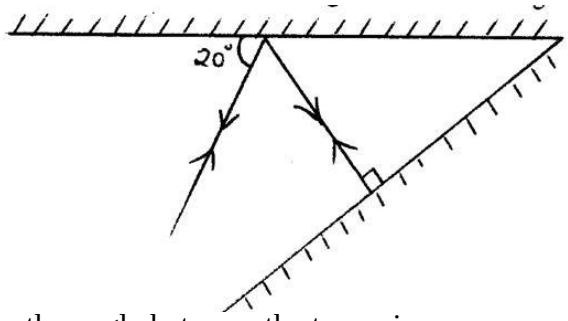
CATHOLIC DIOCESE OF KAKAMEGA EVALUATION TEST.
AUG/SEPT EXAM 2022.

132/2 PHYSICS PAPER 2 MARKING SCHEME

SECTION A (25 marks**)**

*Answer **all** the questions in this section in the spaces provided.*

1 The figure shows the path of light after striking two mirrors at an angle.



Determine the angle between the two mirrors. (1 mark)

Angle = 180 – (90 + 20)

= 70^0 ✓(1)

2 In a textile industry, the machines experience electrostatic forces at certain points. Suggest **<u>one</u>** method of reducing these forces. (1mark)

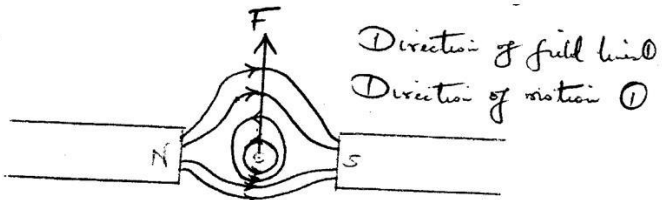
- Earthling machine using spikes ✓(1)

3 A positively charged rod is brought near the cap of a leaf electroscope. The cap is then earthed momentarily by touching with the finger. Finally, the rod is withdrawn. The electroscope is found to be negatively charged. Explain how this charge is acquired.

(2 marks)

- The positively charged rod attracts the negatives and repels the positives. ✓(1)
- when earthed, the negative charges flow from the earth and neutralize the positive charges .the electroscope acquires a negative charge.

4 (a) The figure shows a conductor carrying current placed within the magnetic field of two magnets.



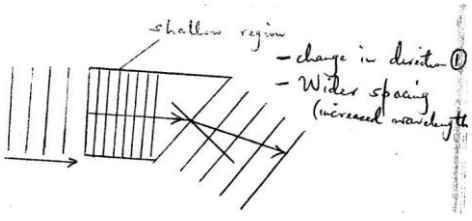
Complete the diagram by showing the field pattern and the direction of force F that acts on the conductor. (2 marks)

(b) State the reason why soft iron is used as a core of the coil of an electric bell.

(1 mark)

It is easy to magnetize and demagnetize

5 The figure shows wave fronts in a ripple tank approaching a shallow region in the tank.



Complete the diagram to show the wave fronts as they pass over the shallow region and after leaving the region. (2 marks)

6 State **one** advantage of a lead-acid accumulator over a nickel-iron accumulator. (1 mark)

- Has a higher c.m.f. per cell ✓ than the nickel iron accumulator.

7 Four bars of metal W, X, Y and Z are tested for magnetism. X attracts both W and Y but not Z. Z does not attract W, X or Y. W and Y sometimes attract one another and sometimes repel one another. State the conclusion you can draw about:

(a) Bar W (1 mark)

-Permanent magnet ✓①

(b) Bar X (1 mark)

-Magnetic material ✓①

8 An observer watching a fireworks display sees the light from an explosion and hears the sound 4 seconds later. Determine how far the explosion was from the observer. (Speed of sound in air 330m/s). (3marks)

Distance = speed x time ✓①

= 330 x 4 ✓①

= 1320m ✓①

9 An object placed 15cm from a convex lens forms an upright image which is magnified two times. Determine the focal length of the lens. (2 marks)

M=2

$\frac{v}{u} = 2$

v=2u

v=2(15)

= 30 ✓①

V= -30cm (virtual, erect image)

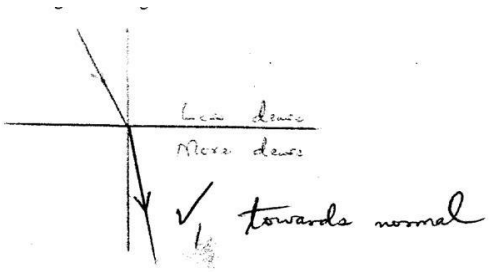
$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

$= \frac{1}{15} + \frac{1}{-30}$

$= \frac{2-1}{30} = \frac{1}{30}$

f= 30cm ✓①

10 (a) The figure shows light travelling from a less dense medium to a more dense medium.



