

5. What is the "kinetic energy" of a moving mechanical system? A shot of 1,000 lbs. moving at 1,600 feet per second strikes a fixed target. How far will the shot penetrate the target exerting upon it an average pressure equal to the weight of 12,000 tons?

B

6. What do you understand by the pressure of fluid *at a point*? A cylindrical bucket 10 inches in diameter and one foot high is half filled with water. A half-hundredweight of iron is suspended by a thin string, and held so as to be completely immersed in water, without touching the bottom of the bucket. Subsequently the string is removed and the iron allowed to rest on the bottom of the bucket. By how much will the pressure on the bottom be increased in each case by the presence of the iron? [A cubic foot of iron contains 440 lbs. and a cubic foot of water $62\frac{1}{2}$ lbs.]

7. Two vertical cylindrical vessels, A and B, are connected at the bottom by a very narrow tube, and stand on a horizontal table. The diameter of A is 6 inches, that of B is 4 inches. A liquid of specific gravity 1.4 fills the cylinders to a height of 6 inches above the base, when an equal volume of water is poured carefully on the top of the liquid in A. Where will the common surface of the liquids be when equilibrium has been restored?

8. The length of a barometer tube is 80 inches, its diameter is $\frac{1}{2}$ inch except for one inch of its length, where a cylindrical bulb is inserted so as to increase the diameter of the tube to 3 inches. The bottom of the bulb is 27 inches above the mercury in the tank. The lower portion of the bulb and of the tube below contains mercury, the upper part of the bulb and tube contains water. If the mercurial barometer rise .5 inch, through what distance will the upper surface of the water move, the

specific gravity of mercury being 13.67?

9. A diving-bell is lowered into water at a uniform rate, and air is supplied by a force-pump so as to just keep the bell full without allowing any to escape. How must the quantity (*i. e.* mass) of air supplied per second be varied as the bell descends?

10. State the laws of refraction of light.

Explain clearly by aid of a diagram why the bottom of a lake appears nearer to the surface than it really is?

11. What is the focal length of a lens?

A circle an inch in diameter, a convex lens whose focal length is 6 inches, and a second lens whose focal length is 10 inches are placed so as to have a common axis. The distance from the circle to the first lens is 20 inches and from the first lens to the second 36 inches. What images of the circle will be formed, where will they be situated, and what will be their dimensions?

12. Explain the formation of images by means of a concave spherical mirror. How would you determine the focal length of such a mirror?

13. Define the latent heat of fusion of a substance.

The latent heat of fusion of ice is 79.5. Its specific gravity is .917. Ten grammes of metal at 100°C . are immersed in a mixture of ice and water, and the volume of the mixture is found to be reduced by 125 cubic millimetres, without change of temperature. Find the specific heat of the metal.

14. What is the Dew-Point?

Explain why two volumes of air at different temperatures neither of which is saturated with aqueous vapour, may, when mixed, produce a cloud.

15. How would you compare the thermal conductivities of brass and copper?

Two equal cylinders, one of iron and the other of bismuth, are covered with wax and simultaneously placed on