NAME..... ADM NO ..... CLASS .....

232/2
PHYSICS
PAPER 2
JULY 2018
TIME: 2 HOURS

MOKASA II JOINT EXAMINATIONS

232/2

PHYSICS

INSTRUCTIONS TO CANDIDATES:

(a) Write your **Name,** admission number and class in the spaces provided **above**.
(b) This paper consists of **two** Sections; **A** and **B**.
(c) Answer **ALL** the questions in Sections **A** and **B** in the spaces provided.
(d) All workings must be clearly shown.
(e) Non-programmable silent electronic calculators and KNEC Mathematical tables and **may be** used.
(f) This paper consists of 13 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and no questions are missing

FOR EXAMINER'S USE ONLY:

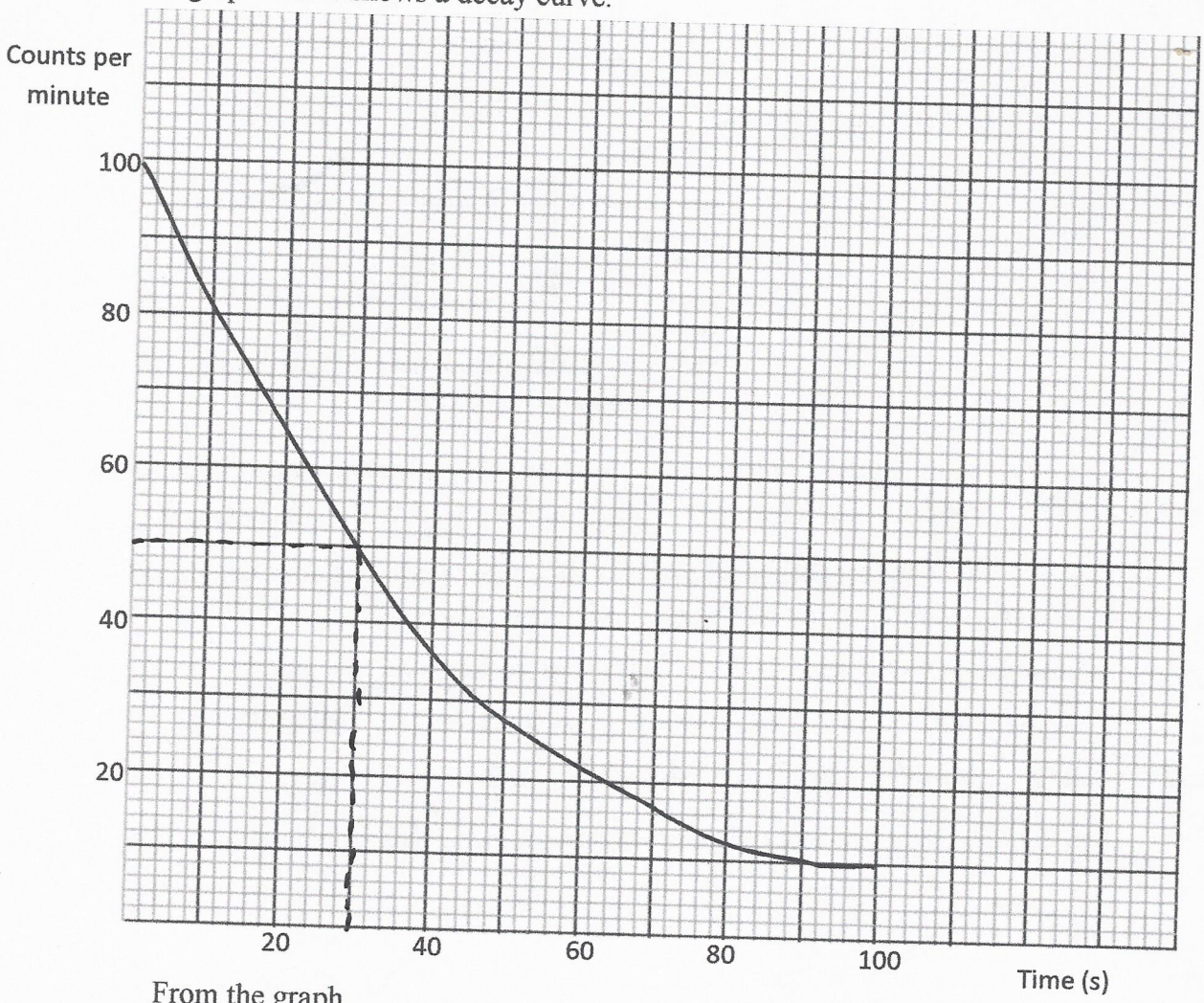
Section	Question	Maximum Score	Candidate's Score
A	1 – 11	25	
B	12	08	
	13	09	
	14	08	
	15	09	
	16	12	
	17	09	
Total Score		**80**	

M | SCHEME. – 232/2 PHYSICS

MOKASA II 2018.

