# MANGU HIGH SCHOOL

**NAME: .....CLASS:.....**

**INDEX NO.....ADM NO.....**

**232/2**
**PHYSICS**
**PAPER 2**
**JULY 2016**

**Instructions to candidates**

- This paper consists of two sections **A** and **B.**
- Answer **ALL** the questions in the two sections in the spaces provided after each question
- All working **MUST** be clearly shown.
- Electronic calculators and mathematical tables may be used.



**EXAMINER'S USE ONLY**

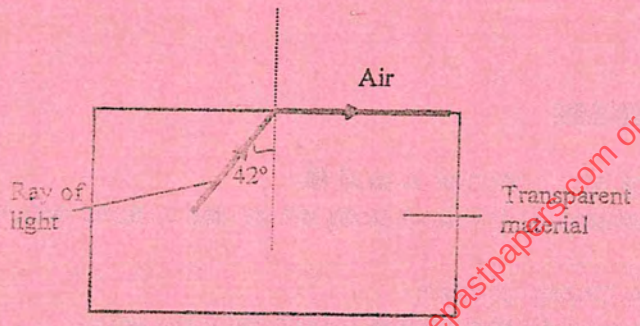
| SECTION | QUESTION | MAXIMUM SCORE | CANDIDATE'S SCORE |
|---|---|---|---|
| Section A | 1-11 | 25 | |
| Section B | 12 | 8 | |
| | 13 | 9 | |
| | 14 | 8 | |
| | 15 | 14 | |
| | 16 | 9 | |
| | 17 | 7 | |
| | TOTAL | 80 | |

- This paper consists of **12** printed pages.

## SECTION A (25 MARKS)

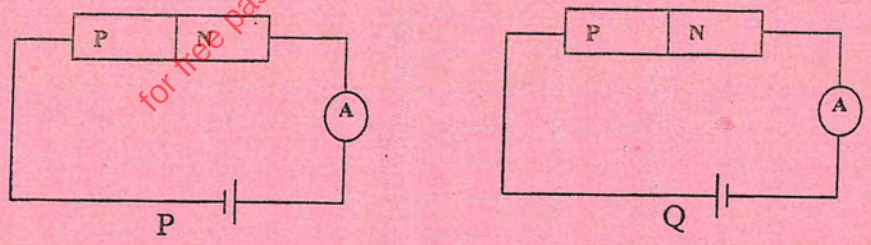
1. Using a diagram, show how a convex mirror gives a wider field of view than a plane mirror. ( 2mks )

2. The figure below shows the path of a ray of light through a transparent material placed in air.




Determine the refractive index of the transparent material (2mks)

3. The Figure shows two ways of biasing a P-N junction.




State and explain in which circuit current will flow. (2mks)

