KENYA NATIONAL EXAMINATION COUNCIL
REVISION MOCK EXAMS 2016
TOP NATIONAL SCHOOLS

ALLIANCE BOYS HIGH SCHOOL
232/1
PHYSICS
PAPER 2
MARKING SCHEME

SCHOOLS NET KENYA
Osiligi House, Opposite KCB, Ground Floor
Off Magadi Road, Ongata Rongai | Tel: 0711 88 22 27
E-mail:infosnkenya@gmail.com | Website: www.schoolsnetkenya.com

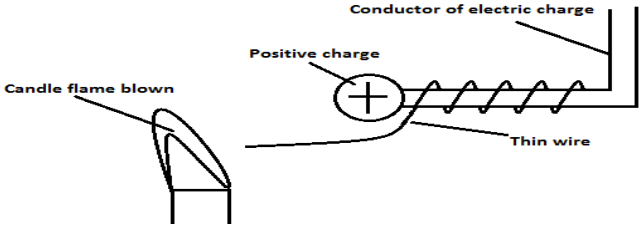
ALLIANCE BOYS HIGH SCHOOL KCSE TRIAL AND PRACTICE EXAM 2016

Paper 2

MARKING SCHEME

SECTION A (25 MARKS)

1. The figure below shows a thin wire connected to a charge generator and placed close to a n candle flame.



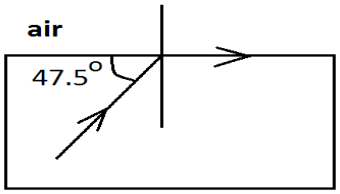
Explain why the candle flame is deflected as shown. (3 marks)

High concentration of positive charges at the sharp point causes ionization (√1) to provide electrons and positive ions, (√1) electrons are attracted to the wire while positive ions drift towards the flame forming an electric wind (√1) which deflects the flame

2. State the meaning of the term "threshold frequency" as used in photoelectric emission. (1mark)

Minimum frequency of an incident radiation to cause emission of photo electric effect

3. The figure below shows the path of light passing through a rectangular block of perpex, placed in air.



Calculate the refractive index of the Perspex. (2 marks)

$$\sin 42.5 = \frac{1}{n}$$

$$n = \frac{1}{42.5} = 1.48$$

4. A radio signal of 30MHz is received by an aerial whose length is 1/8 th of its wavelength. If the speed of light is $3.0x10^8$ m/s determine the length of the aerial. (3 marks)

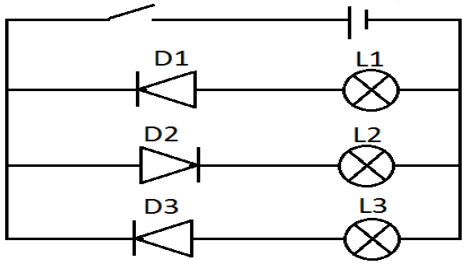
$$v = f\lambda$$

$$\lambda = \frac{v}{f} = \frac{3.0x10^8}{3.0x10^8} = 100m$$

$$length = \frac{1}{8}x100$$

$$= 12.5m$$

5. The figure below shows an electric circuit with three diodes, three bulbs and a cell. State and explain what would be observed when the switch is closed. (2 marks)



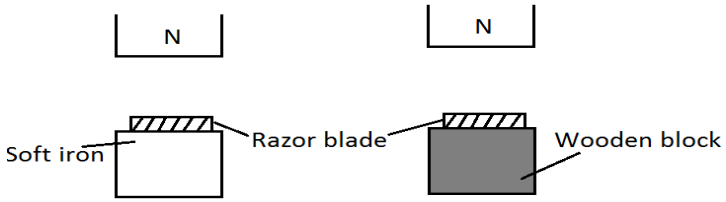
L_2 lights, L_1 and L_3 do not

D_2 is forward biased while D_1 and D_3 are reversed biased

6. What property of cathode rays shows that they are particles and not waves? (1 marks)

They are able to turn a paddle wheel.

7. Two similar razor blades are placed one on a wooden block and the other on a soft iron block as shown in the figure below

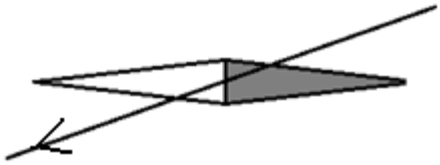


It was observed that the razor blade on the wooden block was attracted to the magnet while the other on the soft iron block was not. Explain. (2 marks)

Soft iron became induced magnet and attracts back the razor

Wood is non-magnetic material hence does not attract the blade.