SECTION A (25 Marks)

1. The graph below shows a decay curve.



From the graph,

a) Determine the half-life of the radioactive substance (1mk)

30s – should be shown on graph. ✓ 1

b) If a radioactive sample of this substance has 40g, how long will it take to decay to 5g? (2mks)

$40g \xrightarrow{30s} 20g \xrightarrow{30s} 10g \xrightarrow{30s} 5g$ ✓ 1

90s ✓ 1

Or

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

$5 = 40\left(\frac{1}{2}\right)^{T/30}$

$\frac{5}{40} = \left(\frac{1}{2}\right)^{T/30}$

$\frac{1}{8} = \left(\frac{1}{2}\right)^{T/30}$

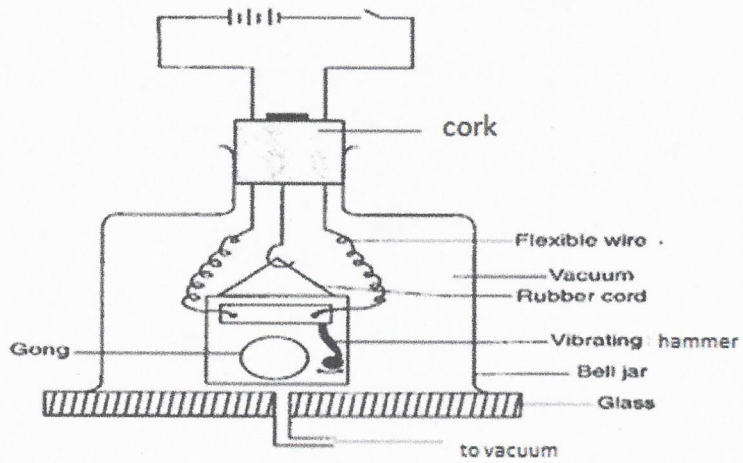
$\left(\frac{1}{2}\right)^{3} = \left(\frac{1}{2}\right)^{T/30}$

$3 = T/30$ ✓ 1

$T = 90s$.

03

2. The diagram below shows a setup used to study the behavior of sound.



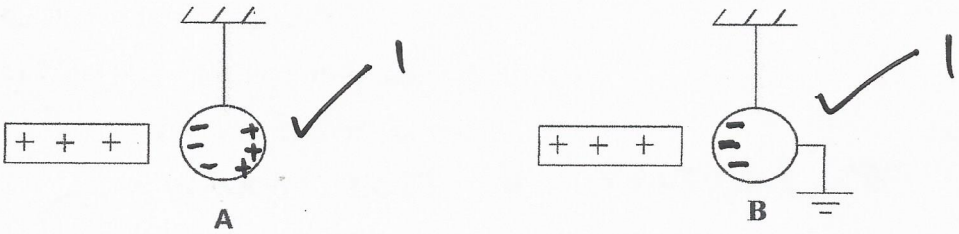
a) What property of sound waves can be studied using this setup? (1mk)

Sound requires a medium for transmission ✓1

b) Briefly describe how the property in (a) above is investigated? (2mks)

- The switch is closed, the bell rings and the ringing is loud enough. ✓1
- The vacuum pump is turned on, the sound gets faint, but the bell can be seen ringing ✓1 – sound requires a medium.

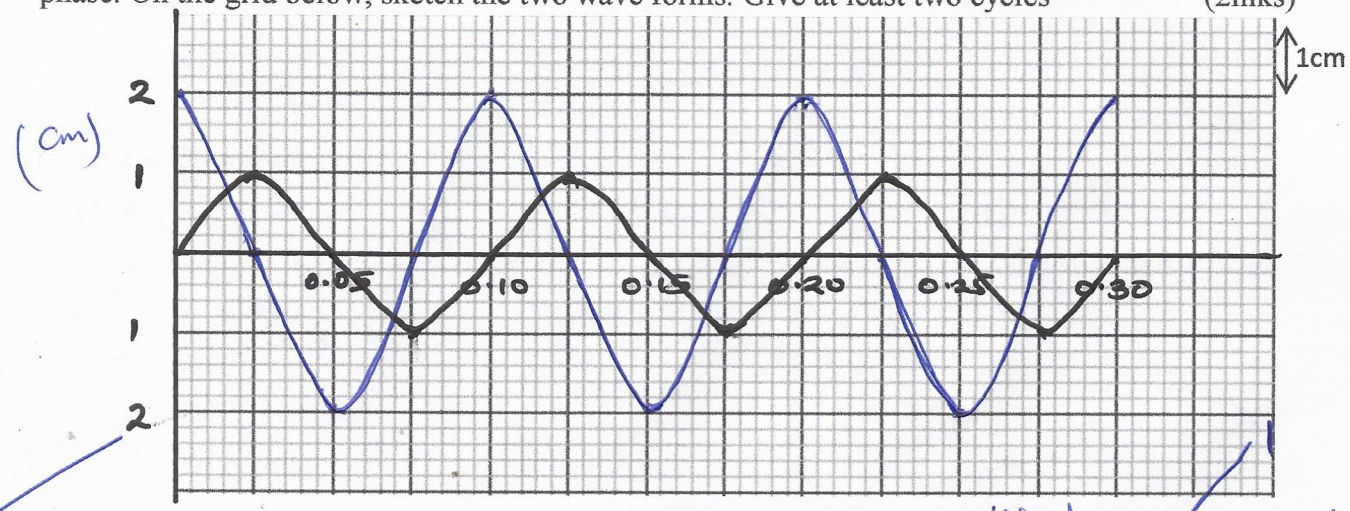
3. The diagram below shows a charged body brought close to a spherical pith ball.



