PHYSICS
PAPER 2
(Theory)
JULY/AUG. 2016
2 HOURS

Name.....Index Number...../.....

Adm.....Class: .....Candidate's Signature.....Date.....

INSTRUCTIONS TO CANDIDATES

i) *Write your name, admission number and index number in the spaces provided above.*
ii) *Sign and write the date of examination in the spaces provided above*
iii) *This paper consists of **TWO** sections **A** and **B***
iv) *Answer **ALL** the questions in section **A** and **B** in the spaces provided*
v) *All working **MUST** be clearly shown*
vi) *Electronic calculators and mathematical tables may be used.*
vii) *ALL numerical answers must be expressed in decimal notation.*
viii) ***This paper has 13 pages. It is the responsibility of the candidate to ascertain that all the pages are printed as indicated and that no questions are missing.***
ix) ***Candidates should answer the questions in English.***

For Examiners Use Only

Section	Question	Maximum Score	Candidate's Score
A	1 – 12	25	
B	13	13	
	14	13	
	15	13	
	16	8	
	17	8	
	TOTAL	80	

SECTION A (25 marks)

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

1 **Figure 1** shows an object placed in front of a pinhole camera.

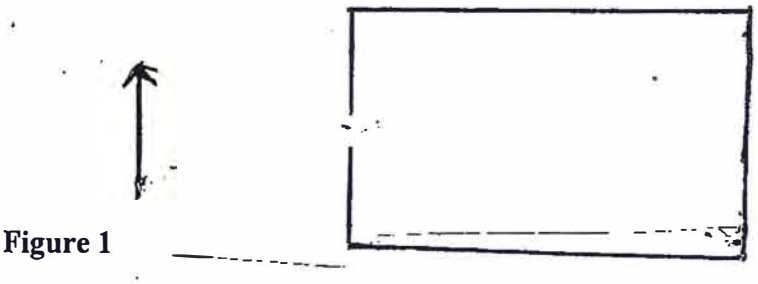

Figure 1

Sketch the rays to show the formation of an image in the camera (2 marks)

2 The current carrying capacity of an accumulator is 50Ah. Find the amount of current flowing if the accumulator is used for 60 minutes (2marks)

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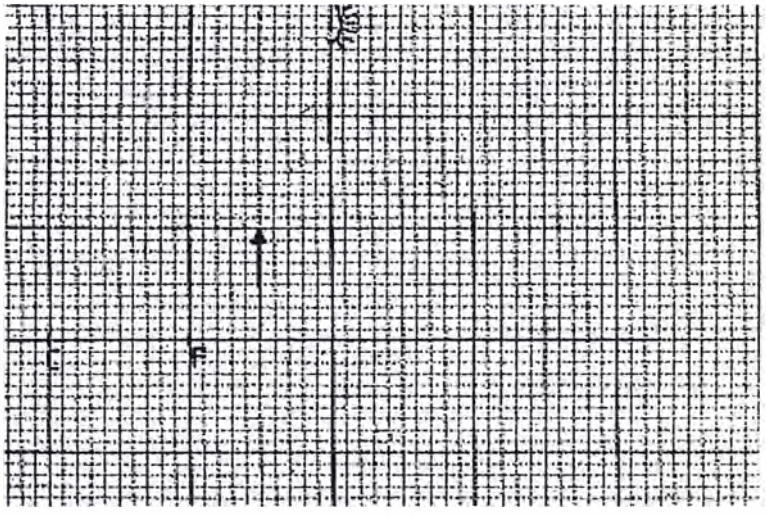
3 The figure shows an object placed in front of a concave mirror of focal length 10cm. C is the centre of curvature.



On the same figure draw a ray diagram showing the location of the image.

(3marks)

4 The velocity of light in air is $3x10^8$m/s and in water is $2.25x10^8$m/s. Determine the angle of refraction of light in water from a ray of light passing from air to water at an angle of incidence of 30^0 (2 marks)

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5 A siren has 200 holes and makes 30 revolutions per minute. If the speed of sound waves produced is 340m/s, determine the wavelength of sound produced. (2 marks)

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6 Draw the resultant magnetic field pattern around the following current carrying conductor. (2 marks)

7 Distinguish between p-type and n-type semiconductors. (1 mark)

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8 a) State the adjustment to be made in an X-ray tube to increase the quality of X –rays produced. (1 mark)

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b) An X-ray tube has an accelerating voltage of 50KV. Determine the shortest wavelength of X-ray beam. (Planck's constant = 6.64 x 10^{-34}Js, electron Charge= $1.6 X 10^{-19} C$ and velocity of electromagnetic waves C= 3 X 10^{8}m/s) (3marks)

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9 State the reason why radio waves signals are easier to receive than TV (television) signals in a place surrounded by hills. (1 mark)

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10 State the function of the grid in a Cathode ray oscilloscope.