4. (a) The following nuclear reaction is part of a radioactive series

$$^{210}_{83}B \xrightarrow{R} {}^{210}_{84}C \xrightarrow{S} {}^{Y}_{82}D$$

i) Name the radiation represented by R and S

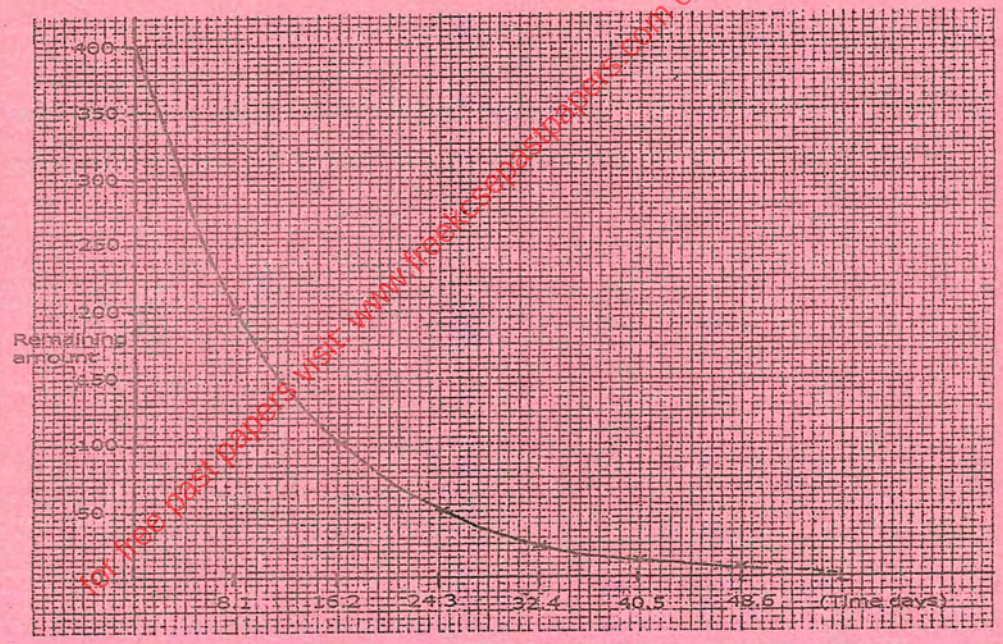
R ..... (1 Mark)

S..... (1 Mark)

ii) Determine the value of Y

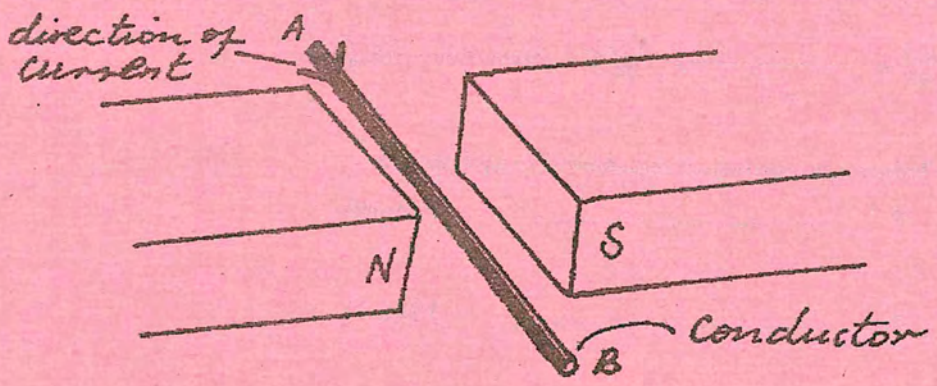
Y..... (1 Mark)

b) The graph below shows radioactive decay of iodine.




Use the graph to determine the half – life of iodine. (1mk)

5. A current-carrying conductor AB is in a magnetic field as shown in the figure below.




(a) Indicate the force F acting on the conductor. (1mk)

(b) State two factors that determine the direction of the force F. (2mks)

6. The figure below shows a horse-shoe magnet whose poles are labeled and two other magnets near it. Iron nails are attracted to the upper ends of the magnet as shown.

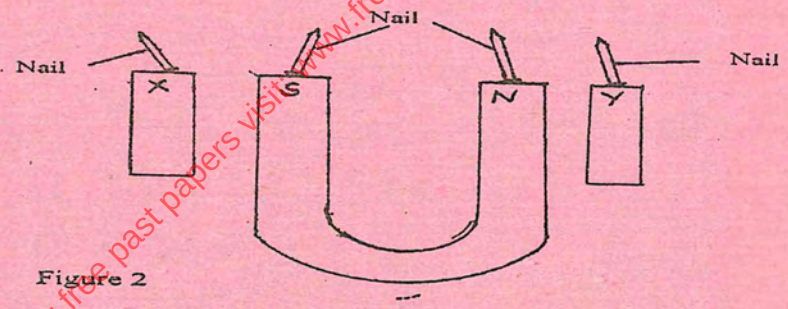



Figure 2

Identify the poles marked X and Y (2mark)

X ..... Y .....