✓1 ✓1

Indicate the charges on the ball in A and B (2mks)

4. Two waves of the same frequency of 10Hz with amplitudes of 1cm and 2cm are 90^0 out of phase. On the grid below, sketch the two wave forms. Give at least two cycles (2mks)

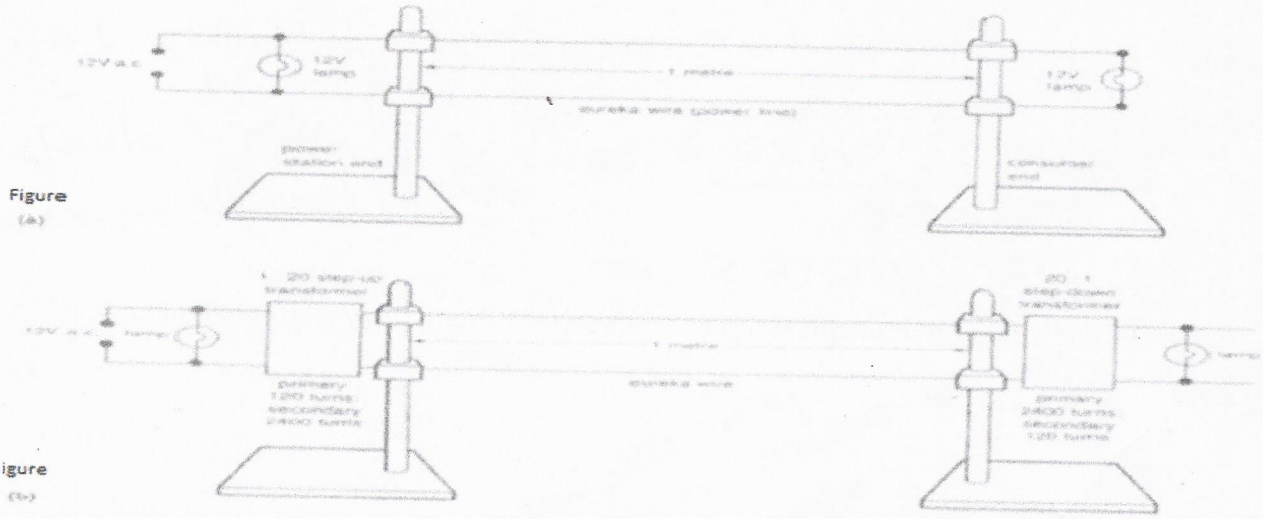


amplitudes ✓1

Phase difference ✓1

07

5. The circuits in the diagram below were set up using a 12V a.c power supply.



i) How do the brightness of the bulbs in the circuits in figure (a) and figure (b) compare? (1mk) 1

the brightness in (b) is higher than in (a)

ii) Give a reason for your answer in (i) above (1mk) 1

Power loss is minimised in (b)

6. A rectangular coil of wire, attached two slip rings is rotated between the poles of a permanent magnet to form a dynamo.

a) What is the position of the coil when;

i) There is no current generated. (1mk) 1

When coil is vertical to field lines

ii) When the current generated is greatest (1mk) 1

When coil is horizontal to field lines

b) What type of ring(s) must be used to obtain direct current in an external circuit? (1mk) 1

Split rings.

7. What is photoelectric effect? (1mk) 1

The ejection of electrons from a metal surface when irradiated with electromagnetic radiation of sufficient frequency.

06

b) The threshold wavelength λ_0 of a photo emissive surface is 0.90μm. determine its work function in electron volts.

