

**PHYSICS DEPARTMENT**

**S5 Test**

**June 2015**

**Paper 2**

**Time 1 hour**

Attempt **ALL** the questions.

1. (a) What is meant by

(i)***refractive index*** of a medium? (1)

(ii) ***critical angle*** (1)

(b) (i) Show that when the bottom of a pond is observed from above, the refractive index, n, of the liquid in the pond is given by

(5)

(ii) Describe an experiment that employs the principle in (i) to determine the refractive index of the material of a glass block. (4)

(c) (i) State the laws of refraction of light. (2)

(ii) Show that when a ray of light passes through different media separated by plane boundaries

***nsini = constant***

where n is the absolute refractive index of a medium and *i* is the angle made by the ray with the normal in the medium. (4)

(d) A ray of light from water of refractive index 1.35 is incident normally on a parallel-sided glass slab.With the ray fixed, the glass slab is the rotated about an axis through the point incidence until the ray just fails to emerge from the glass.

Find the angle through which the glass slab was rotated. (3)

2. (a) What is meant by

(i) capacitance (1)

(ii) dielectric constant (1)

(b) (i) State any two factors that determine capacitance of a capacitor and the manner in which they do so. (2)

(ii) Describe an experiment to investigate the effect of one of the factors in (b)(i). (5)

(iii) Explain how a dielectric enhances storage of charge by a capacitor.

(4)

(c) Two metal plates, A and B, are arranged to form a parallel-plate capacitor with air in between. The capacitor is charged to a steady p.d of 12V.

A B

12V

M

(i) With plate A fixed but B made to vibrate in the direction as indicated by the arrows on the diagram, the meter M registers an alternating current. Explain this observation. (3)

(ii) Now, with the plate separation maintained at 2 mm, the charging source is disconnected.If the separation of the plates is then increased to 4mm, what will a voltmeter connected across the capacitor read? (2)

(iii) At the new separation, what is the dielectric constant of a substance that will need to be inserted between the plates in order to restore the p.d to 12 V? (2)