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11 (a) An electric bulb is labelled 100W 240V. What does this mean? (1mark)

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(b) Two light bulbs are labelled 40W 240V and 100W 240V. Determine the cost of using the two bulbs for six hours daily for 5 days given that the cost of electricity is 40 cents per kilowatt hour. (2marks)

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12 **Figure 2** shows a current carrying conductor placed in a magnetic field.

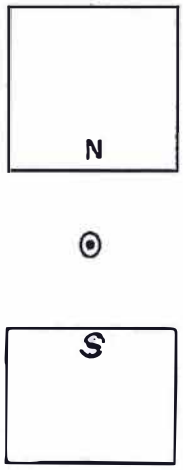

Figure 2

i) Sketch the resulting magnetic field pattern (1mark)

ii) On the diagram show the direction of the force(1mark)

SECTION B (55 marks)

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

13 a) Define the term work function (1mark)

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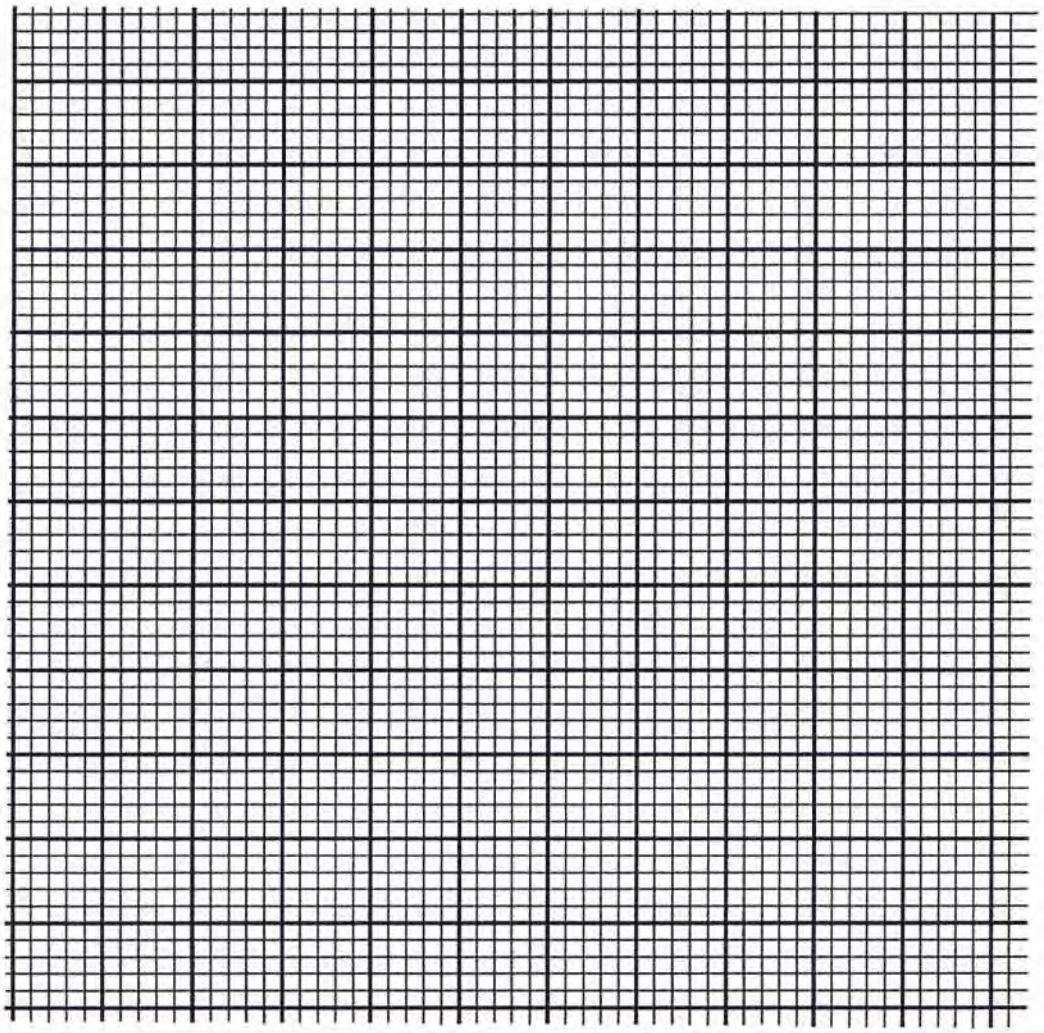
b) The table below shows the value obtained by form 4 students while investigating how maximum kinetic energy of the photoelectrons, emitted from a zinc cathode, varies with the frequency of the incident radiation.