Show the direction of the refracted ray. (1 mark)

(b) State any **one** condition necessary for total internal reflection to take place.
(1 mark)

- Angle of incidence must be greater than the critical angle.
- Ray must be passing from optically denser medium to a less dense medium.

11 An electric bulb rated, 40W is operating on 240V mains. Determine the resistance of its filament.
(2 marks)

$P = 40\,W$
$V = 240\,V$
$P = \frac{V^2}{R}$

$R = \frac{V^2}{P}$
$= \frac{(240)^2}{40}$ ✓ Sub ①
$= 1440\,\Omega$ ✓ Evaluation ①

12 The graph shows the variation of capacitance of a capacitor with voltage supplied across it.

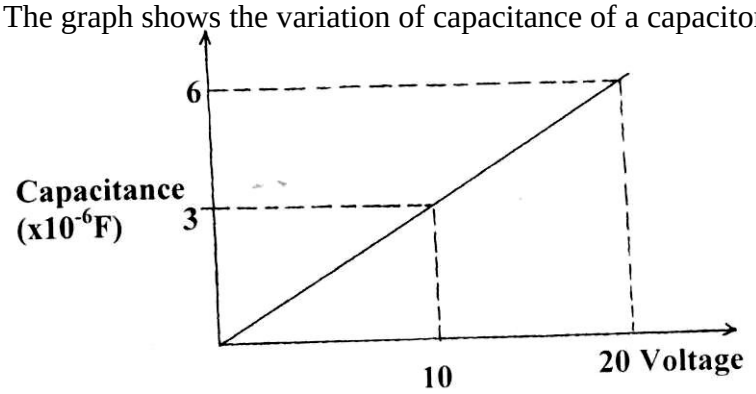


Fig. 6

Use the graph to determine the quantity of charge stored in the capacitor. (3marks)

$Q = CV$

The areas under the graph = Q

$=6 \times 10^{-6} \times 20$

$=1.2 \times 10^{-4}C$

13 The box contains names of seven parts of electromagnetic spectrum.

Radio waves	Microwaves	Infra-red	Visible light	Ultra violet	X-rays	Gamma rays

State the order in which they have been written. (1mark)

- Increasing frequency / Reducing wavelength

SECTION B (55 marks**)**

*Answer **all** the questions in this section in the spaces provided.*

14 (a) P-type and n-type semiconductors are made from a pure semiconductor by a process known as "doping"

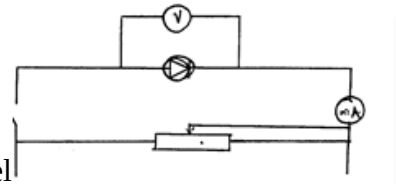
(i) State what is meant by doping. (1 mark)

- Introduction of an impurity into a pure semiconductor to improve its conductivity

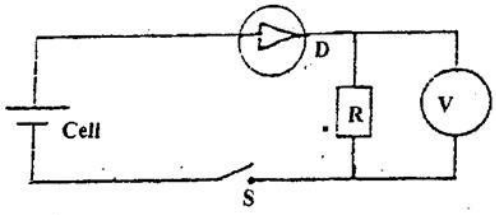
(ii) Explain how the doping produces an n-type semiconductor. (2 marks)

- Formed by adding a pentavalent atorm (phosphorous)to a group 4 semiconductor and an extra electron is left impaired and is available for conduction Majority carriers are electrons .