8. The figure below shows a wire carrying current placed over a magnetic compass. On the wire, indicate the direction of electric current. The shaded side is the North Pole. (1 mark)



9. Differentiate between a capacitor and capacitance. (1 mark)

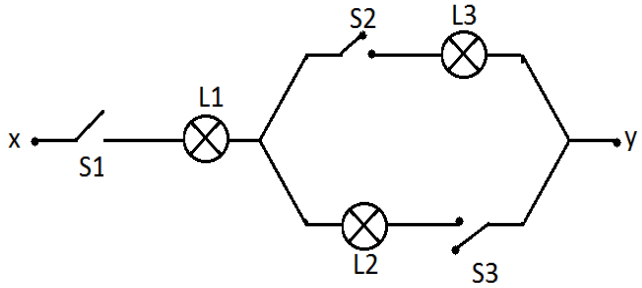
A capacitor is a device used for storing charge.

While capacitance is the amount of charge stored per unit volt

10. A 10μF capacitor is charged by a 100 V supply and then connected a cross an uncharged 20μF capacitor. Calculate the final p.d on each capacitor. (3 marks)

$$\boldsymbol{Q = CV = 10x100V = 1000\mu C}$$
$$\boldsymbol{C_T = C_1 + C_2}$$
$$\boldsymbol{C_T = 20 + 10 = 30\mu F}$$
$$\boldsymbol{pd = \frac{Q}{C} = \frac{1000\mu C}{30\mu F}}$$
$$\boldsymbol{V = 33.33V}$$

11. Fig. 7 shows an electric circuit including three switches, S_1, S_2, S_3 and three lamps L_1, L_2, L_3. A constant potential difference is applied across X and Y.



i). Other than L_1, state the lamp that will light when S1 and S_2 are closed.

L_3 (1 mark)

ii). How does the brightness in L1in i) above compare with its brightness when all the switches are close

L_1 is brighter (1 mark)

iii). Explain the observation in ii) above. (1 mark)

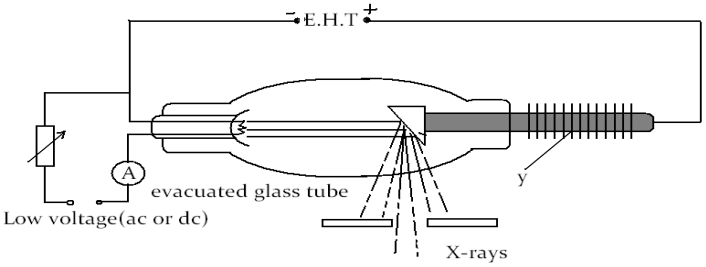
When the switches are all closed the total resistance is less

12. During total eclipse of the sun, both light and heat are observed to disappear simultaneously. Explain the observation. (2 marks)

When the moon covers the sun it obstructs both the light and the heat, since they move with the same velocity

SECTION B (55 MRKS)

1. The figure below shows an X-ray tube.



a) Label the part marked Y. (1 mark)
Cooling fins /copper fins .

b) How would one increase

i). The intensity of the X –rays. (1 mark)
Increase the cathode heater current .

ii). Penetrating power of the X –rays. (1 mark)
Increasing the anode potential .

c) Explain why the tube is highly evacuated. (2 marks)
To prevent **energy loss** by electrons this results from **collisions** with the air particles .

d) An X –ray tube operating with an anode potential of 10 kV and current of 15Ma.

i) Calculate the number of electrons hitting the anode per second. (3 marks)

$$\mathbf{Q = It = 15\ x10^{-3}x1 = \ 15\ x10^{-3}C}$$

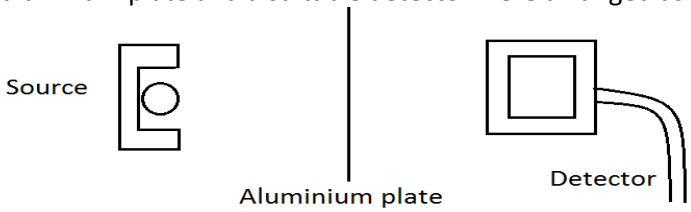
$$\mathbf{N = \frac{Q}{e} = \frac{15\ x10^{-3}}{1.6\ x10^{-19}} = 9.4\ x10^{16}electrons}$$

ii) Determine the speed with which the electrons hit the target (3 marks)
(Charge of an electron, q=1.6x10^{-19}C, mass of an electron m_e=9.1x10^{-31} kg.)

