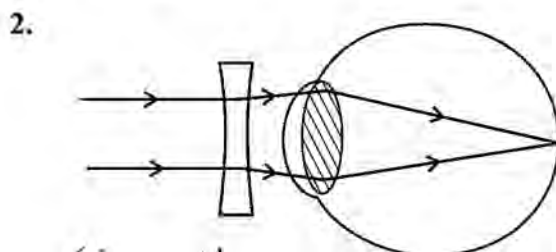


NTIMA, NYAKI AND MUNICIPALITY CLUSTER EVALUATION 2016

PHYSICS Paper 2 July/August 2016 MARKING SCHEME

SECTION A :

1. $f = \frac{1}{T} \checkmark T = 0.008 \times 2 = 0.016$
 $= \frac{1}{0.016} \checkmark$
 $= 62.5\text{Hz} \checkmark$



- $\checkmark$ 1 correct lens
- $\checkmark$ 2 mark for each ray

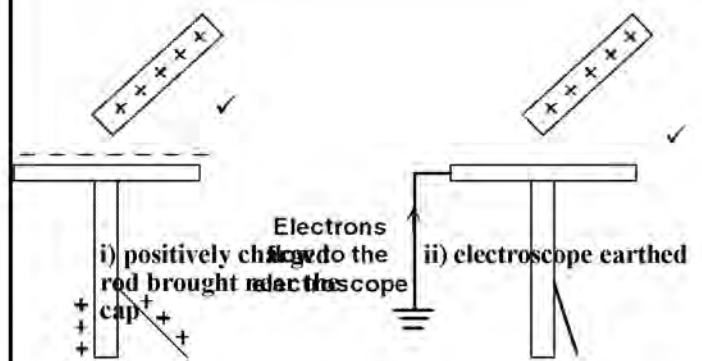
3. Hardening of lead sulphate on the lead plates
 $\checkmark$ 1

4. This is due to the deposition of hydrogen gas bubbles (or molecules) on the copper plate / polarization $\checkmark$ 1

5. $P = VI$
 $I = \frac{P}{V} = \frac{1000}{240} = 4.167\text{A} \checkmark$
 The suitable fuse is 5A fuse $\checkmark$ 1 (give mark for any answer slightly above 4.167A)

6. $P = VI$
 Efficiency = $\frac{\text{power output}}{\text{power input}} \times 100\%$ or
 Power input = $\frac{100 \times 100}{95} \checkmark$
 $I = \frac{100 \times 100}{95 \times 40}$
 $= 2.632\text{A} \checkmark$

7.



iii) Remove earthing then positively charged rod

8. Electrons are emitted from the surface of the zinc plate $\checkmark$ 1 causing electrons to move from the electroscope to zinc plate thus reducing the repulsion force $\checkmark$ 1
9. - the dot or spot moves up and down due to the change in direction of the current in the circuit. $\checkmark$ 1
 The movement of the dot is caused by the induced voltage which increases gradually from zero to the peak value and back to zero on either side causing the beam to move up and down $\checkmark$ 1

10.

✓1 correct direction (downwards)

11. Alpha forms straight, short and thick tracks while beta forms thin and irregular long tracks ✓2

12. Used in

- spectroscopy
- detecting forgeries and fresh eggs
- kill bacteria in operating theatres
- skin treatment

✓1 any one

SECTION B :

13. a) The critical angle of medium is the angle of incidence of a ray of light from the medium to air / vacuum when the angle of refraction is 90° ✓1

b) $\sin \theta = \frac{1}{n}$ ✓1

$$\sin \theta = \frac{1}{1.5}$$

$$\theta = 41.81^\circ \quad \checkmark 1$$

c) i) $n = \frac{\sin i}{\sin r}$, or $\frac{3}{2} = \frac{\sin 70^\circ}{\sin a}$ ✓1

$$\sin a = \frac{\sin 70^\circ \times 2}{3} = 0.62645$$

$$\sin a = 0.6265$$

$$a = 38.79^\circ \quad \checkmark 1$$

ii) $n_1 \sin i_1 = n_2 \sin i_2$
 $1.5 \sin 38.79 = \frac{4}{3} \sin b$ ✓1

$$\sin b = \frac{1.5 \sin 38.79 \times 3}{4}$$

$$= 0.7048$$

$$b = 44.77^\circ \quad \checkmark 1$$

iii) angle c

$$\left. \begin{array}{l} n_1 \sin i_1 = n_2 \sin i_2 \\ \frac{4}{3} \sin 44.77^\circ = 1 \sin c \end{array} \right\} \checkmark 1$$

