

SUKEMO JET - 2016

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.**

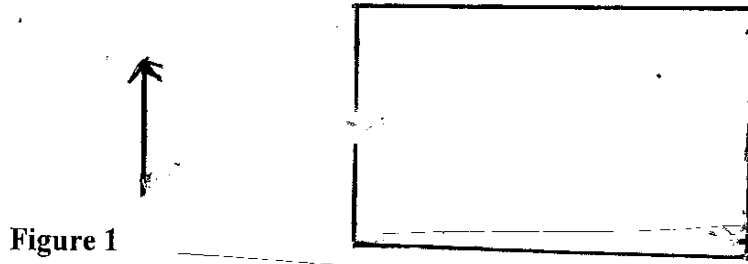
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Section	Question	Maximum Score	Candidate's Score
A	1 – 12	25	
B	13	13	
	14	13	
	15	13	
	16	8	
	17	8	
TOTAL		80	

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.



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)

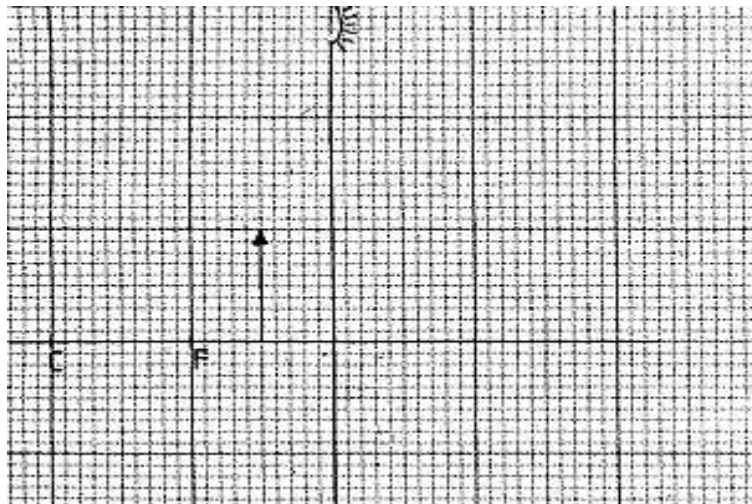
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- 3** The figure shows an object placed in front of a concave mirror of focal length 10cm. C is the centre of curvature.



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

(3marks)

4 The velocity of light in air is $3 \times 10^8 \text{ m/s}$ and in water is $2.25 \times 10^8 \text{ m/s}$. 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° (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 340 m/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 = 6.64×10^{-34} J_s, electron Charge= 1.6×10^{-19} C and velocity of electromagnetic waves C= 3×10^8 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.

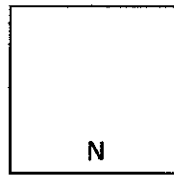
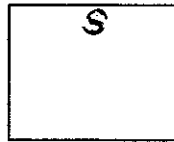