$$V = \sqrt{\frac{2eV}{m_e}} = \sqrt{\frac{2x1.6x10^{-19}x10,000}{9.1x10^{-31}}}$$

$$= 5.93x10^7 m/s$$

2. A radioactive source, aluminum plate and a suitable detector were arranged as shown below.



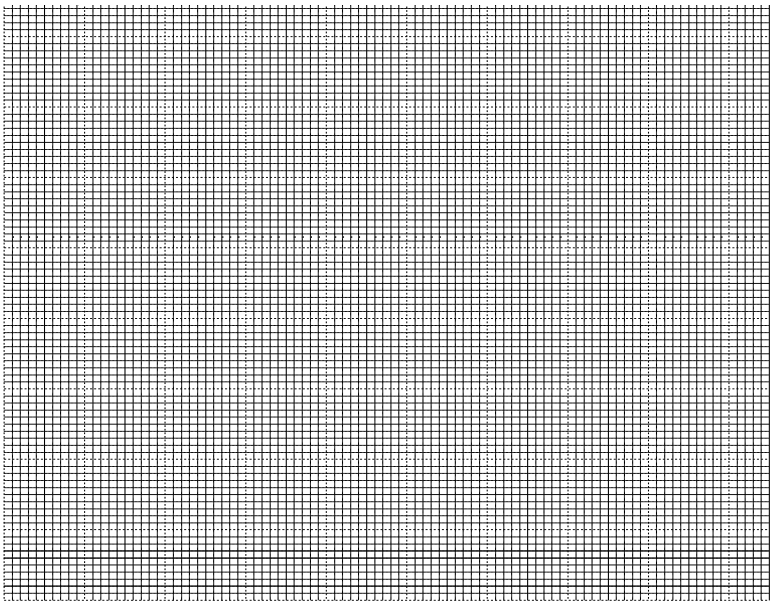
a)

i) Before the source was introduced, the detector registered a reading of 40 counts per second. Explain this observation. (1 mark)
Due to background radiations .

ii) The following readings were obtained using a radioactive detector and a timer.

Count rate(counts/s^{-1})	1440	1272	1128	840	624	480	360	264	204	180
Time	0	3	6	12	18	24	30	36	42	45

i). Plot a graph of count rate against time on the grid provided below. (5 marks)



ii). Use the graph to obtain the half life of the source. (1 mark)

15 hours.

iii). Using the half life determine how long it would take for the count rate to fall from320 to 40 counts per second. (2 marks)

$$320 \rightarrow \mathbf{15hrs} \rightarrow 160 \rightarrow \mathbf{15hrs} \rightarrow 80 \rightarrow \mathbf{15hrs} \rightarrow 40$$

Total time $3\text{x}\ 15hrs = \mathbf{45}\boldsymbol{hrs}$

a) Define the term electromagnetic spectrum. (1 mark)

This is the arrangement of the electromagnetic waves according to their frequencies or wave length .

b) Your radio is tuned into a radio station 144km away.

i). How long does it take the signal to reach your receiver? (2 marks)

$$\boldsymbol{time} = \frac{\boldsymbol{distance}}{\boldsymbol{speedofradiowave}}$$

$$= \frac{\mathbf{144000}\boldsymbol{m}}{\mathbf{3.0}\boldsymbol{x}\mathbf{10}^{\mathbf{8}}\boldsymbol{m/s}} = \mathbf{4.8}\boldsymbol{x}\mathbf{10}^{-\mathbf{4}}\boldsymbol{seconds}$$

ii). If the signal has a frequency of 600 KHz, how many wavelengths is the station from your receiver.