7. The figure below shows how the displacement varies with time of a wave at a point.

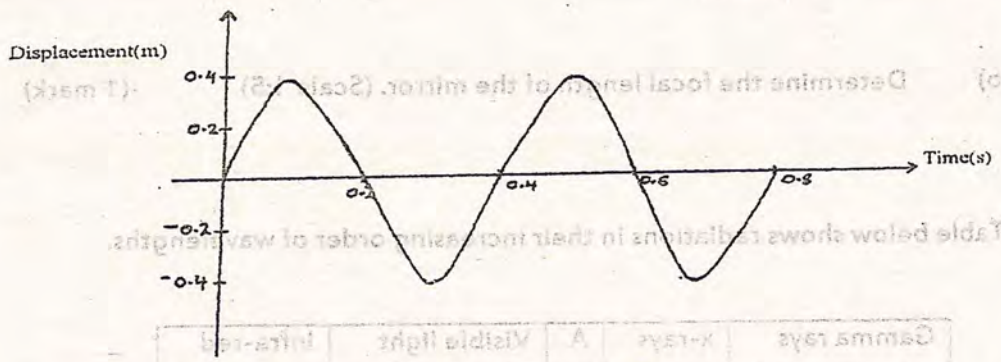
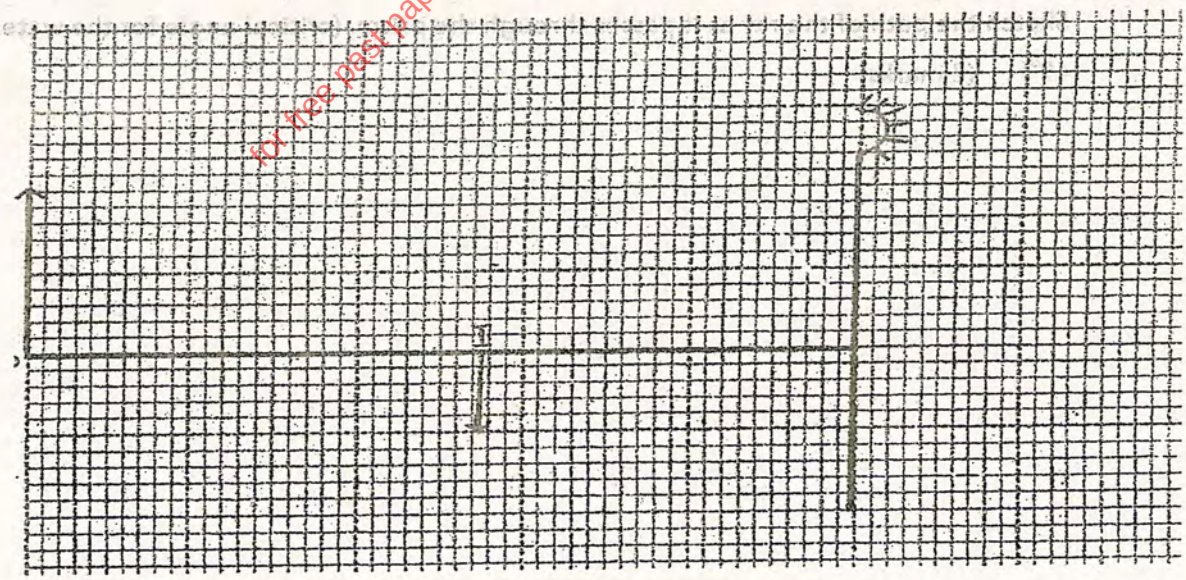



Figure 3

On the same diagram, draw a wave which passes the point with twice the frequency and half the amplitude of the one shown. (2 marks)

8. A boy standing in front of a cliff blows a whistle and hears the echo after 0.5s. He then moves 17 m away from the cliff and blows the whistle again. He now hears the echo after 0.6s. Determine the speed of the sound. (2 marks)