(Take $C=3.0 \times 10^8 ms^{-1}$, $1ev = 1.6 \times 10^{-19}J$, $h= 6.63 \times 10^{-34}Js$)

(2mks)

$W_o = hf_o$

W_o in joules – (1 mark) $= hc/\lambda_o = \frac{6.63 \times 10^{-34} \times 3.0 \times 10^8}{9.0 \times 10^{-7}}$

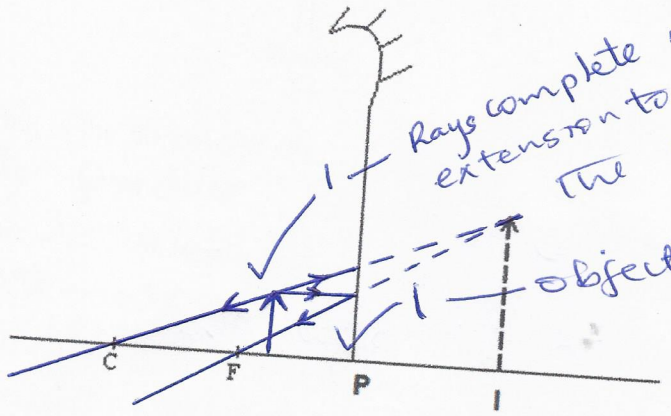
W_o in eV – (1 mark)

$= 2.21 \times 10^{-19} J$ $W_o = \frac{2.21 \times 10^{-19}}{1.6 \times 10^{-19}}$

$= 1.3813 eV$

8. The diagram below shows an image I formed by a concave mirror. Using ray diagrams show the position of the object.

(2mks)



9. Give one advantage and one disadvantage of the small aperture of a pinhole camera. (2mks)

Advantages:
- Sharp image
- large field of depth.

disadvantages:
- Image is faint (any one)
- Long exposure time – leads to shaking.

10. Define electric current and give its SI unit

(1mks)

This is the rate of flow of charge. ½

SI – ampere. ½

11. Differentiate gamma rays from ultra violet light in terms of;

i) Production

Gamma rays produced by energy changes within the nucleus while U.V produced by energy changes within the atom (1mk)

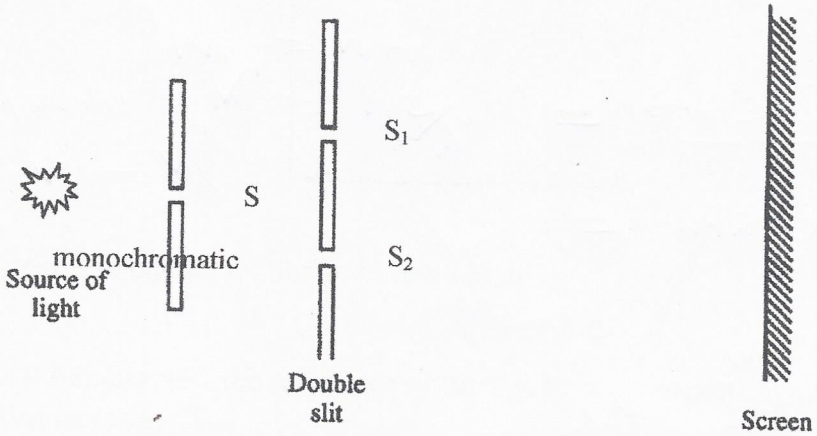
ii) Detection

Gamma rays detected by photographic film and radiation detectors, UV detected by photographic films, photocells, & flouresent materials. (1mk)

08

SECTION B (55 Marks)

12. The diagram below shows young's double slit experiment.



a) What is the purpose of slit S_1 and S_2 (1mk)

to produce coherent sources ✓ 1

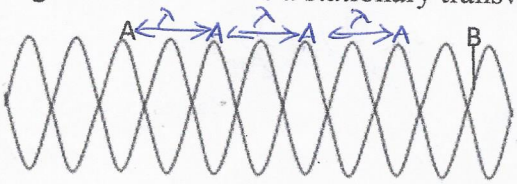
b) State what is observed on the screen (1mk)

alternate dark and bright fringes ✓ 1

c) Explain your observation in (b) above (2mks)

Bright fringes as a result of constructive interference; dark fringes as a result of destructive interference. ✓ 1 ✓ 1

d) The diagram below shows a stationary transverse wave.



i) Name the parts A and B (2mks)

A - antinode ✓ 1, B - node ✓ 1

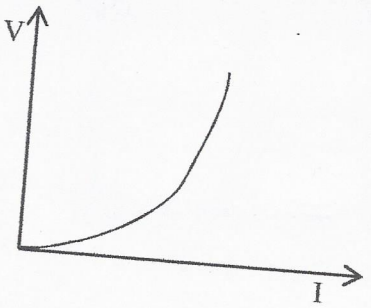
ii) Determine the distance AB in terms of wavelengths. (2mks)

AB = $3\frac{3}{4} \times \lambda$ ✓ 1 - accept working on diagram

$= 3.75\lambda$ ✓ 1 (also $3\frac{3}{4}\lambda$)

08

13. a) The graph below shows the voltage-current relationship for a certain conductor.



i) Is the conductor ohmic or non-ohmic

it is non ohmic ✓1

(1mk)

ii) Explain why the resistance of the conductor is increasing.

increase in current increases the K.E & hence vibration of electrons hence hindering their flow increasing the resistance ✓1

(2mks)

b) A battery whose e.m.f (E) is 6.0V and internal resistance (r) is 1.0Ω consists of two resistors of 6Ω and 3Ω connected in parallel. Determine the current through each resistor.