Figure 2



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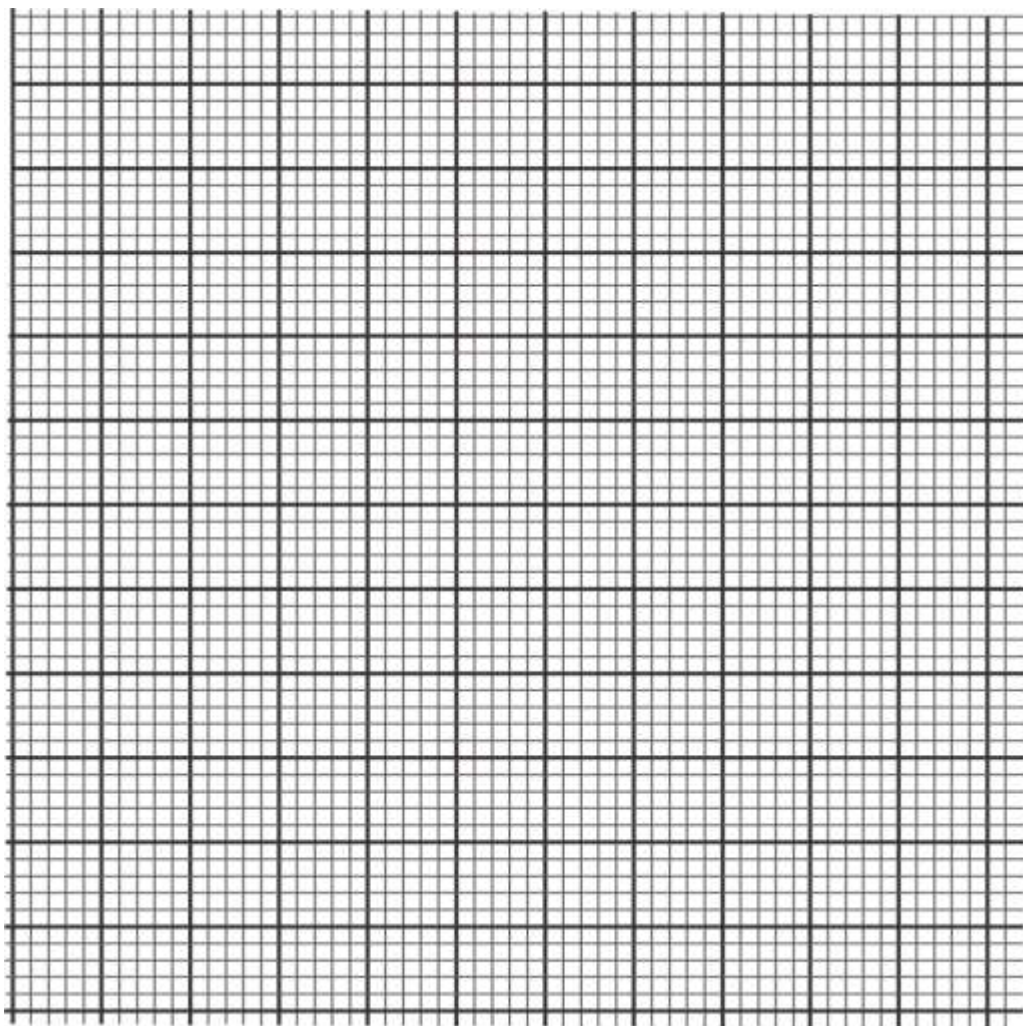
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b) The table below shows the value obtained by form 4 students while investigating how maximum kinetic energy of the photoelectrons, emitted from a zinc cathode, varies with the frequency of the incident radiation.

<i>K.E.</i> <i>X 10⁻¹⁹J</i>	0.5	1.0	1.5	2.0	2.5	3.0	3.5
<i>Frequency</i> <i>f (X 10¹⁴)</i> <i>Hz</i>	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**.

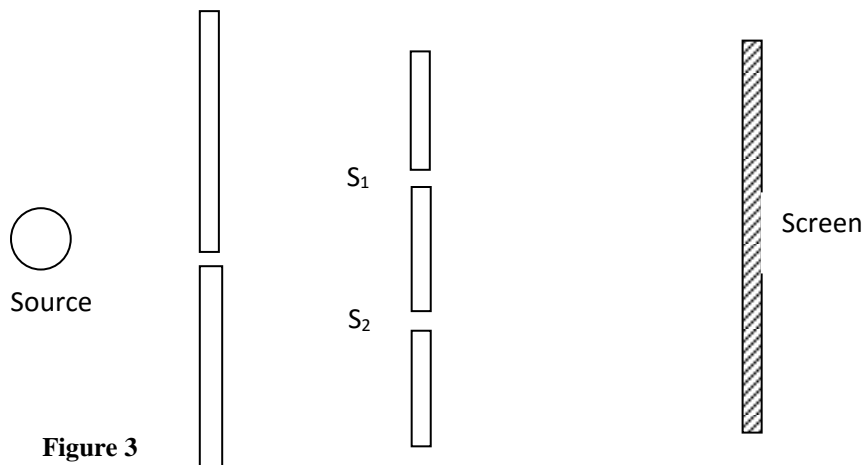


Figure 3

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.

