Not more than six questions to be answered.

One question, at least, must be answered from each section.

All questions are of equal value.

Section I.

1. What do you understand by specific gravity ?

Describe how you would measure the specific gravity of oil.

A piece of zinc weighs 42 grams in air and 37.8 grams in oil of specific gravity 0.7. Find the specific gravity of zinc.

2. Show that $s = ut + \frac{1}{2}ft^2$ in the case of a body moving in a straight line with uniform acceleration f.

A body is projected vertically upwards from the ground with an initial velocity of 200 feet per second. Find the greatest height to which the body rises and the time it takes to reach that height.

3. State the principle of moments and outline an experiment you would perform to verify it.

One end of a uniform bar, weighing 10 lbs., is hinged smoothly to a vertical wall and the other end is attached by means of a string to a point in the wall vertically above the hinge so that the bar is held in a horizontal position and in a plane at right-angles to the wall. Find the tension in the string if it makes an angle of 60° with the horizontal.

Section II.

4. Describe how you would find the focal length of a concave mirror by experiment.

A pin stands upright on the axis of a concave mirror. Indicate by means of diagrams, the position and the nature of the image formed when the pin is

   (i) at a great distance from the mirror,

   (ii) at the centre of curvature,

   (iii) between the centre of curvature and the focus,

   (iv) between the focus and the pole of the mirror.

5. What is meant by the refractive index of a liquid ?

Describe how you would measure the refractive index of a transparent liquid.

A rectangular block of glass 5 inches thick is placed over an ink-spot on a sheet of paper. Indicate by means of a diagram the apparent position of the ink-spot when viewed from above.

If the refractive index of the glass is $\frac{3}{2}$, find the apparent displacement of the ink-spot.

6. What do you understand by the mechanical equivalent of heat ?

Describe how you would find a value for it by experiment.

Section III

7. Describe how you would make a map of the resultant magnetic field in the neighbourhood of a bar magnet placed horizontally in the plane of the magnetic meridian, with its north-seeking pole pointing south.

Draw a sketch to illustrate the field and mark on it the position of the neutral points. How do you account for the existence of these points ?

8. Describe fully either a Daniell cell *or* a Leclanché cell.

Give an account of the actions that take place within the cell you have described when electric current is being drawn from it.

9. Describe the construction of the tangent galvanometer and explain how it works.

10. Describe any instrument in which Wheatstone's bridge method of comparing resistances is used, and tell how you would use the instrument to find the resistance of a given coil.