ASUMBI GIRLS HIGH SCHOOL
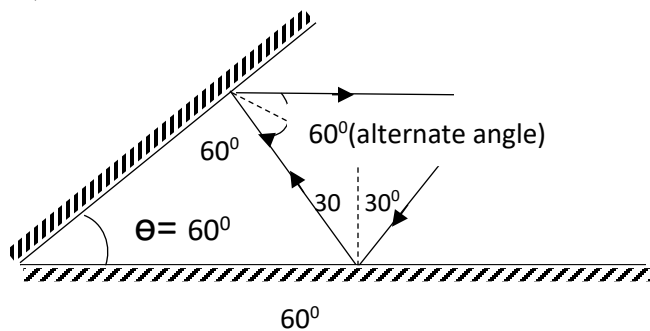# TERM 2 – DECEMBER 2021
FORM 4 – PHYSICS PAPER 2

Marking Scheme

Section I

1.   a) 1.85 mA

b) 3.7 mA

2.

✓ Angle between the incident and the reflected rays on the second mirror

✓ Angle between the two mirrors

3.

✓ metal is a good conductor of charges

✓ causes earthing of the electroscope
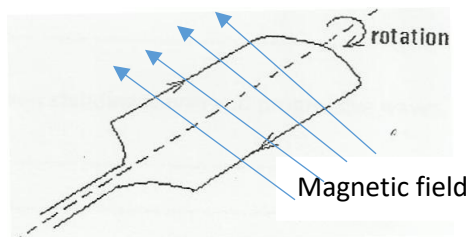
4.   a) $Q = It$

$$40 = I \times \frac{120}{60}$$ ✓ **1 mk**

$$\therefore I = 20 \text{ A}$$ ✓ **1 mk**

b) Increased internal resistance by combining cells in series, leads to insufficient current to start the car engine

5.   **X** – North

Y – South

6.

✓ **1 mk**

7.

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

$$\frac{-1}{15} = \frac{1}{25} + \frac{1}{v} \qquad \checkmark \text{1 mk}$$

$$v = -9.375cm \qquad \checkmark \text{1 mk}$$

$\therefore$ the image is virtual

8. $t_2 - t_1 = 0.25$

$$t_1 = \frac{2d}{v} = \frac{2 \times 100}{340}$$

$$= 0.588 \text{ S}$$

$^{2d}/_v = 0.588 + 0.2$

$^{2d}/_{340} = 0.788 \text{ s}$

$d = 133.96$

9.   a)

Ultraviolet rays	X – rays
Microwaves	UV – Rays
X-rays	Visible light
Visible light	microwaves

b) i) Ultraviolet rays: detect forgeries, mineral analysis, vitamin D etc
    ii) Microwaves: cooking, communication

10. $P = \dfrac{V^2}{R}$

$$= \frac{6^2}{4} \qquad \checkmark \text{1 mk}$$

$$= 9 \text{ W} \qquad \checkmark \text{1 mk}$$

11.

- ✓ do not insert foreign objects in sockets
- ✓ Do not handle electrical apparatus with wet hands
- ✓ Ensure all electrical switches are turned off when not in use

Section II

12. a) is the plane perpendicular to principal axis that passes through the principal focus

b) i) Shutter: controls the exposure of the film to light
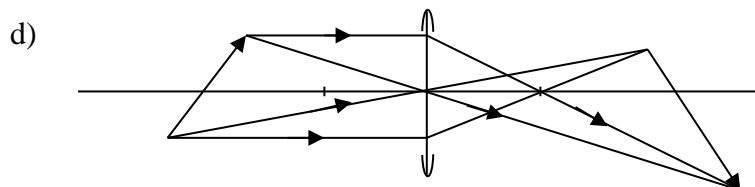
ii) Film: captures and records the image

iii) Diaphragm: controls the amount of light entering the camera

c) For the first image $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$ $= \frac{1}{0.8} - \frac{1}{1.2}$ $therefore$ $v = 2.4cm$

$$\frac{1}{d-2.4} = \frac{1}{2.5} \quad \frac{1}{10} \qquad d - 2.4 = 3.33 \qquad d = 5.733$$

