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PHYSICS

PAPER 2

(THEORY)

JULY, 2017

TIME: 2 HOURS

KITUI COUNTY MOCK

END OF TERM II FORM FOUR EXAMINATION, 2017

Kenya Certificate of Secondary Education (K.C.S.E)

MARKING SCHEME

SECTION A

1. u = 20cm, f = -15cm, v = 20cm

$\frac{1}{v}=\frac{1}{f}-\frac{1}{u}1\frac{1}{15}-\frac{1}{20}=\frac{-4-3}{60}=\frac{-7}{60}$

m = $\frac{v}{u}=\frac{8.571}{20}$

= 0.4286

v = $\frac{60}{-7}=-8.571\,cm$

Position: Image is 8.571 from the optical centre on the same side of the object

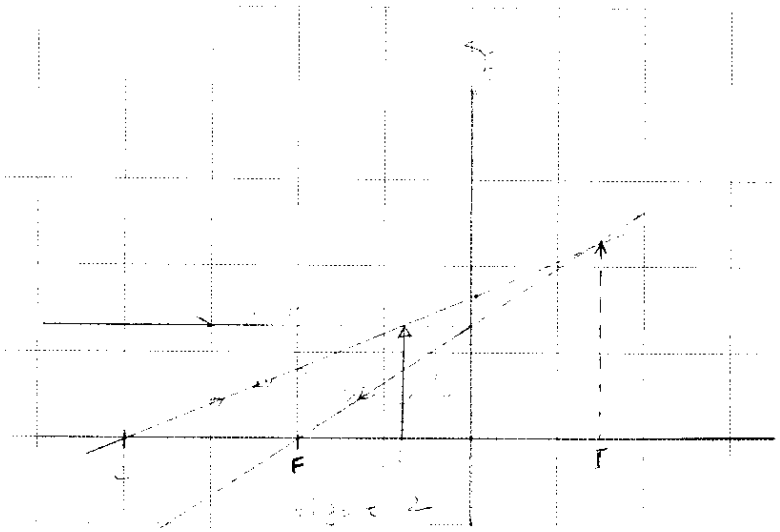
2. - Enlarged hole allows more light to reach the screen ✓½

- Enlarged hole allows multiple images to be✓½ formed on the screen hence overlapping images

3. a) 2.5V ✓1

b) 1.6V ✓1

4.



5. a) a = 0 ✓½

b = 0 ✓½

b) Energy ✓1

6. $\frac{N_S}{N_P}=\frac{V_S}{V_P}$ ✓1 = $\frac{4}{10}=\frac{V_S}{24}$✓1

$V_S = \frac{4\times 24}{10}$ = 9.6V ✓1

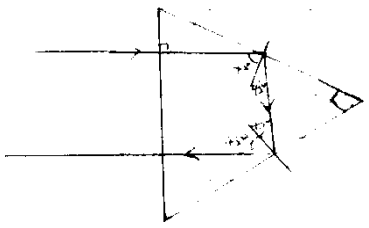
7. (-) lamps in parallel produce light of the same ✓1 brightness

(-) When lamps are in parallel, failure in one does not affect others (-)

8. When the switch is closed, x-rays ionize the air particles between the plates, where the positive ions move to the negative plate, while negative ions move to positive plate✓1, completing the circuit hence a deflection is seen on the milliameter ✓1

9. This is because of most of the energy of the electrons that strikes the anode is converted into heat which causes the heating of the anode. ✓1

10.



11. V = 330ms-1 $\lambda = \checkmark^1 \frac{v}{f} = \frac{330}{440}$

f = 0.44 kHz = 0.75 m ✓1

1kHz = 1000Hz

∴ f = (0.44 x 1000)Hz = 440Hz

12.

13. P = $\frac{1}{f(m)}$ ✓1, f = 40cm = 0.40m

= $\frac{1}{0.40} = +2.5\,D$ ✓1

SECTION B

14. a) The electroscope discharges through the electrons flowing through your body✓1 to the ground.

b) i) $\frac{1}{C_1} = \frac{1}{C_2} + \frac{1}{C_e}$ ✓1 = $\frac{1}{3} + \frac{1}{6} = \frac{2+1}{6} = \frac{3}{6}$ ✓1

$C_e = \frac{6}{3} = 2f$ ✓1

ii) $Q_T = Q_1 = Q_2$ ✓1 = CV

$Q_T = 2 \times 10^{-6} \times 4 = 8\mu C$ ✓1

$Q_A = 8\mu C$ ✓1

iii) $Q_B = 8\mu C$ ✓1

c)

