BETHANY HIGH SCHOOL NAALYA

S.6 PHYSICS

Paper 2

INSTRUCTIONS
Assume where necessary.
Permittivity of free space £o = 8.85 x $10^{-12}FM^{-1}$
The constant $\frac{1}{4\pi £o}$ = 9.0 x 10-19F^{-1}m

SECTION A

(a) (i) Show that the effective length , f of two thin lenses in constant is given by

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

Where f_1 and f_2 are the focal length of the individual lenses. (5mks)

(ii) A compound lens consists of two lenses in contact having powers of +12.5Δ and -2.5Δ. Find the position and nature of the image of an object placed 15.0cm from the compound lens. (5mks)

(b) (i) Define refractive index. (1mk)

(ii) An equip – convex lens is placed on a horizontal plane mirror and a pin held vertically above the lens is found to coincide with its image when positioned 20.0cm above the lens. When a few drops of liquid is placed between the lens and the mirror, the pin had to be raised 10.0cm to obtain coincidence with the image. If the refractive index of the convex lens is 1.5, find the refractive index of the liquid. (5mk)

(c) Explain the terms chromatic and spherical aberrations in lenses. (4mks)

2. (a) Define the focal length of a concave mirror. (1mk)

(b) An object is placed at a distance µfrom a concave mirror. The mirror forms an image of the object a distance V. Draw diagrams to show the path of light raysa when the image formed is

(i) Real (2mks)

(ii) Virtual (2mks)

(c) Use a geometrical ray diagram to derive the relation $\frac{1}{u}+\frac{1}{v}+\frac{1}{f}$

for a concave minor. (5mks)

(d) A concave mirror of radius of curvature 40.0cm contains a liquid to a height of 2.0cm. A pin clamped horizontally and viewed from above is observed to coincide with its image when it is 27.0cm above the surface of the liquid. Calculate the refractive index of the liquid. (4mks)

(e) You are provided with the following pieces of apparatus.

A screen with cross- wire, a lamp, a concave mirror and a metre rule.

Describe an experiment to determine the focal length o f the concave mirror using the above apparatus. (6mks)

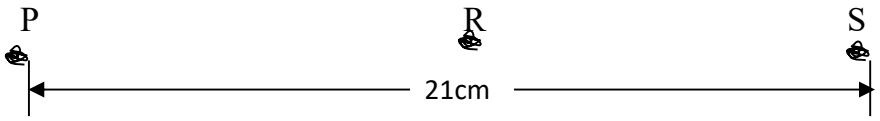
`

SECTION D

3. (a) Explain the meaning of an equipotential surface as applies to electric field (2mks)

(b) With the aid of a diagram, describe an experiment to show that excess charge resides only on the outside surface of a hollow conductor. (5mks)

(c) State conlomb's law electrostatics. (1mk)



Two point charges p and s of 17.6 and -90μC respectively are placed in vacuum at a distance of 21cm apart. When a third charge , R, is placed mid- way between P and S as shown in figure above , the net force on S is zeri.

(i) Determine the charge on R. (5mks)

(ii) Calculate the electric potential at the position of R. (5mks)

(iii) Sketch the electric field lines corresponding in the charge distribution.[[[(2mks)

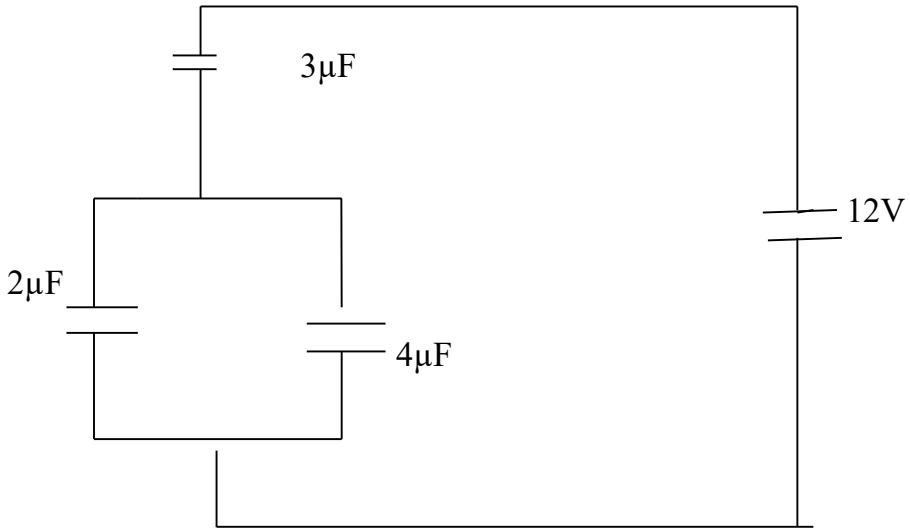
4. (a) (i) Define Capacitance of a capacitor. (1mk)

(ii) Derive an expression for the energy stored in a capacitor of capacitor of capacitance C charged to a Pd, V. (4mks)

(b) (i) Explain the effect of placing an insulator between the plates of charged capacitor. (5mks)

(ii) State two physical properties desirable in a material to be used as a dielectric in a capacitor. (2mks)

(d)



A battery of emf 12v is connected across a system of capacitors as shown in figure above. Find the

(i) Change on the 3μf capacitor. (3mks)

(ii) Energy stored in the 4μF capacitor. (3mks)

(e) Describe a simple experiment to show that capacitance of a capacitor increases with surface area of the plates. (2mks)

End