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(Department of Education).

LEAVING CERTIFICATE EXAMINATION, 1947.

SATURDAY, 14th JUNE.—MORNING, 10 TO 12.

PHYSICS.—HONOURS.

Not more than *six* questions to be attempted of which one at least must be selected from each Section. All questions are of equal value.

SECTION I.

1. A motor car, weighing half a ton, is capable of working at 10 H.P. Assuming that the resistance due to wind and friction is equivalent to 24 lbs. wt. per ton, find in m.p.h. the maximum speed of the car up an incline of 1 in 15.

2. Describe Atwood's Machine. Explain how you would use it to investigate how the acceleration of a system is related to the force which acts upon it.

3. State Archimedes' Principle. Justify the principle on theoretical grounds. Describe an experiment, based on the principle, for investigating the dependence on temperature of the density of a liquid. What result would you expect to obtain if the liquid were water ?

4. A copper calorimeter weighs 500 grams and contains 1,000 grams of ice-cold water and 200 grams of ice. How many grams of steam at 100° C., must be passed into the calorimeter in order to bring the calorimeter and its contents to 50° C. ?

Specific heat of copper=0·09. Latent heat of steam=540 calories/gram. Latent heat of ice=80 calories/gram.

SECTION II.

5. Explain how forces may be compounded and how they may be resolved.

A body of mass 1 cwt. rests on a smooth plane inclined at 20° to the horizontal and is kept in equilibrium by two forces P and Q. The magnitude of the force P is 30 lbs. wt. and it acts up the plane along the line of greatest slope. If the force Q makes an angle of 40° with the direction of P and is in the same vertical plane as P, find its magnitude. Find, also, the reaction of the plane, and the magnitude and direction of the resultant of P and Q.

6. Describe the spectrometer. Explain how you would set up the instrument and adjust it. How would you use it to find the index of refraction of the material of a prism for the light from a sodium flame lamp ?

7. A small bright object is placed 15 cms. from a thin lens and a real image is formed on a screen. The positions of the object and screen remaining fixed the lens is moved a distance of 15 cms. towards the screen when it is found that a sharp image is again formed on the screen. Determine the type and focal length of the lens, and, also, the linear magnification in each case.

8. Describe fully any terrestrial method of determining the velocity of propagation of light.

Section III.

9. The coil of a tangent galvanometer is of mean radius 5 cms. and consists of 10 turns of wire. It is set up with its plane at right angles to the plane of the magnetic meridian in a place where the horizontal component of the earth's magnetic field is 0·18 oersted. A current of 0·25 amperes is sent through the coil (*a*) in a certain direction, and (*b*) in the opposite direction. Calculate the ratio of the time of vibration of the magnet in the case (*a*) to its time of vibration in the case (*b*) if it suffers a small displacement from the position of equilibrium ?

10. Describe the Wheatstone network, and prove the relationship which must hold between the resistances of its arms when balanced. Explain how you would use any form of Wheatstone bridge to determine the specific resistance of a metal available in the form of wire of uniform cross-section.

11. State the laws of electrolysis. Describe an experiment based on these laws for determining the accuracy of calibration of a commercial ammeter.

12. Describe a common form of secondary cell and explain the changes which take place within it while (*a*) being charged ; (*b*) being discharged.