BUSEDE SEED SCHOOL

S5 PHYSICS PAPER I1

END OF TERM/YEAR 2001 EXAM

TIME: 2½HOURS.

*Instructions*:

Attempt ONLY Five Questions.

1. ***(a) Define the following with reference to a convex mirror.***

***(i) Principal focus [1]***

***(ii) Aperture [1]***

***(b) A concave mirror forms an image of magnification 2 when the object is placed in front of it. When the object is moved 6cm towards the mirror, the magnification becomes 2.5. Find focal length of the mirror. [4]***

***(c) An object coincides with its image when it is placed 30cm from a concave mirror. When a concave lens is placed 20cm from the object the concave mirror has to be moved 5cm farther away to make the image coincide with the object.***

***(i) Sketch a ray diagram to represent the final situation. [2]***

***(ii) Calculate focal length of the concave lens. [4]***

***(d) (i) A pin held above a concave mirror containing a small quantity of liquid coincides with its image when it is at height h above the mirror. Show that refractive index of the liquid, n = R h , where R is radius of curvature of the mirror. [5] (ii) A concave mirror is placed at the base of a stand and a pin clamped above the mirror coincides with its image when it is 15cm above the mirror. When a liquid is put in the mirror to a depth of 3cm the pin coincides with its image when it is 12.6 cm above the mirror. Calculate refractive index of the liquid.***

***(i) Define absolute refractive index of a material. (1)***

***(ii) Explain, with the aid of a diagram, why a thick plane mirror forms multiple images. (4)***

***(b) Describe how the refractive index of a liquid can be determined using a concave mirror. (6)***

***(c) (i) A parallel-sided glass block of thickness h and refractive index n is placed over a mark scribbled on a sheet of paper. Write an expression for the apparent displacement of a mark when viewed directly from above. (1)***

***(ii) A coin is placed at the bottom of a beaker. Water of refractive index 1.33 is poured in the beaker to a height of 15 cm. Above the water surface there is a layer of another liquid L, of thickness 8 cm. An observer from above sees the coin displaced 6.0 cm from the bottom. Calculate the refractive index of the liquid. (3)***

***(d) (i) For a ray of light passing through a prism perpendicular to the refracting edge of the prism, what are the conditions for minimum deviation? (1)***

***(ii) In part (i), if the refracting angle of the prism is , the minimum deviation is , and the refractive index of the material of the prism is n, derive an expression relating n,  and .*** 6- a)i) explain the term total internal reflection (1mark)

ii)State the ***Condition for total internal reflection to occur***

(2 ma

b). The critical angle for water-air interface is 48°42 11 and that of glass-air interface is 38°47 1 . Calculate the critical angle for glass-water interface. (4marks)

* + - * c)***The refractive index for red light is 1634 of crown glass and the difference between the critical angles of red and blue light at the glass-air interface is 0°56 1 .What is the refractive index of crown glass for blue light (5marks)***

d) (i) With the aid of a diagram, explain why a fish appears bigger in

water than its actual size when out of water. (3 marks)

d) A fish is 3.0m below the surface of a pond and 2.5m from the bank. A man 2.0m tall stand s 4.0m from the edge of the pond. Assuming that the sides of the pond are vertical, calculate the distance the man should move towards the edge of the pond so that he is just seen by the fish.

(The refractive index of water is 1.33) (5 marks)

***(i) What is meant by the dielectric constant? (1)***

***(ii) Derive an expression for the energy stored in a capacitor, of capacitance C, charged to a voltage V. (5)***

***(b) Explain the action of a dielectric. (4)***

***(c) Describe how the unknown capacitance of a capacitor can be determined using a ballistic galvanometer. (4)***

***(d) A capacitor of capacitance 5 F is charged to a p.d. of 52 V with the aid of a battery. The battery is then removed and the capacitor is connected to an uncharged capacitor of capacitance 8F. Calculate:***

***(i) the final p.d., V across the combination. (2)***

***(ii) the energy stored before and after connecting the two capacitors.***

1. ***. (a) Define the terms***

***(i) Define the Farad. [1]***

***(ii) Dielectric strength. [1]***

***(b) With aid of an appropriate circuit diagram, describe how the ballistic galvanometer is used to determine dielectric constant of a dielectric. [5]***

***(c) Derive the expression for effective capacitance of two capacitors in series. [5]***

***(d) Two parallel plate air capacitors of equal dimensions and capacitance 600µF are connected in parallel. They are charged to 25 volts and then disconnected from the battery. A dielectric of constant 1.2 is inserted between the plates of one of the capacitors. Calculate the:***

***(i) the p.d. across the capacitors. [4]***

***(ii) final energy in the system of capacitors.***