

AN ROINN OIDEACHAIS

(Department of Education).

LEAVING CERTIFICATE EXAMINATION, 1946.

PHYSICS.—PASS.

MONDAY, 24th JUNE.—MORNING, 10 TO 12.

Candidates must answer one question at least out of each Section, and not more than *six* questions in all.

All questions are of equal value.

SECTION I.

1. Explain how you would find by geometrical construction the resultant of two unequal parallel forces (*a*) if the forces are in the same sense, (*b*) if they are in opposite senses. Discuss briefly case (*b*) when the forces are equal in magnitude.

2. Illustrate by a graphical method the following formula pertaining to the motion in a straight line of a particle subject to a constant acceleration= a ;

$$S=ut+\frac{1}{2}at^2.$$

S =distance traversed from time $t=0$, u =initial velocity.

3. Explain the principle of Nicholson's hydrometer, and describe fully how you would use it to obtain the specific gravity of a small sample of wood.

4. A cylindrical tank 10 feet in diameter is filled to a depth of 5 feet with oil of density 0.8 grams per c.c. How far is the centre of gravity of the liquid above the bottom of the tank? Assuming that the mass of the oil is concentrated at the centre of gravity, calculate the work required to raise all of the oil to ground level if the bottom of the tank is 20 feet below ground. It is required to empty the tank in 5 minutes using a motor-driven pump. Assuming that 20% of the power is wasted, calculate the minimum power of the motor which will suffice to drive the pump. 1 cubic foot of water weighs 62.5 lbs.

SECTION II.

5. Give an account of the working of a mercury thermometer and describe the experiments you would carry out to graduate its stem in degrees Centigrade. The bulb of a thermometer has an internal volume of 0.1 c.c. and the length of the capillary is to be 20 cms. What will be the bore of the tube if the instrument is to be just capable of giving readings from 32°F. to 100°F.? Apparent coefficient of cubical expansion of mercury= $1.8 \times 10^{-4}/^{\circ}\text{C}$.

6. Define latent heat of vaporisation of water. How would you determine its value by experiment? Mention the principal sources of error.

7. Explain by aid of diagrams how a concave mirror forms real and virtual images. The height of the image of a certain object in a mirror is 3 times that of the object. Find the possible positions of the object if the focal length of the mirror is 5 cms., and comment on the nature of the image in each case.

8. Describe a method of measuring the velocity of propagation of light.

SECTION III.

9. Explain the meaning of "magnetic declination," "dip." How might you measure the value of the "dip"?

10. Give a short account of what occurs when an electric current is passed through (a) acidulated water, (b) a solution of copper sulphate. An electric current is passed through a solution of copper sulphate for 30 minutes. It is found that the cathode increases in weight by 0.66 grams. Calculate the mean value of the current in amperes. Electro-chemical equivalent of copper = 3.3×10^{-4} gram/coulomb.

11. What determines the rate of evolution of heat when an electric current passes through a conductor? A coil of wire between the ends of which is maintained a potential difference of 10 volts is immersed in a beaker containing 1,000 c.c. of water. The current in the coil is 2 amperes. Supposing that no heat is lost by the beaker and its contents, and neglecting the water equivalent of the beaker, calculate the rise of temperature which takes place in 5 minutes.

12. Describe the Wheatstone network and quote the relationship which subsists between the resistances of its arms when balanced. Explain how you would use a metre bridge to measure the electrical resistance of a sample of wire.