$$\sin c = 0.9390$$

$$c = 69.88^\circ$$

$$\approx 70^\circ \quad \checkmark 1$$

14. a) i) Transverse wave ✓1

The particles vibrate at right angle to the direction of motion of the wave ✓1

ii) The wavelength = 50cm or 0.5m ✓1

iii) $v = \lambda f$ ✓1

$$f = \frac{9}{0.5} \quad \checkmark 1$$

$$= 18\text{Hz} \quad \checkmark 1$$

b) i) Bright and dark fringes are formed ✓1

Bright fringes are formed where constructive interference occurs while dark fringes are formed where destructive interference occurs ✓1

ii) Produce coherent sources of light ✓1

15. a) Image formed

Between F and C

Between F and P

1. Real
2. Inverted
3. same side as the object

✓2 any two

b) $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ ✓1

$$\frac{1}{60} + \frac{1}{v} = \frac{1}{40}$$

$$\frac{1}{v} = \frac{3}{120} - \frac{2}{120} = \frac{1}{120}$$

$$v = 24\text{cm} \quad \checkmark 1 \text{ same side as the object}$$

c) i) slope = $\frac{\text{change } y}{\text{change } x} = \frac{\Delta(u+v)}{\Delta(uv)}$ ✓1

$$= \frac{62.5 - 40}{625 - 400}$$

$$= 0.1 \quad \checkmark 1$$

ii) since $(u+v) = \frac{uv}{f}$

$$\text{then slope} = \frac{1}{f} \quad \checkmark 1$$

$$= \frac{1}{0.1}$$

$$= 10\text{cm} \quad \checkmark 1$$

16. a) Lenz's law states that the direction of the induced current is such that it opposes the change in magnetic field producing it ✓1

b) i) The pointer deflects to and fro from the zero mark ✓1

This is due to the fact that current on the wire changes direction when moving up and down

ii) - changing the speed of wire downwards or upwards

- using a stronger or weaker magnetic field (or magnet)

- changing the angle between conductor and magnetic field

c) i) To reduce energy losses due to eddy

currents ✓1

- ii) To reduce energy loss due to hysteresis
✓1(during magnetization and demagnetization of the core)

Alt 1

$$\begin{aligned} \text{d) Cost} &= \text{number of units} \times \text{cost / unit} \quad \checkmark 1 \\ &= \frac{3000 \times 30 \times 60 \times 30 \times 7}{1000 \times 60 \times 60 \times 1} \quad \checkmark 1 \\ &= \text{sh.315.00} \quad \checkmark 1 \end{aligned}$$

Alt 2

$$\begin{aligned} \text{cost} &= \text{no units} \times \text{cost / unit} \\ &= 3 \times \frac{30}{60} \times 7 \times 30 \\ &= \text{sh.315.00} \end{aligned}$$

}

17. a) Q - cooling fins ✓1

R - cathode ray beam ✓1

- b) i) The intensity of X-rays is increased ✓1
since the number of electrons emitted increases with temperature ✓1

- ii) - harder X-rays are produced ✓1
higher e.h.t increases the speed (or K.E) of electrons ✓1 and hence X-rays of higher energy are produced

- c) - tungsten ✓1
- tungsten has a high melting point ✓1

$$\begin{aligned} \text{d) Voltage} &= \text{Y-gain} \times \text{number of division/cm} \\ &= 50 \times 3.5 \quad \checkmark 1 \\ &= 175\text{V} \quad \checkmark 1 \end{aligned}$$

18. i) ammeter reading

$$= \frac{\text{voltage}}{\text{resistance}}$$

$$i = \frac{V}{R_e} \quad \text{where } R_e = 2.75 + R_1$$

$$= \frac{12}{3.55} \quad \checkmark 1$$

$$\begin{aligned} &= 3.380\text{A} \quad \checkmark 1 \\ &\frac{1}{R_1} = \frac{1}{4} + \frac{1}{2} + \frac{1}{2} \\ &= \frac{5}{4} \\ &R_1 = 0.8 \end{aligned}$$

- ii) $V = IR$

$$\begin{aligned} &= 2.75 \times 3.38 \quad \checkmark 1 \\ &= 9.296\text{V} \quad \checkmark 1 \end{aligned}$$