(3mks)

$E = I(R+r)$

$6 = I(2+1)$

$I = 2A$

$V = E - Ir$

$V = 6 - 2\times1$

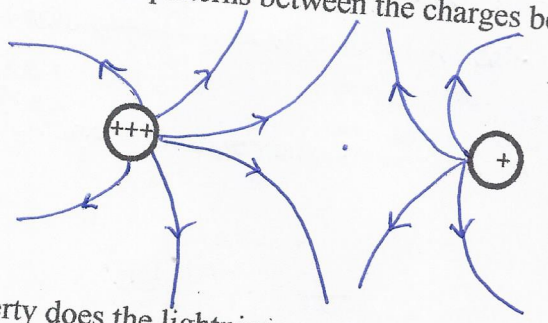
$= 4V$ ✓1

I through 6Ω $\Rightarrow I = V/R = 4/6 = 0.6667A$ ✓1

I through 3Ω $\Rightarrow I = V/R = 4/3 = 1.3333A$ ✓1

c) Sketch the electric field patterns between the charges below

(2mks)



- direction of field ✓1
- Position of neutral point (closer to +) ✓1

d) On what property does the lightning arrestor operate?

action at a point ✓1

(1mk)

14.a) Give the difference between conductors and insulators in terms of the energy band theory

Conductors the valence & conduction bands overlap ✓1 areas in insulators there's a forbidden gap between conduction and valence bands.

(1mk)

b) Define doping

Addition of impurities to a pure semiconductor so as to increase their conductivity. ✓1

(1mk)

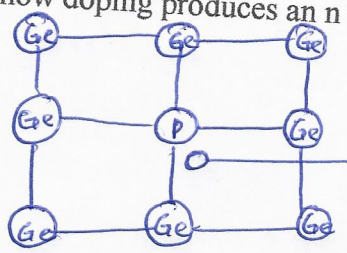
10

✓1 – diagram. (award all 3 marks if diagram correctly drawn & free electron shown).

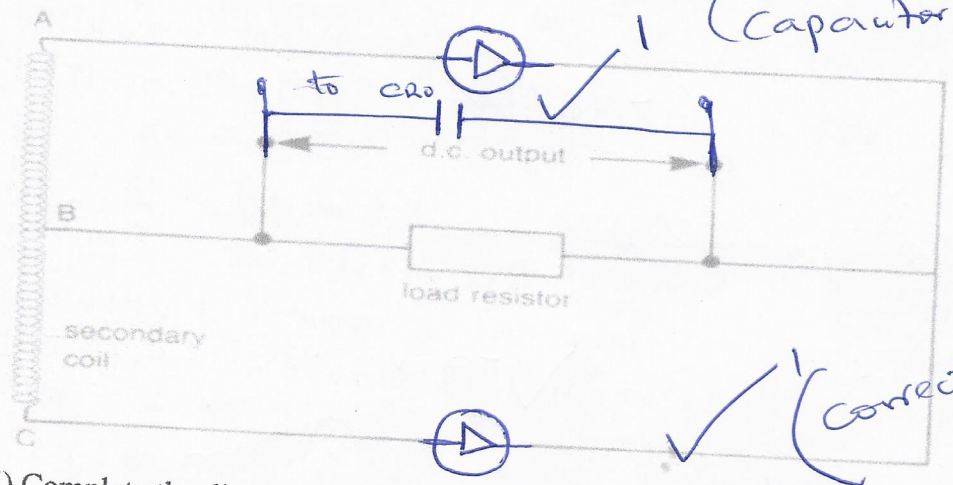
c) Using a diagram, show how doping produces an n type semiconductor (3mks)

✓1 Doping with a pentavalent

✓1 Showing the free electron



d) The diagram below shows a centre tap transformer using two diodes rectifier circuit.