(b) Sketch a circuit diagram that can be used to investigate p-n junction diode characteristics. (2marks)



(c) The figure bel

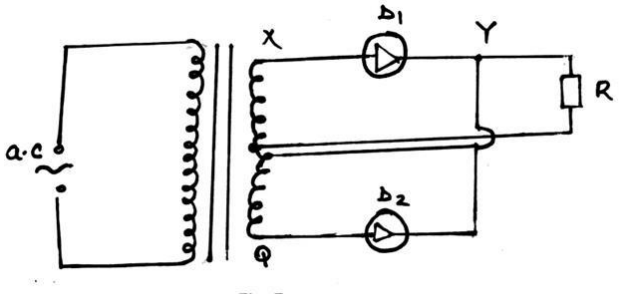


When the switch, S is closed, the voltmeter shows a reading. When the cell terminals are reversed, the voltmeter reading is zero. Explain these observations.

(2 marks)

- Diode is forward biased – current flows
- Diode is reverse biased no current flows

(d) Study the figure and use it to answer questions that follow.



(i) Briefly explain how the circuit works to produce a rectified alternating current. (3marks)

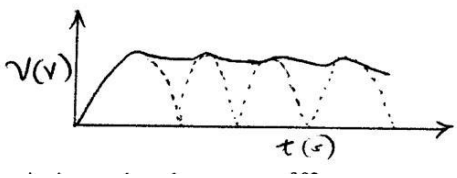
- During the first half cycle, D1 is forward biased while D2 is reverse biased
- The path taken by current is X D_1 Y Z X
- During the next half cycle, D_2 in forward biased while D_1 is reverse biased
- The path taken by current is QD_2YZQ
- During both half cycles, current flows through the resister in the same direction.

(ii) Draw on the diagram to show the position of the capacitor. (1mark)

(iii) State the function of the capacitor in the circuit. (1mark)

- Smooth the output signal

(iv) Sketch the graph of the output as seen on a CRO screen. (1mark)



15 (a) A radioactive isotope showed a count rate of 82 counts per second initially. After a time of 210 seconds, the count rate dropped to 19 counts per second. The average background count remained constant at 10 counts per second. Determine the half-life of the material.

(2 marks)

$N = N_0\left(\frac{1}{2}\right)^{\frac{T}{t}}$

$N_0 = 82 - 10 = 72$

$N = 19 - 10 = 9$

$9 = 72\left(\frac{1}{2}\right)^{x}$ ①

$\frac{9}{72} = \left(\frac{1}{2}\right)^{x}$ ✓

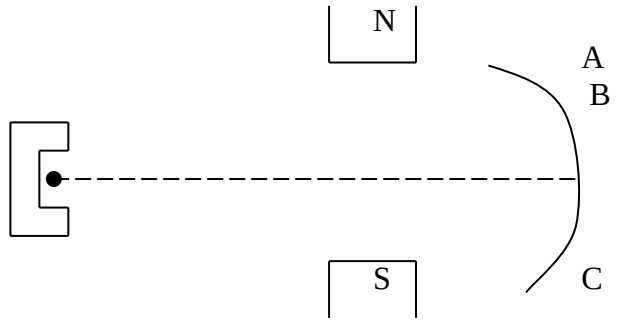
$\frac{1}{8} = \frac{1}{2^x}$

where $x = \frac{T}{t}$

$x = 3 = \frac{210}{t}$

$t = 70$ seconds ✓①

(b) The figure shows an experimental set up in a vacuum for investigating the effect of a magnetic field on the radiation emitted by a radio-active source.



The background radiation at the place is 5 counts per minute. The detectors are placed a positions A, B and C respectively. Results obtained are shown in the table below.

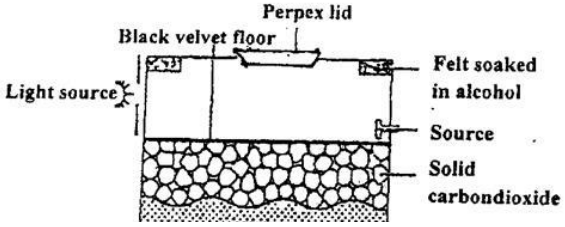
Positions	A	B	C
Counts / min	480	5	400

Use the table to explain which of the three types of radiations are emitted from the source.

(2marks)

A. Alpha – heavy, less deflected by the field
B. Gamma – no deflection just a ray
C. Beta – lighter, deflected more in the field.

(c) The figure shows a diffusion cloud chamber used for detecting radiations from a radioactive source.



