

**PHYSICS DEPARTMENT**

**END-OF-TERM I EXAMINATIONS**

**April, 2015**

**S5 PHYSICS**

**Paper 2**

**2 hours**

**INSTRUCTIONS TO CANDIDATES:**

*Attempt* ***ALL*** *questions*

*Assume where necessary:*

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

**FOR EXAMINER’S USE ONLY**

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| --- | --- | --- | --- | --- | --- |
| Question |  |  |  |  | Total |
| Marks scored |  |  |  |  |  |

1. (a) What is meant by

(i) a **ray** of light (1)

(ii) **glancing angle** (1)

(iii) **lateral inversion** as far as images are concerned? (1)

(b) (i) State the laws of reflection (2)

(ii) Describe how one of the laws in (i) may be verified (5)

(iii) With the aid of a ray diagram show that the image formed by a plane mirror is the same size as the object. (4)

(c) (i) What is meant by diffuse reflection? (1)

(ii) Explain how diffuse reflection occurs (2)

120o

20o

M1

M2

O

P

Fig. 1

(d)

Figure 1 shows two mirrors, M1 and M2, inclined at 120o to each other. A ray OP is incident on M1 at a glancing angle of 20o. After reflection on M2, what will be the angle between the reflected ray and the mirror M1? (3)

2. (a) Medi, whose height is 160 cm, plans to fix a plane mirror on a vertical wall in his room so that he sees the image of the whole of himself.

If his eyes are 12 cm below the highest point of his head, find

(i) how high above the floor the lowest edge of the mirror should be. (3)

(ii) the minimum vertical dimensions of the mirror. (2)

(b) (i) What is the principle applied in a sextant? (1)

(ii) With the aid of a diagram explain how an optical lever works to increase the sensitivity in measurements (4)

(c) Explain

(i) the formation of a caustic curve by a spherical mirror (3)

(ii) why a parabolic mirror is preferred to a spherical mirror for searchlight.

(3)

(d) Derive the mirror formula for a spherical mirror. (5)

3. (a) Explain

(i) how rubbing certain materials together brings about charge. (3)

(ii) charging by rubbing is possible only with insulators. (1)

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

(c) (i) What is meant by electrostatic induction? (1)

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

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

(3)

(d) Describe an experiment to show that when a charge is enclosed by a hollow conductor, excess charge resides only on the outside of the hollow conductor while the net charge inside is zero. (5)

4. (a) Define

(i) Electric field (1)

(ii) Electric potential (1)

(b) Derive an expression for the electric intensity at a point d metres from an isolated point charge Q in a medium of permittivity ε. (3)

(c) In the figure below, Q1 and Q2 are point charges. Q1 = **-4** μC and Q2 = **10** μC

10cm

6cm

8cm

Q1

Q2

P

Find (i) the electric potential at point P (4)

(ii) the magnitude of the electric intensity at point P (5)

(iii) the location of a point Y between Q1 and Q2 where the electric potential will be zero (3)

(iv) the force that will act on a point charge of 3 μC when placed at point Y

(4)