✓1 (capacitor placed across the load)

✓1 (correct placing of diodes)

i) Complete the diagram to give full wave rectification in the output (1mk)

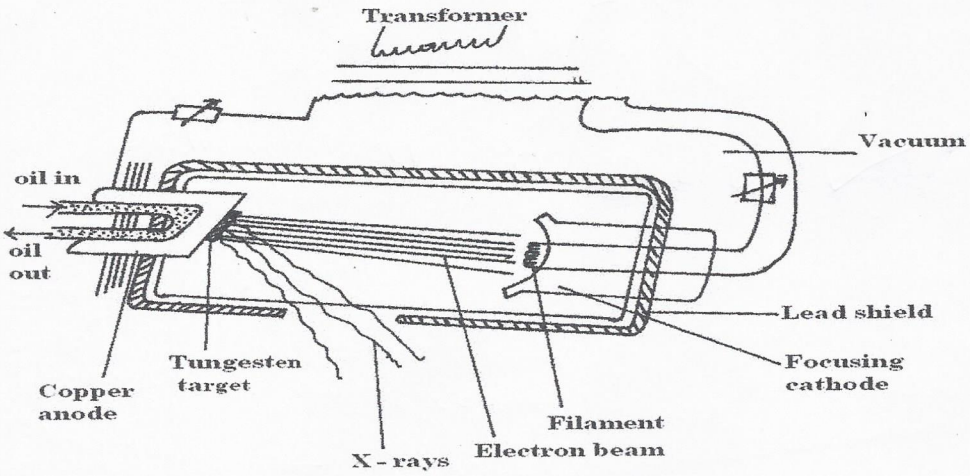
ii) on the diagram connect a capacitor c to produce a smoothed output (1mk)

iii) Give one disadvantage of the rectifier above to a four diode rectifier (1mk)

• Requires a large transformer – the transformer is centre tapped ✓1

• Requires a transformer with many turns

15. The figure below shows the essential component of an X-ray tube.



06

(i) How are the electrons produced accelerated towards the anode? (1mk)

accelerated by the EHT between the anode and cathode. ✓1

(ii) Why is the target made of tungsten? (1mk)

Tungsten has a high melting point ✓1

(iii) State two ways in which cooling is achieved in this kind of X-ray machine. (2mks)

- use of coolant (oil) ✓1
- use of cooling fins ✓1 (any 2)
- copper anode.

b). If the accelerating potential is 200KV. Determine;

i) The kinetic energy of the electrons arriving at the target. (*Take (e=1.6 x10^{-19}C)* (2mks)

$K_e = \frac{1}{2} M_e V^2$ ✓1

$E = hf = eV$ ✓1

$= 1.6 \times 10^{-19} \times 2.0 \times 10^{5} = 3.2 \times 10^{-14} J$

ii) If 0.1% of the electron energy is converted into X rays, determine the minimum wavelength of the emitted X rays. (*h = 6.63 x 10^{-34} Js and C = 3.0 x 10^{8}m/s*) (3mks)

$= \frac{0.1}{100} \times 3.2 \times 10^{-14}$ ✓1

$= 3.2 \times 10^{-17} J$ ✓

$hf = 3.2 \times 10^{-17}$

$\frac{hc}{\lambda} = 3.2 \times 10^{-17}$ ✓1

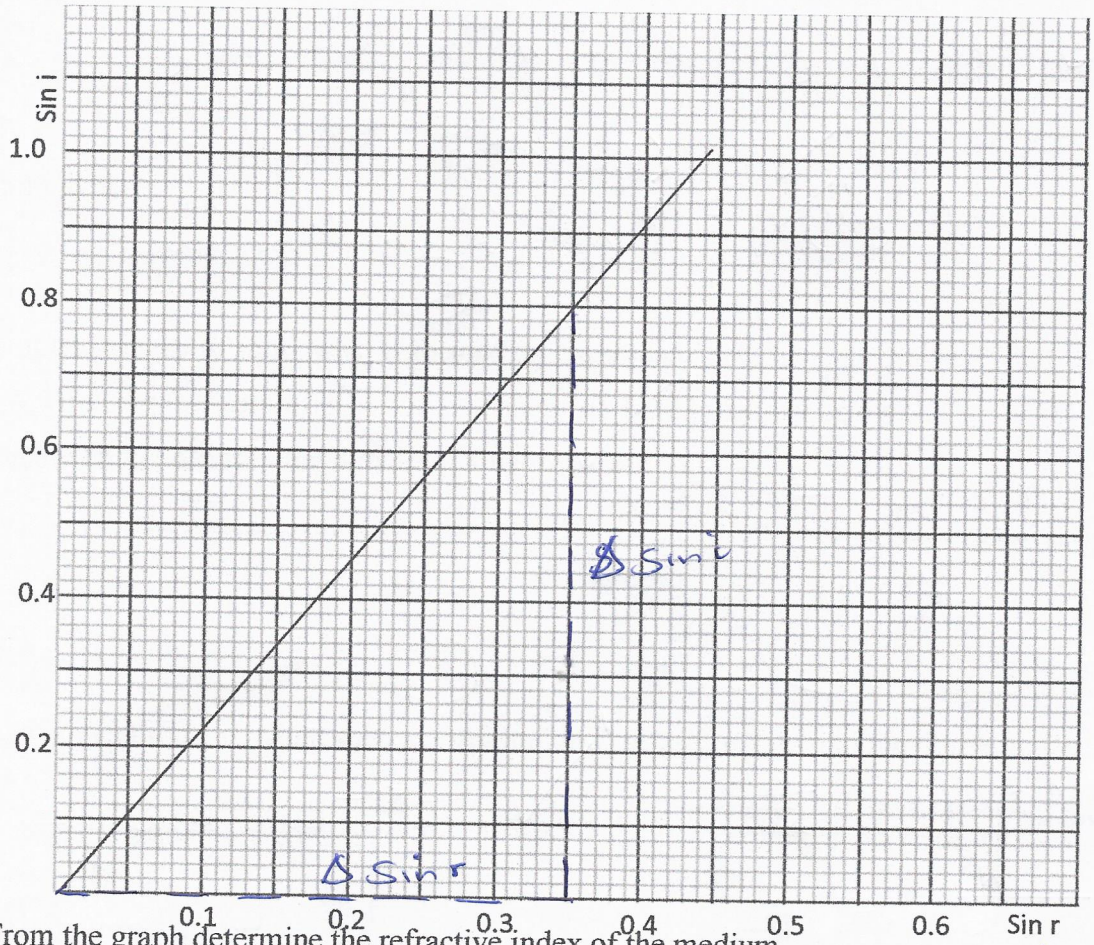
$\lambda = \frac{hc}{3.2 \times 10^{-17}}$