(i) Explain how the chamber works when a radioactive particle is introduced at the source.

(2 marks)

- The radiation ionize gas along their path.
- The alcohol vapour condense on the ions formed creating tracks.

(ii) State the purpose of solid carbon (IV) oxide. (1 mark)

-Lower the temperature in the chamber
-Thus making it possible for the alcohol vapour to condense.

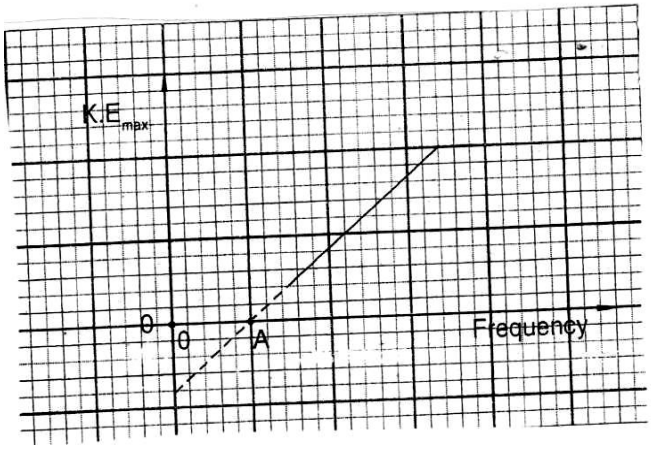
(iii) State **one** advantage of the cloud chamber over a G.M tube as a detector of radioactive emissions. (1 mark)

- The nature of radiations can be identified

(d) State **one** use of radio activity in medicine. (1mark)

- Used to monitor the function of the thyroid gland
- Used to trace blood clots (any one)
- Used to kill harmful tissues such as cancerous cells.

16 (a) A photocell has a cathode made of caesium metal when a monochromatic radiation is shone on the cathode photoelectrons are emitted. A graph of kinetic energy against frequency is drawn as shown in the figure.



Use the graph to answer the questions below.

(i) State the unit of the slope. (1mark)

- Joule second

(ii) State the physical quantity represented by point A. (1mark)

- Threshold frequency

(iii) Lithium metal has a higher work function than caesium. On the same axes, sketch the graph of lithium. (check the graph. Straight line parallel to the given line with lower Y intersept.) (1mark)

(iv) State what the term monochromatic means. (1mark)

- Radiation with single wavelength

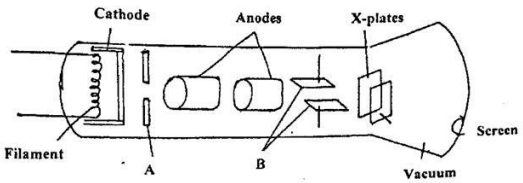
(b) The maximum Kinetic energy of the electrons emitted from a metallic surface is 1.6×10^{-19}J when the incident radiation is 7.5×10^{14}Hz. Determine the minimum frequency of radiation for which electrons will be emitted. (Planck's constant = 6.6×10^{-34}Js) (3marks)

K.E = hf – hfo

$1.6 \times 10^{-19} = 6.6 \times 10^{-34} (7.5 \times 10^{14} - fo)$

Fo = 5.076×10^{14} Hz

17 (a) The figure shows the features of a cathode ray oscilloscope.



(i) Name the parts A and B. State role played each of the parts A and B. (2 marks)

A Grid –controls the brightness of the spot

B Y - plates – deflects the electron beam vertically.

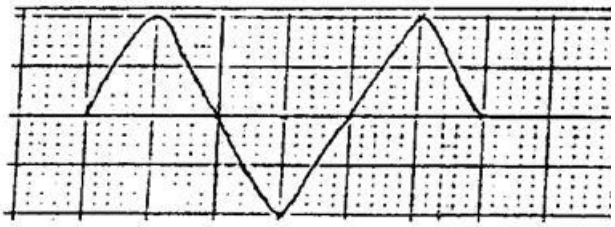
(ii) Explain how electrons are produced. (2 marks)

- When the cathode is heated, electrons are emitted from it through thermionic emission which are then accelerated and focused by the anode on to the fluorescent screen.