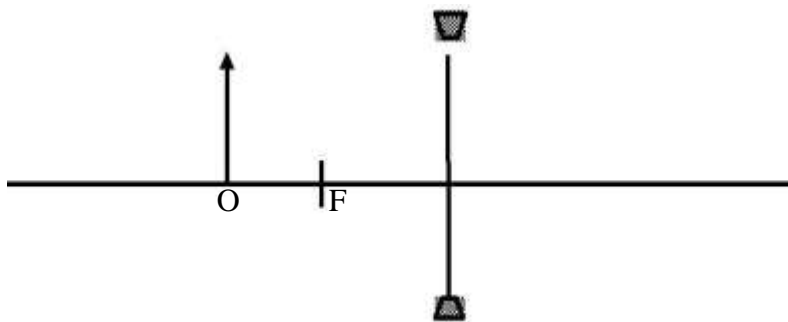


Figure 4

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

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

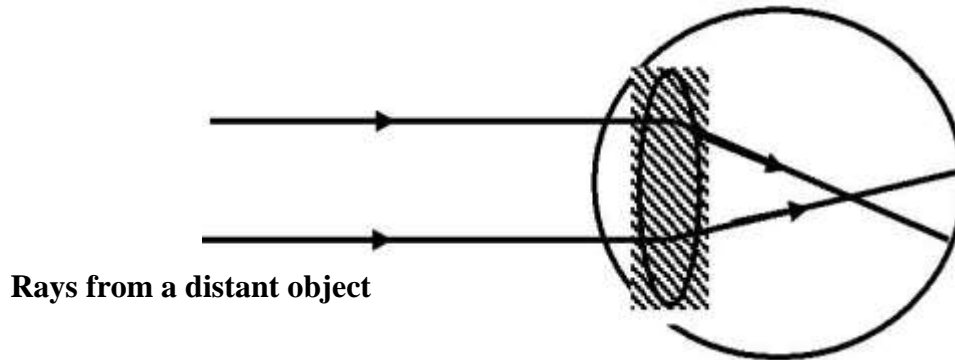


Figure 5

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.

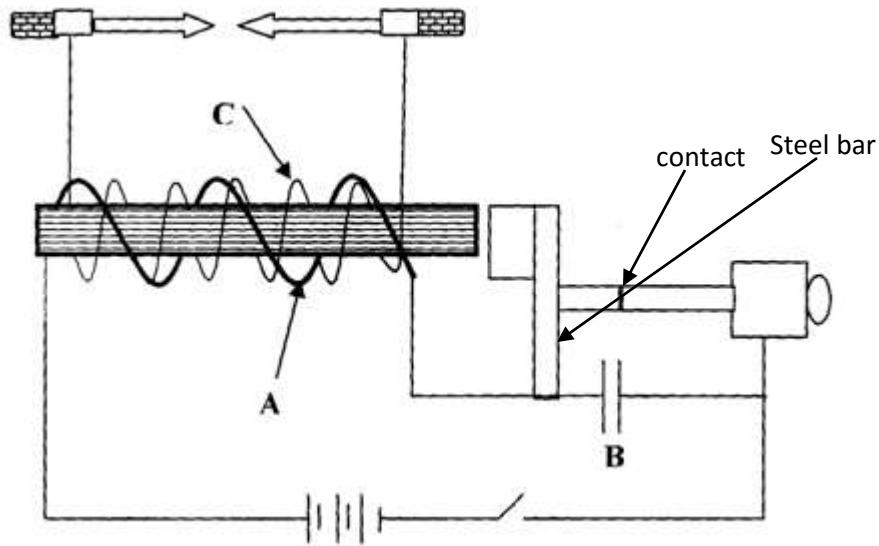


Figure 6

(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 $2.0\mu\text{F}$.

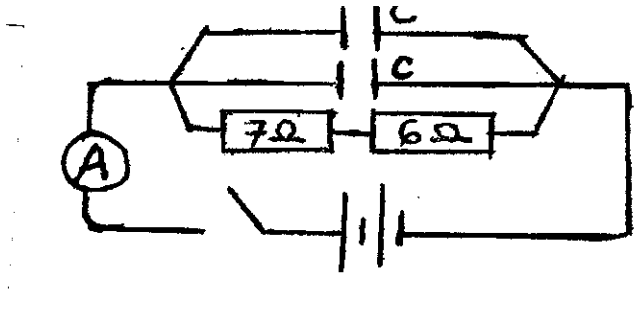


Figure 7

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 ${}^{238}_{92}\text{U}$ 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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