K.E. $X\ 10^{-19} J$	0.5	1.0	1.5	2.0	2.5	3.0	3.5
Frequency $f\ (X\ 10^{14})$ ***Hz***	4.7	5.9	7.0	8.3	9.5	10.7	11.9

i) Plot a graph of ***K.E.*** against frequency, f. (5marks)



From the graph determine:

ii) The threshold wavelength of the metal Zinc (speed of light = 3×10^8 m/s). (2marks)

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iii) The Planck's constant. (3marks)

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c) State two factors that affect photoelectric effects of a given metal surface. (2marks)

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14 a) In an experiment to observe interference of light waves a double slit is placed close to a monochromatic source of light as shown in **figure 3**.

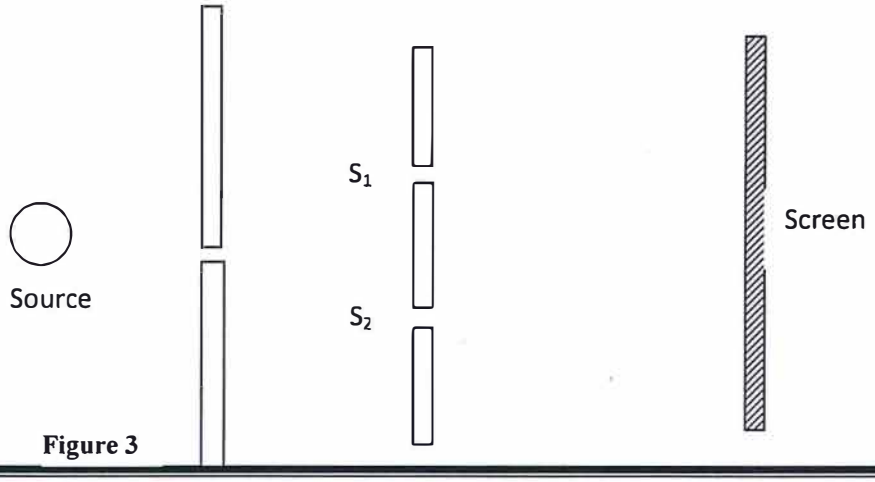

Figure 3

i) State the function of the double slit (1 mark)

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ii) State what is observed on the screen (3marks)

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iii) State what is observed on the screen when the slit separation S_1S_2 is reduced (1 mark)

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(b) **Figure 4** shows an object O placed in front of a diverging lens whose principal focus is F.

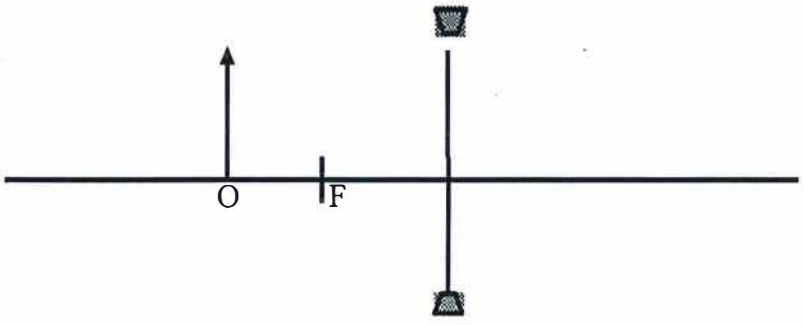

Figure 4

On the diagram, draw rays diagram to locate the image formed. (3marks)

(c) **Figure 5** shows a defective eye focusing a distant object.

