

**PHYSICS DEPARTMENT**

**S 5 BOTTMAY 2013**

**Paper 2**

**Time 1 hour 40 minutes**

Attempt **ALL** the questions.

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| Questions Attempted |  |  |  |
| Marks obtained |  |  |  |

Where necessary, use the following constants:

*Permittivity of free space, ε0 = 8.85 x 10-12 Fm-1*

1. (a) (i) Distinguish between  ***glancing angle*** and  ***angle of incidence*** (2)

(ii) What is meant by ***lateral inversion*** as far as images are concerned? (1)

(b) (i) Show that the image of an object formed by a plane mirror is as far behind as the object is in front of the mirror. (3)

(e)

θ

X

Y

O

P

Two mirrors, X and Y, are inclined to each other at an angle θ. A ray from O strikes X at P as shown. Use the given diagram to show that after the next reflection on Y the net deviation is 2θ.

(4)

(d) (i) What is meant by the ***principle focus***  of a convex mirror? (1)

O M P I

I΄

(ii) Describe an to determine the focal length of convex mirror using a converging lens (5)

When an object O was placed 20 cm in front of a convex mirror, its image was formed at I. A small plane mirror, facing O, was placed at M 15 cm from O such that the image I’ of the lower part of O in M coincided in position with the upper part of the image I of O in the convex mirror. Determine the focal length of the convex mirror. (4)

2. (a) (i) Explain the mechanism by which objects get charged by rubbing. (3)

(ii) Why is the charging process in (i) possible only in insulators? (1)

(b) The diagram shows two metallic spheres A and B placed apart and each supported on an insulating stand. A positively charged plate C is placed mid-way between them but without touching them.

A

C

B

B is momentarily earthed in the presence of C. Finally C is withdrawn.

(i) Draw the spheres at the end of the operation and show the charge distribution over them.

(2)

(ii) On the same diagram sketch the electric field pattern in the region of the spheres. (2)

(iii) Explain the change in p.d between the spheres as the spheres are moved further apart.(2)

(c) Describe an experiment to investigate the charge distribution over a conductor. (5)

(d) (i) Sketch the electric field pattern in the region where a negatively charged ball is placed near a neutral metal plate. (2)

(ii) Explain why a neutral conductor is attracted by charged body nearby. (3)

3. (a) (i) What is meant by an equipotential (1)

(ii) On the same diagram sketch the electric field lines andequipotentials due to two neighbouring like point charges. [Use broken lines for the field and solid lines for the equipotentials] (2)

(b) In the figure below Q1 = **-2µC**, Q2 = **+2µC** and Q3 = **+3µC**

20cm

Q1

Q2

Q3

P

Find

(i) theelectric potential energy of Q3 (2)

(ii) the resultant electric field intensity at point P, midway between Q1 and Q2, due to the charges. (6)

(c) Define the following terms

(i) Capacitor (1)

(ii) Capacitance (1)

(d) (i) State the factors that determine the capacitance of a capacitor. (3)

(ii) Explain how a dielectric enhances storage of charge by a capacitor (4)