(Take C=3.0x10^8 m/s) (3 marks)

$$\lambda = \frac{\boldsymbol{c}}{\boldsymbol{f}} = \frac{\mathbf{3.0}\boldsymbol{x}\mathbf{10}^{\mathbf{8}}\boldsymbol{m/s}}{\mathbf{600,000}} = \mathbf{500}\boldsymbol{m}$$

$$\boldsymbol{noofwaves} = \frac{\mathbf{144000}}{\mathbf{500}}$$

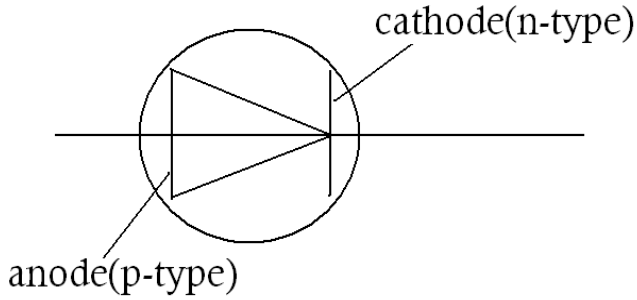
$$\boldsymbol{waves} = \mathbf{288}$$

c) State the function of magnetron in a microwave cooker. (1 mark)

It produces microwaves .

3.

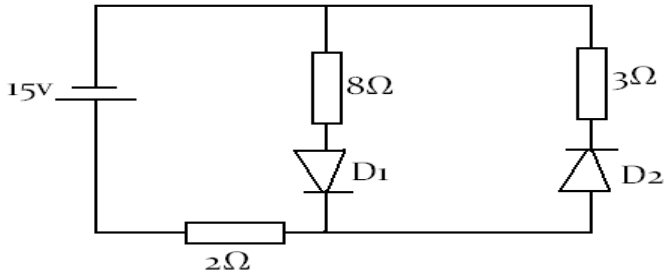
a) Sketch the circuit symbol of a semiconductor diode and name its parts. (2 marks)



b) What is rectification (1 mark)

The process of transforming an alternating voltage into a direct or unidirectional voltage

c) Study the diagram below and answer the following questions



i). Calculate the current flowing through the 2Ω resistor. (2 marks)

$$I = \frac{V}{R}$$

$$\frac{1.5}{3} = 3A$$

ii). Calculate the voltage drop across the 3Ω resistor. (3 marks)

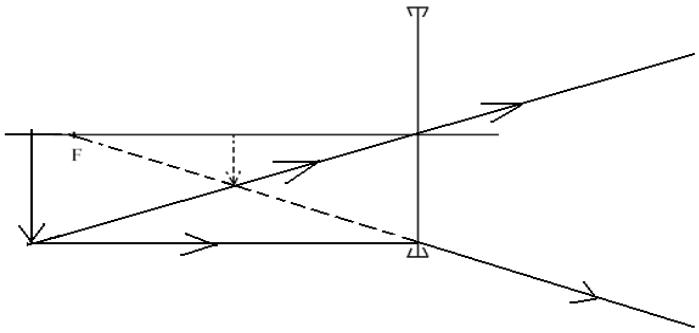
$$V = IR$$

$$3x3$$

$$9V$$

4.

a) Complete the diagram below indicating the rays that will lead to the formation of the image shown below (3marks)



b) A compound microscope with an objective lens L_o of focal length 1.2cm and an eye piece lens L_e of focal length 2.8cm. An object is placed 1.8cm from the objective lens. The system of lenses produces a final image a distance of 12.0cm from L_e. Determine the distance of separation of lens L_o and L_e. (4 MARKS)

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{1.2} - \frac{1}{1.8}, \frac{1}{v} = 0.2778, v = 3.6cm$$

$$u_e = d - v$$

$$\frac{1}{d - 3.6} = \frac{1}{2.8} - \frac{1}{10}$$

$$d - 3.6 = 3.8889$$

$$d = 7.489cm$$

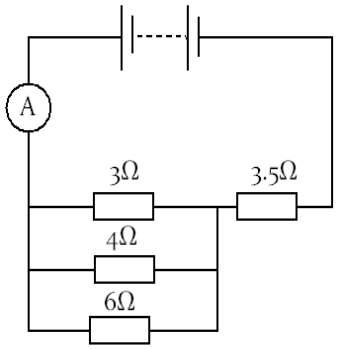
c) An object is placed 12cm from a convex lens and it forms a virtual image 36cm from the lens. Calculate the focal length of the lens. (3 MARKS)

$\underline{u = 12cm}$

$\underline{v = -36cm f = \frac{uv}{u+v}}$

$\underline{\frac{12x-36}{12-36} = \frac{432}{24} = +8cm}$

a) The diagram below show a battery of e.m.f 12V and an internal resistance of 0.17Ω connected to a combination of resistors.