9. The figure below shows an object, O, in front of a concave mirror and its image, I, formed after reflection.



a) On the same diagram draw an appropriate ray(s) to locate the principal focus, F, of the mirror. (2 marks)

b) Determine the focal length of the mirror. (Scale 1:5) (1 mark)

10. Table below shows radiations in their increasing order of wavelengths.

| | | | | |
|---|---|---|---|---|
| Gamma rays | x-rays | A | Visible light | Infra-red |

Name the missing radiation A. (1 mark)

11. The figure below shows a ray of light incident on the face of a water prism.

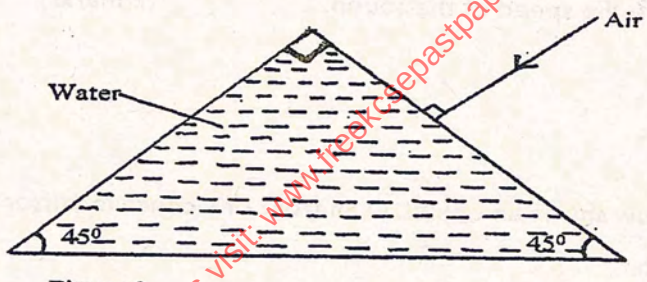


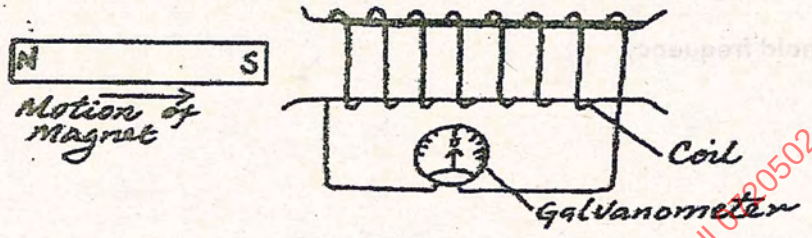

Figure 8

Sketch the path of the ray as it passes through the prism. (critical angle for the water is $49^0$) (2 marks)

## SECTION B (55 MARKS)

12. (a)(i) State Lenz's law of electromagnetic induction. (1mk)

(ii) A bar magnet is moved into a coil of insulated copper wire connected to a centre-zero galvanometer, as shown in the figure below.




(i) Show on the diagram the direction of induced current in the coil. (1mk)

(b) A transformer has 800 turns in the primary and 40 turns in the secondary winding. The alternating e.m.f connected to the primary is 240V and the current is 0.5A.

(i) Determine

I the secondary e.m.f (2mks)

II the power in the secondary coil if the transformer is 95% efficient. (2mks)

(ii) Explain how energy losses in a transformer are reduced by having:

I a soft-iron core. (1mk)

II a laminated core. (1mk)

13. (a) Distinguish between thermionic emission and photoelectric emission. (2mks)

(b) Sodium has a work function of 2.3eV. Given that:
Planck's constant $h = 6.63 \times 10^{-34}$Js
Velocity of light in vacuum, $c = 3.0 \times 10^{8}$m/s
1 electron-volt (1eV) = $1.6 \times 10^{-19}$ C
Mass of an electron, $m_e = 9.1 \times 10^{-31}$kg, calculate:

(i) Its threshold frequency. (2mks)

(ii) The maximum velocity of the photoelectrons produced when sodium metal is illuminated by light of wavelength $5.0 \times 10^{-7}$m. (3mks)

(iii) The stopping potential V, with the light of this wavelength. (2mks)

14. (a) State two advantages of using a Cathode Ray Oscilloscope (C.R.O) as a voltmeter over the ordinary voltmeter. (2mks)