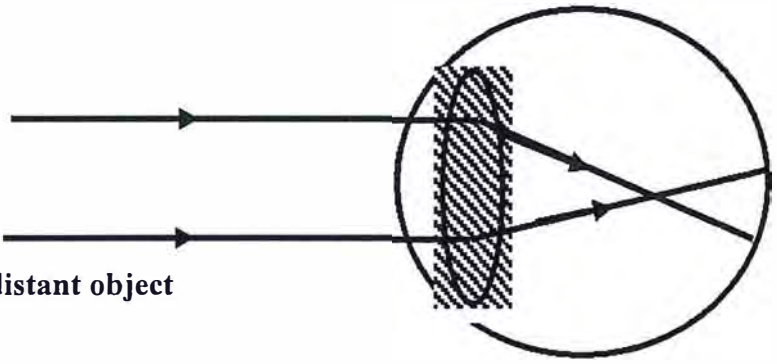

Figure 5

On the same diagram, sketch the appropriate lens to correct the defect and sketch the rays to show the effect of the lens. (2marks)

d) A real image twice the size of an object is formed by a lens. If the distance between the object and the image is 45cm, determine focal length of the lens. (3marks)

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15 a) Define the term mutual induction (1mark)

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b) **Figure 6** shows an induction coil used to produce sparks.

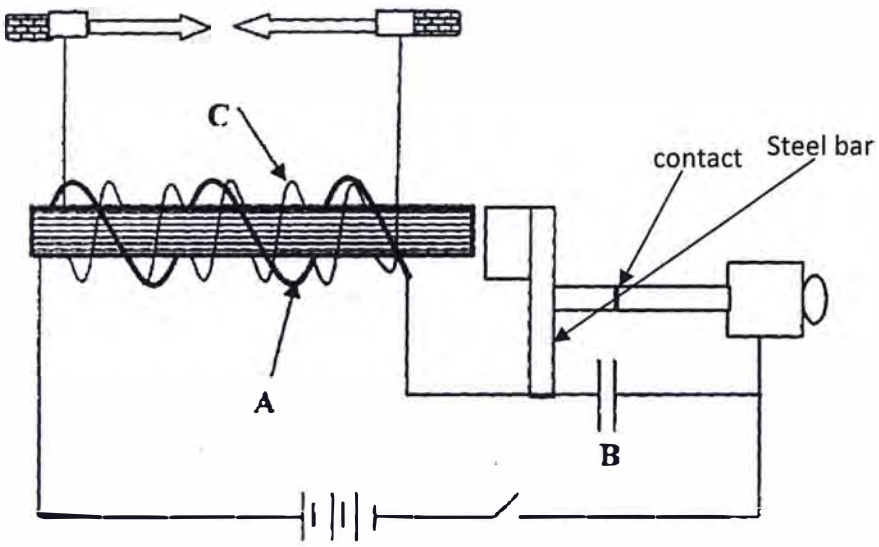

Figure 6

(i) Name parts labeled **A, B** and **C** (3marks)

A.....

B .....

C.....

(ii) Briefly explain how the induction coil works. (4marks)

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c) A transformer is used on a 240V a.c supply to deliver 12A at 120V to a heating coil. Given that 20% of energy taken from the supply is dissipated in the transformer. Determine the current in the primary coil. (3marks)

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d) Account for two causes of the 20% energy dissipation in the transformer above. (2marks)

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16 In the circuit diagram shown in **Figure 7**, each cell has an e.m.f of 1.5v and internal resistance of 0.2Ω. The capacitance of each capacitor is 2.0μF.

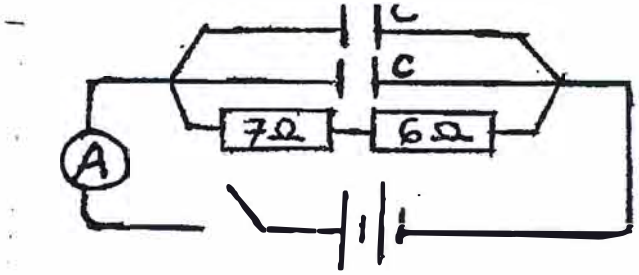

Figure 7

When the switch is closed, determine the:

i) effective capacitance in the circuit. (1 mark)

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ii) ammeter reading (2 marks)

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iii) charge on each capacitor (3 marks)

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iv) potential difference across the 6Ω resistor (2 marks)

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17 a) Define radioactivity. (1mark)

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b) Explain how you would separate the three radiations emitted by a radioactive substance. (2marks)

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c) An isotope of uranium $^{238}_{92}U$ decays by emitting an alpha particle and a beta particle forming a new element M. Write down an equation for the reaction. (2marks)

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d) Nekesa discovered a radioactive substance which gave 118counts/min. She noted that the background count was 18counts/min. After 6hours the count rate had dropped to 25counts/min. Determine the half life of the radioactive substance. (3marks)

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