magnitude is equal to one of the given forces.

3. Describe some form of balance in which the beam is below the scale-pans.

A body appears to weigh 24lbs. when placed in one scale-pan, and 25lbs. when placed in the other. Find its real weight to three places of decimals.

4. Shew that the centre of gravity of three equal weights placed at the angles of a triangle coincides with the centre of gravity of the triangle.

ABC is an equilateral triangle of 6 inches side, of which *O* is the centre. If the triangle *OBC* be removed, find the distance from *A* to the centre of gravity of the remainder.

5. A smooth inclined plane, whose height is one-half of its length, has a small pulley at the top, over which a string passes. To one end of the string is attached a mass of 12lbs., which rests on the plane; while from the other end, which hangs vertically, is suspended a mass of 8lbs.; and the masses are left free to move. Find the acceleration and the distance traversed from rest by either mass in 5 seconds.

B.

6. What is the resultant pressure of a heavy fluid on a body immersed in it?

An empty balloon with its car and appendages weighs *in air* 1200lbs. If a cubic foot of air weigh 1¼ oz., how many cubic feet of gas of specific gravity .52 must be introduced before the balloon will begin to ascend?

7. How may a hydrometer with a short and slender stem be adapted for the determination of the specific gravities of liquids which differ widely from one another; as, for example, alcohol and concentrated sulphuric acid?

Describe Sikes' Hydrometer.

8. The cylinder of a single-barrelled air-pump has a sectional area of one square inch, and the length of the stroke is 4 inches. The pump is attached to a receiver whose capacity is 36 cubic inches. Compare the pressure of the air in the cylinder after eight complete strokes of the pump with the pressure before commencing the operation.

What conditions limit the amount of exhaustion which an air pump can effect?

9. Describe fully the adjustments you would make before reading a standard barometer; and state clearly how you would adjust the vernier scale for reading the upper surface of the mercurial column.

10. How would you experimentally verify the laws of Refraction?

What condition is necessary in order that a ray of light may be able to emerge from the plane surface of a refracting medium?

11. Shew by a drawing how you would employ a right-angled isosceles glass prism to bend a beam of light at right angles. Will any light be lost at the hypothenuse? State fully the reasons for your answer.

12. Explain the formation of an image by a convex mirror.

The radius of a convex mirror is 6 inches. If the linear dimensions of an object be twice those of its image, where must each be situated.

13. Why do we generally speak of *degrees* of temperature but *quantities* of heat?

"If two bodies are in thermal equilibrium with the same body, they are in thermal equilibrium with one another." How would you prove this statement experimentally?

14. Define latent heat, specific heat, capacity for heat, coefficient of cubic expansion, and thermal conductivity.

How would you determine the capacity for heat of a copper vessel?

15. Distinguish between evaporation and ebullition. What condition determines whether a liquid will boil or evaporate?

A closed vessel is half full of water, and half full of dry air, all at 0°C and at ordinary pressure. On heating the vessel the pressure is found to rise to two atmospheres, though the temperature is several degrees below 100°C. Account for this.

16. Explain the formation of dew, stating the conditions which are favourable to its deposition, and why they are so.

How do you account for the efficiency of a glass fire screen, while the interior of a green-house is rendered much hotter than the air outside by the sun's rays alone?