$= \frac{6.63 \times 10^{-34} \times 3.0 \times 10^{8}}{3.2 \times 10^{-17}}$ ✓1

$= 6.2156 \times 10^{-9} M.$

09

16. a) The graph below shows the variation of the sine of angle of incidence and the sine of the angle of refraction for a given medium



i) From the graph determine the refractive index of the medium (3mks)

$n = \frac{\sin i}{\sin r}$ ✓1

$= \frac{0.8 - 0}{0.35 - 0}$

$n = \frac{0.8}{0.35}$ ✓1

$= 2.2857$ ✓1

ii) If the speed of light in air is 3.0 x10^8 m/s, what is the speed of light in this medium (2mks)

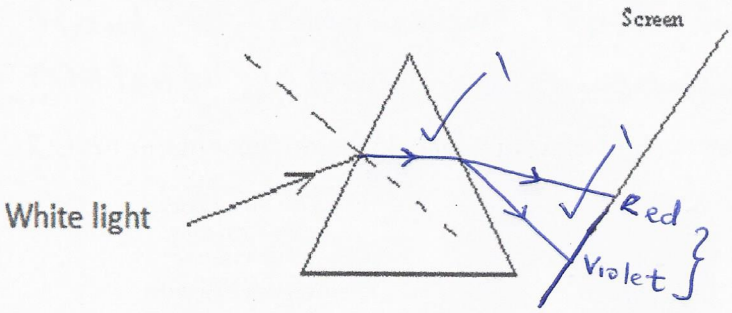
$n = \frac{\text{Speed in air}}{\text{Speed in medium}}$ ✓1 (Substitution)

$2.2857 = \frac{3.0 \times 10^8}{\text{Speed in medium}}$

Speed $= 1.3125 \times 10^8$ M/s ✓1 (Answer)

05

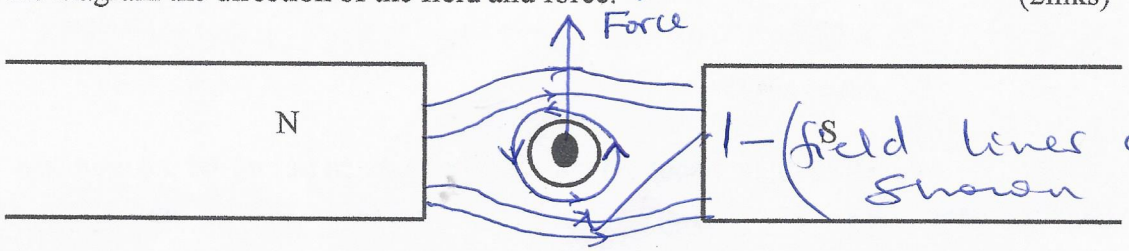
iii) The diagram below shows a ray of white light incident to an isosceles glass prism.



