
(b) State two cases where friction is desirable and one where it is undesirable.  
(c) Draw a labelled sketch of a mercury barometer marking in the average vertical height of the column of mercury.  
(d) How, if at all, is the height of the barometer affected by the diameter of the bore?
5. (a) Distinguish between conduction, convection and radiation. Give one example of each.  
(b) Which of these three methods of heat transference plays the most important role in the heating of a room by a wood fire in an open fireplace? Give reasons.  
(c) Draw a diagram explaining the ventilation of a room heated by an open fireplace.
6. Explain the following :—
  - (a) Tight fitting metallic lids on glass jars are more easily unscrewed if first dipped into hot water.
  - (b) A burn caused by steam at  $100^{\circ}\text{C}$ . is more painful than one caused by boiling water at  $100^{\circ}\text{C}$ .
  - (c) It is oppressive when rain falls on a hot day.
  - (d) Shears for cutting metal have long handles and short blades, while tailors' scissors are just the reverse.
7. Draw a diagram of an electric trembler bell and explain how it works.
8. (a) What do you understand by (i) natural magnets, (ii) artificial magnets?  
(b) If you were given a bar magnet, the poles of which were not marked, how would you locate the north pole?  
(c) Draw a diagram to show how you would magnetise a needle so as to have a north pole at each end. Would there be any other poles?

9. Describe how you would prepare several jars of hydrogen. Give a labelled diagram of the apparatus used and the chemical equation for the reaction. Describe the physical and chemical properties of hydrogen.

10. What happens when—

- (a) A burning taper is placed in a jar of oxygen.
- (b) Hydrochloric acid is added to a solution of sodium hydroxide.
- (c) Air is bubbled through a solution of slaked lime (lime water).
- (d) Phosphorus is burnt in air or oxygen.