Calculate

i). The current through the 3.0Ω resistor (3 marks)

$$\underline{R = \frac{1}{3} + \frac{1}{4} + \frac{1}{6} + 3.5 + 0.17 = 5.00\Omega}$$

$$\underline{I = \frac{12}{5} = 2.4A, V = IR = 2.4x3.5 = 8.4V, 12 - 8.4 = 3.6V}$$

$$\underline{I = \frac{V}{R} = \frac{3.6}{3} = 1.2A}$$

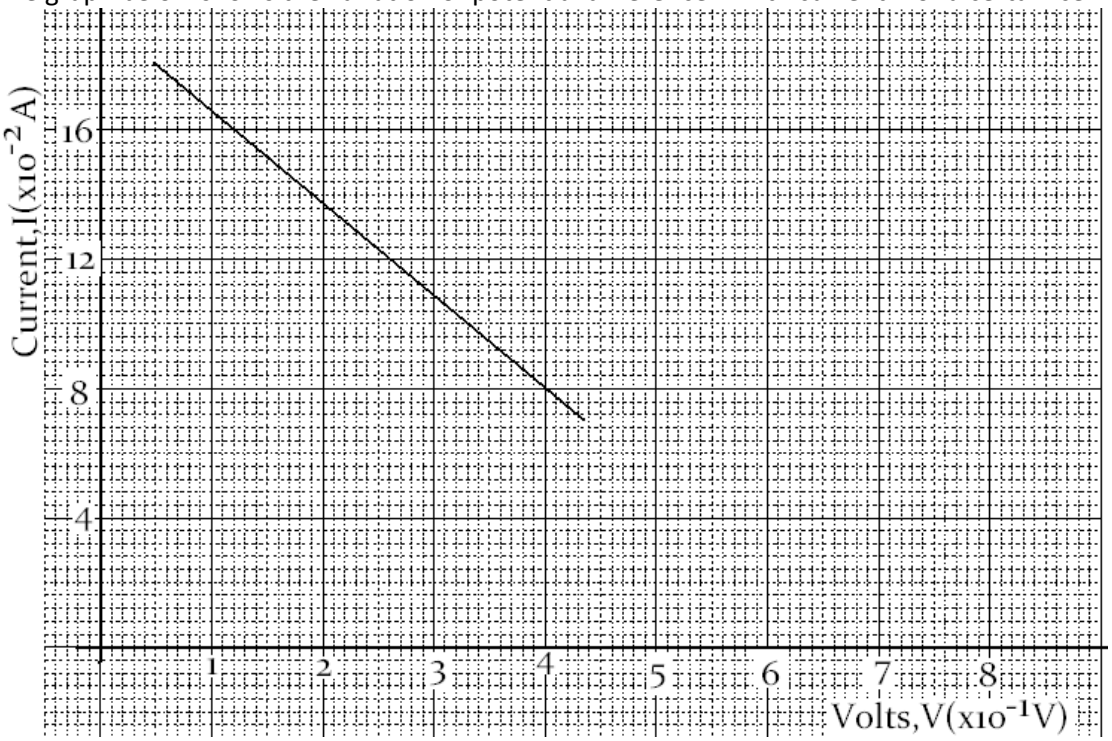
ii). The potential difference across the parallel connection. (2 marks)

$$12 - 8.4 = 3.6V$$

iii). The current through the 4Ω resistor. (1 mark)

$$\underline{I = \frac{V}{R} = \frac{3.6}{4} = 0.9A}$$

b) The graph below shows the variation of potential difference V with current I for a certain cell.



From the graph determine

i). The internal resistance of the cell (3 marks)

$$\boldsymbol{internal resistance, r = \frac{1}{gradient} = \frac{12-8}{2.6-4} = 2.857^{-1}, 0.35\Omega \pm 0.01}$$

ii). The e.m.f of the cell (1 mark)

$$\mathbf{e.m.f when I = 0 e.m.f = 6.8V}$$