

**PHYSICS DEPARTMENT**

**S 5 APRIL TEST 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) State the laws of reflection of light. (2)

(ii) Explain ***diffuse reflection*** (3)

(b) (i) A ray of light is incident on a plane mirror. Show that when the incident ray is left fixed but the mirror rotated, the reflected ray rotates through twice the rotation of the mirror.

(4)

(ii) With the aid of a diagram, describe one application of the principle in b(i) above.

(5)

(c) Alice is 162 cm tall and her eyes are 10 cm below the top of her head. The furthest away she can stand from a vertical mirror mounted on a wall is 3 m. If Alice is to see the whole of herself by reflection in the mirror, find

(i) the minimum vertical dimensions of the mirror (4)

(ii) how high above the flour the lower edge of the mirror should be (2)

2. (a) (i) State the first law of electrostatics. (1)

(ii) An electroscope is charged negatively. Then a conductor is brought near its cap. State and explain what is observed. (4)

(b) State the advantages of charging by induction over that by contact (2)

(c) (i) Explain the mechanism of point action in conductors (3)

(ii) Describe how a Van de Graaf generator works (7)

(iii) State in which way any two factors determine the maximum p.d that can be developed by this generator? (2)

3. (a) Define

(i) Electric field (1)

(ii) Electric potential (1)

(b) Derive an expression for the electric intensity at a point x 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 = **3** μC and Q2 = **-2**μC

10 cm

10cm

Q1

Q2

P

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

(ii) 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)