PHYSICS DEPARTMENT
S 5 APRIL TEST 2019
Paper 2

Time 1 hour 30 minutes

Attempt **ALL** the questions.

Questions Attempted	1	2	3	TOTAL
Marks obtained				

Where necessary, use the following constants:

Permittivity of free space, ε_0   =   *8.85 x 10^{-12} Fm^{-1}*

The constant $\dfrac{1}{4\pi\varepsilon_o}$ = $9.0 \times 10^9 F^{-1}m$

1(a)   (i) State the laws of reflection of light.   (2)
        (ii) Explain, with the aid of a ray diagram, the meaning of *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 through an angle, θ, the reflected ray
        rotates through twice the angle of 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 floor the lower edge of the mirror should be.   (2)

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

(ii) Two plane mirrors **A and B** are inclined at right angles to each other. A ray of light is incident on A. Show, by geometrical analysis, that after the subsequent reflection on B it will emerge parallel to its original path.   (3)

(b)   The figure below shows a pair of parallel plane mirrors **X and Y.**
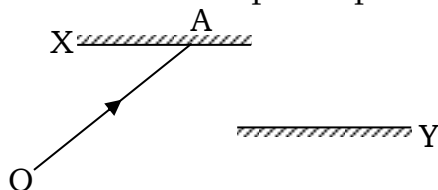
A ray **OA** is incident at A on mirror X.
(i) Copy the diagram and show how the ray finally emerges from mirror second mirror Y.   (1)

(ii) Mention and describe one application of the arrangement in (b) above.

(5)

(c)   (i) For a spherical mirror, what is meant by **radius of curvature**?   (1)

(ii) Show that the focal length of a spherical reflector is half the radius of curvature.   (3)

(d)   Sketch a ray diagram to show how a concave mirror forms a real
(i) diminished image of a real object   (1)

(ii) magnified image of a real object   (1)

(e)   An illuminated object is placed at a distance, **y**, in front of a plane mirror. When the plane mirror is replaced with a concave mirror of focal length **12 cm**, a real, magnified image is formed **18 cm** from the object. Find the value of **y**.   (4)

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

(ii) What is meant by the term electrostatic induction?   (1)

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

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

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

(ii) With the aid of a labeled diagram, describe how a Van de Graaff generator works.   (7)

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

END