15. a) i) Electrons are produced through thermionic emission due to heat energy ✓1

ii) Detected through the glowing of the fluorescent screen ✓1

iii) I. Variable p.d in the grid – controls the amount of electrons reaching the screen ✓1

II. Variable p.d in the anodes – ensures we have electrons of varying strength ✓1

b) i) Time base setting 20 ms/cm

λ = 2cm

⇒ T = Time base setting × No. of division for one oscillation

= 20ms/~~cm~~ × 2~~cm~~ = 40 ms = $\frac{40}{1000} s = 0.04\,s$ ✓1

ii) f = $\frac{1}{T}$ ✓1 = $\frac{1}{0.04} = \frac{100}{4}$ ✓1 = 25 Hz ✓1

16. a) I = 0.02A

t = 1 s Q = eη

e = 1.6 x 10^{-19}C but Q = It

Number of electrons, n? $\therefore$ eη = It

$$\eta = \frac{It}{e} \checkmark^1$$

$$\eta = \frac{0.02 \times 1}{1.6 \times 10^{-19}} \checkmark^1$$

= 1.25 x 10^{17} electrons $\checkmark^1$

b) If all KE = electrical energy, then;

$\frac{1}{2}meV^2 = eV$ $\checkmark^1$

$$V^2 = \frac{2eV}{me}$$

$$V = \sqrt{\frac{2eV}{me}} = \sqrt{\frac{2 \times 1.6 \times 10^{19} \times 10^5}{9 \times 10^{-31}}}$$

= 1.886 x 10^8 ms^{-1} $\checkmark^1$

c) i) f_o = 5.0 x 10^{14} Hz $\checkmark^1$

ii) $\lambda_o = \frac{C}{f_o}$ $\checkmark^1$ $= \frac{3 \times 10^8}{5 \times 10^{14}} = 0.6 \times 10^{-6}$m

$= 6.0 \times 10^{-7}$m $\checkmark^1$

iii) $\frac{h}{e}$ = Gradient of the graph $\checkmark^1$

$$\text{Slope} = \frac{\Delta Vs}{\Delta f} = \frac{2.5 - 0}{(11.20 - 5) \times 10^{14}} = \frac{2.5}{6.2} \times 10^{-14} = 4.032 \times 10^{-15} \checkmark^1$$

h = slope × e

= 4.032 × 1.6 × 10^{-19} × 10^{-15}

= 6.4512 × 10^{-34}Js $\checkmark^1$

iv) $-\frac{w_o}{e}$ = y – intercept $\checkmark^1$

$-\frac{w_o}{e}$ = -2 $\checkmark^1$

W_o = 2 x e

= 2 x 1.6 x 10^{-19}J

= 3.2 x 10^{-19}J $\checkmark^1$

17. a) r = 15° $\checkmark^1$

b) i) θ_1 = 20° $\checkmark^2$

ii) θ_2 = 70° $\checkmark^2$

c) i) Use of thick cables $\checkmark^1$

ii) Transmit power at high voltage to reduce or the current of transmission. Power loss α I^2 $\checkmark^1$

d) i) $\frac{1}{\Re} = \frac{1}{2} + \frac{1}{4} \checkmark^1 = \frac{2+1}{4} = \frac{3}{4}$

$$\text{Re} = \frac{4}{3} + \frac{3}{1} = \frac{4+9}{3} = \frac{13}{3} = 4.333\Omega \checkmark^1$$

ii) $I_T = \frac{V_T}{R_T} \checkmark^1 = \frac{2}{4.333} = 0.462$ $\checkmark^1$

18. a) i) The pointer of the galvanometer deflects to one side and then back to zero $\checkmark^1$

ii) It deflects to the opposite side and back again to zero $\checkmark^1$

b) i) Amount of voltage in the circuit when the switch is opened $\checkmark^1$

c) i) $R = \frac{V}{I}1 = \frac{2.2}{0.4} = 5.5$ ✓1

ii) Non – ohmic – graph is a curve not a straight line ✓1

d) i) e.m.f, E = 1.5v ✓1

ii) E = V + Ir

1.5 = 0 + 0.4r ✓1

$r = \frac{1.5}{4} = \frac{1.5}{4}$ ✓1 = 0.375Ω

r = 0.375 Ω