> ✓ *Two rays from the tip of the object to the tip of the image*
> ✓ *Two rays from the bottom of the object to the bottom of the image*
> ✓ *image*

d)

13. **(a)**i) *It* is used to cool the anode by conducting heat away

ii) *Has a* high melting point

(b) I. P = I X V

= 20X 10^{-3} X 100,000

= 2000W

II. I= nxe

n= I/e

= 20x10^3/1.6x10^{-19}

= 1,25 x10^{17}

III. eV = KE

$=1.6\times10^{-19} \times100000$

$=1.6\times10^{-14}$ J

(2 mks)

c) Energy $= \dfrac{hc}{\lambda}$

$= \dfrac{6.63\times10^{-34} \times3.0\times10^8}{2.15\times10^{-7}}$
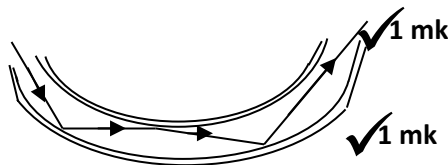
$= 9.251\times10^{-19} J$

=5.782eV

14. a) The ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant for given pair of media
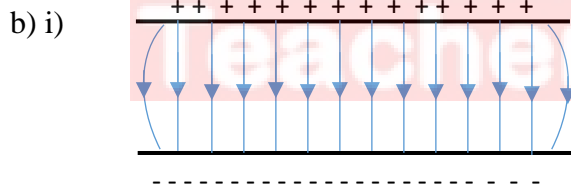
b) Due to total internal reflection

c) i) $_1n_3 = {}_1n_2 \times {}_2n_3$

$$\frac{3}{2} = \frac{4}{3} \times {}_2n_3$$

$$_2n_3 = \frac{3}{2} \times \frac{3}{4} = \frac{9}{8} = 1.125$$

ii)
$$n = \frac{\sin i}{\sin r}$$

$$1.125 = \frac{\sin 40}{\sin r}$$

$$\sin r = \frac{\sin 40°}{1.125}$$

$$\therefore r = 26.39$$

d) Through successive total internal reflection ✓**1 mk**

✓**1 mk**
✓**1 mk**

15. a) Charge stored per unit volt.

b) i)

ii) ✓ Decreasing the distance between the two plates
   ✓ Using a dielectric material of higher dielectric constant

c) i) capacitors arranged in parallel

$$C_{eff} = C_1 + C_2 + C_3$$

$$= 12\mu F + 12\mu F + 12\mu F \quad ✓\text{**1 mk**}$$

$$= 36\mu F \quad ✓\text{**1 mk**}$$

ii) Capacitors in series

$$\frac{1}{C_{eff}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} \quad ✓\text{**1 mk**}$$

$$= \frac{1}{12} + \frac{1}{12} + \frac{1}{12}$$

$$= \frac{1}{4}$$

$$\therefore C_{eff} = 4\mu F \quad \checkmark \textbf{1 mk}$$

iii) Combining series and parallel

Parallel

C = 12 + 12

$\checkmark$ **1 mk**

= 24μF

Series

$$\frac{1}{C} = \frac{1}{24} + \frac{1}{12}$$

$$= \frac{1}{8}$$

$$\therefore C = 8\mu F \quad \checkmark \textbf{1 mk}$$

16. *a)* i

    I.   r- beta
       s- alpha
    II. x…83……….
       y…82……

  ii) I.   volatile
    II. Lowers the temperature in the chamber until is super saturated
    III. Radiation ionizes air inside the chamber
  -     alcohol droplets form on the air ions produced by the radiation forming white tracks
iv)   the type of radiation can be detected , i.e can identify the nature of radiation
b)

    i)   6 hours
    ii)   0.1155m
    iii)   4 x 10^6