Complete the ray to show what is formed on the screen (2mks)

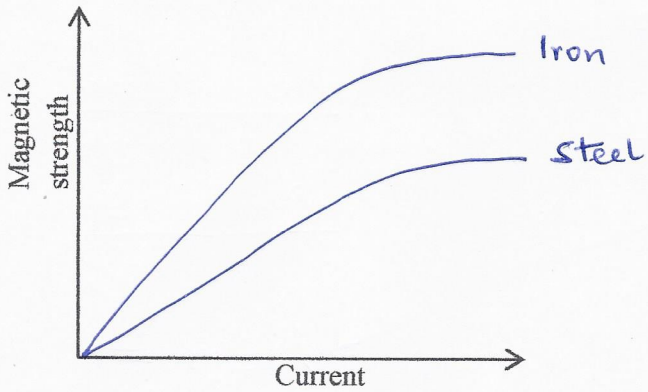
b) A wire carrying current is placed in a magnetic field as shown below.

Indicate on the diagram the direction of the field and force. (2mks)



c) Two metal rods, iron and steel are inserted in a circuit as shown in the figure below.

i) On the axes below sketch the variation of magnetic strength against the magnetizing current for the two metals indicating clearly the metals (1mk)



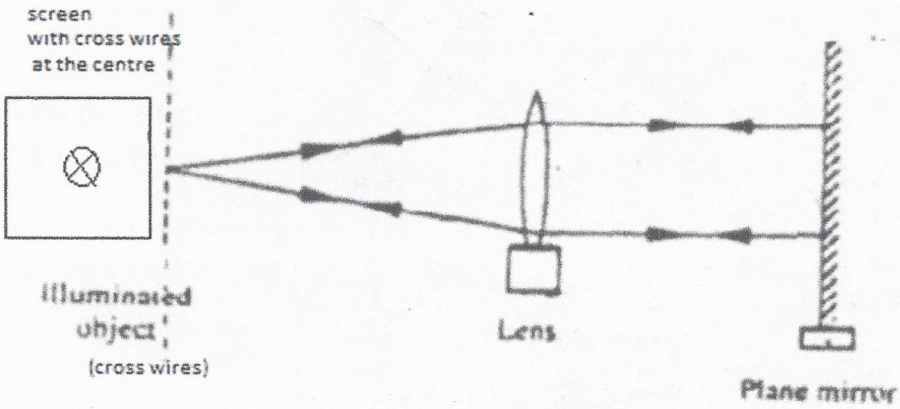
both must be correct

05

ii) Explain the shape of the graphs above (2mks)

Steel is a hard magnetic material and is hard to magnetise; iron is a soft magnetic material, thus is easily magnetised;

17.a) An illuminated object is placed in front of a convex lens as shown in the setup below.

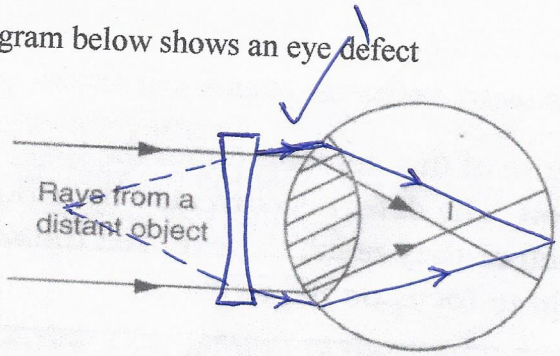


Describe how the set up can be used to determine the focal length of the lens. (3mks)

- Place a lens btw the object & mirror such that the distance btw object and lens is greater than f
- Adjust the lens distance untill a sharp image is formed besides the object (cross wires)
- Measure the distance btw the mirror & lens, this is the focal length
- Repeat the expt several times for accurate results - get an average.

05

b) The diagram below shows an eye defect



i) Name the defect (1mk)

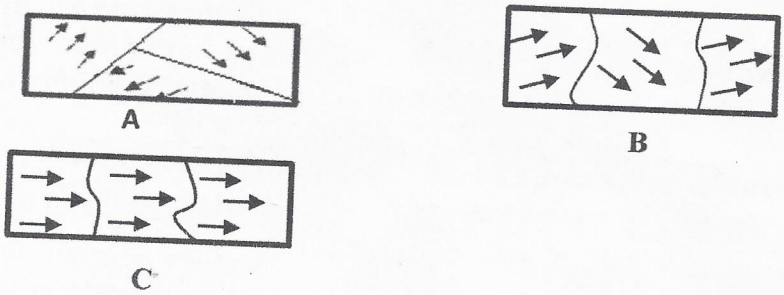
Short sightedness / myopia.

ii) State two causes of this defect (2mks)

- focal length being too short.
- a large / big eyeball

iii) On the same diagram, show how this defect can be corrected (1mk)

c) The diagrams below show some magnetic materials



Using the domain theory, differentiate material A from material C (2mks)

A is an unmagnetised magnetic materials, domains are facing different directions. C is a magnetic material magnetised to magnetic saturation, all domains are facing the same direction.

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