(iii) . State one factor considered when choosing the material for the cathode. (1mk)

- Low work function

(b) The figure shows the trace on the screen of an a.c signal connected to the y-plates of a C.R.O with the time base on.



Given that the time base control is 100ms/div and the y-gain is at120V/division, determine:

(i) the frequency of the a.c signal (2 marks)

T = 4 x 100ms/div $\quad f = \frac{1}{T} \frac{1}{400\ x\ 10-3}$

= 400ms $\quad$ = 2.5 Hz

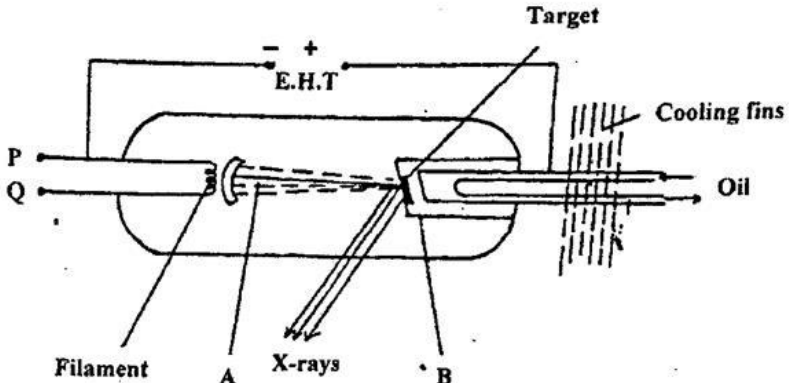
(ii) the peak voltage of the input signal (2 marks)

= m x y – gain

= 2 x 120

= 240V

(c) The figure shows the features of an X-ray tube.



(i) Name the parts labelled A and B. (2 marks)

A Cathode rays (fast moving electrons

B Copper anode

(ii) Explain how a change in the potential across PQ changes the intensity of the X-rays produced in the tube. (2 marks)

- Increased pid. Causes an increase in filament current hence an increase in emitted electrons leading to an increase in the intensity of X-rays (Vice versa)

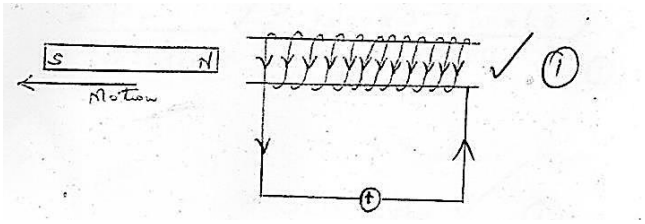
(iii) State the property of lead which makes it suitable for use as a shielding material. (1 mark)

- High density

18 (a) State Lenz's law of electromagnetic induction. (1 mark)

- The direction of induced emf is such that the induced current which it causes to flow produces a magnetic effect that opposes the change producing it.

(b) The figure shows a coil and a magnet being removed from the coil.



Indicate the direction of flow of current on the coil. (1 mark)

One mark for correct direction arrow

(c) The primary coil of a transformer has 1200 turns and the secondary coil has 60 turns. The transformer is connected to a 240V a.c source. Determine:

(i) the output voltage (3 marks)

Np = 1200	Vs = $\frac{Ns}{Np}$ x Vp	= 12V
Ns = 60		form - 1
Vp = 240V	$\frac{60}{1200}$ x 240	sub - 1
		Ans – 1

(ii) the output current when the primary coil has a current of 0.5A. (Assume there is no energy loses) (2 marks)

$\frac{Vs}{Vp} = \frac{Ip}{Is}$	Is = $\frac{Vp}{Vs}$ x Ip	$\frac{240}{12}$ x 0.5	= 10A

(d) One of the primary ways in which power is lost in transformers is through eddy currents. State how eddy currents can be minimised. (1 mark)

-Using thin sheets that are laminated as the core

(e) Give a reason why appliances which draw current from a ring's main circuit have a third cable connected to the earth. (1mark)

- To earth the devise to avoid electrocution

(f) Determine the cost of using an electric iron rated 1500W, for a total of 30 hours given that the cost of electricity per kWh is Ksh 8. (3 marks)

$$\frac{Pt}{3.6\ x\ 106} = \frac{1500\ x\ 30\ x\ 60\ x\ 60}{3600000}$$

= 45 x 6

= Kshs. 360