MENGO SENIOR SCHOOL
DEPARTMENT OF PHYSICS
END OF TERM I EXAM
PHYSICS PAPER II
SENIOR SIX
P510/2

TIME: $2^1/2$ HRS.

INSTRUCTIONS:
- Attempt five questions but not more than two from a given Section.
- All questions carry equal marks.

Assume where necessary.

(i) electron charge e, 1.6×10^{-19}c

SECTION: A

1. a. i. Explain the terms magnifying power and resolving power as applied to optical instruments.

ii. Explain using diagrams how a single biconvex lens can be used as a Magnifying glass and how two biconvex lenses can be arranged to form a microscope adjustment.

b. i. Give one advantage and disadvantage of setting the microscope so that the final image is at infinity rather that at the near point of the eye.

ii. A compound microscope has an objective and eye piece of focal lengths 1.0cm and 5.0cm respectively. When an object is placed 1.1cm from the objective , the final image is 30cm from the eyepiece.
Calculate the angular magnification of this instrument.

c. A lens forms an image of a distant object on a screen 30cm away. Where should a second lens of focal length 30cm be placed so that the screen has to be moved 8.0cm towards the first lens for the new image to be in focus.

2. a. Distinguish between the following terms as applied to lenses.
i. focal length and focal point.
ii. spherical and chromatic aberration .
(use diagrams)

b. i. The deviation d by a prism of small angle A and refractive index n is $d = (n - 1) A$. Use this to show that focal length of a thin converging lens of index n is given by;

$$\frac{1}{f} = (n - 1)\left(\frac{1}{r_1} + \frac{1}{r_2}\right)$$

where r_1 and r_2 are the radii of curvature of the lens surfaces.

ii. A converging meniscus of index 1.5 has radii of 15cm and 30cm. What is the focal length of this lens when it's surrounded by water of index $^{4}/3$.

c. i. A glass prism of index 1.65 has a refracting angle of 60^{o}. Between what limits must the angle of incidence lie if light is to pass through the prism by refraction at adjacent faces.

ii. A ray is incident at an angle of 30^{o} on a prism of index 1.52. What is the maximum refracting angle that the prism should have if the light is to just emerge from the prism.

3. a. i. Describe a simple experiment you can carry out to determine the index of a liquid available only in small quantity using a concave mirror.

ii. A liquid is placed in concave mirror to a depth of 2cm. An object held above the liquid coincides with it's own image when it is 45.5cm from the pole of the mirror. If the radius of curvature of the mirror is 60cm. Calculate the index of the liquid.

b. The magnification of an object in a thin converging lens is m. When the lens is moved a distance d towards the object the magnification becomes m^{1}.
Show that the focal length f of this lens is given by.

$$F = \frac{Dmm_1}{m^1 - m}$$

c. A convex lens L_1 of focal length 10cm is placed ycm from a concave lens L_2 of focal length 20cm. An object is placed 20cm of L_1 on it's side remote to L_2. If the final image by L_2 forms at the principal focus of L_2. Calculate.
i. The distance y ii. The final magnification

d. Explain using diagrams why

i. An object far away fro m the eye appears to be smaller than when it is near.

ii. An object at the bottom of a swimming pool appears nearer to the water surface than it's actual depth.

SECTION: B

4. a. i. Define the terms electric field intensity and electric potential at a point in space.

iii. Derive the relation between the two quantities you have defined in (i)above.

b. The figure below shows small spheres X and Y carrying charges of $2x\ 10^{-8}c$ And $-2 \times 10^{-8}C$ respectively. Find