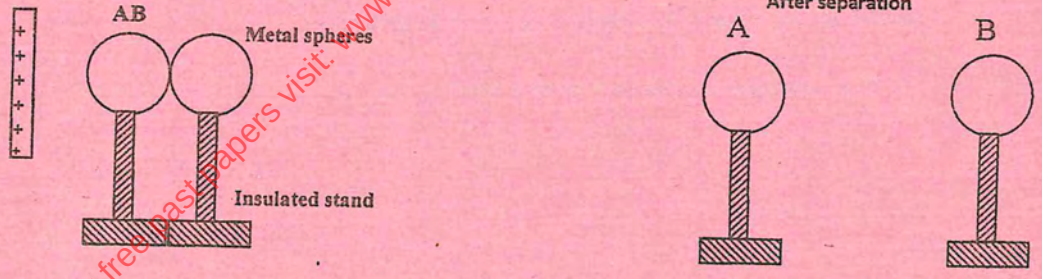
(b) An X-ray operates at 30000V and the current through it is 2mA. Given that the charge of an electron is $1.6 \times 10^{-19}$C, h = $6.63 \times 10^{-34}$Js, speed of light c = $3.0 \times 10^{8}$m/s, calculate:

(i) the maximum kinetic energy of the electrons when hitting the target. (2 mks)

(ii) the number of electrons hitting the target per second. (2mks)

(iii) the minimum wavelength of the X-rays emitted. (2mks)

15. a). Two metallic spheres A and B stand in contact as shown. A positively charged rod is held near sphere A.

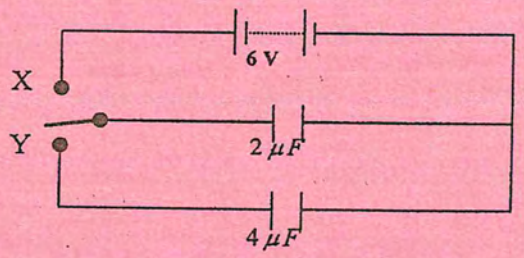



i). Show the charge on each sphere when the metallic balls are separated and the rod is removed. (2mks)

ii) State the reason why the balls are supported on insulated stands. (1mk)

b) State two factors that determine capacitance of a parallel plate capacitor. (2mks)

c) The figure below shows a circuit where a battery of e.m.f 6V, a voltmeter, switches X and Y, two capacitors of capacitance 2 $\mu F$ and 4 $\mu F$ are connected




i) Determine the charge stored in the $2\mu F$ capacitor when switch X is closed and switch Y is open. (2mks)

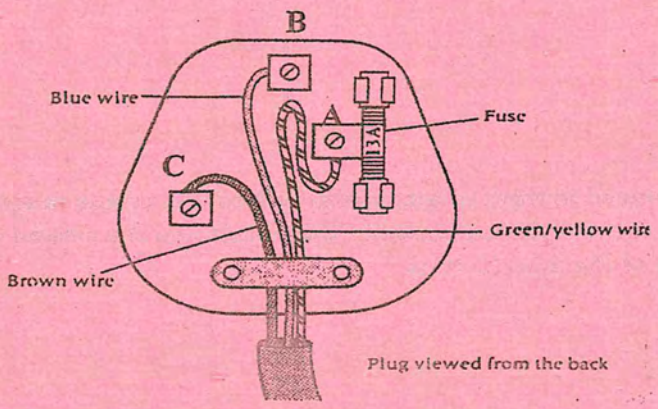
ii) When the switch Y is finally closed and switch X is open, determine the potential difference across each capacitor. (2mks)

d). A dry cell can deliver 0.15 A when connected to an 8.0 Ω resistor. When connected to another 8.0 Ω is connected in series with the first, the cell can only deliver 0.08A to the combination. Use this information to calculate:

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

ii) The e.m.f of the cell. (2mks)

16. The figure below shows a connection to the pin plug.




a) Name the parts A, B and C (3mks)

A .....

B .....

C .....

b) A consumer has the following appliances operating in the laboratory for the times indicated in one day

| Appliance | Time |
|---|---|
| 2 Fluorescent tubes (40W) | 12 hrs |
| one 500 W fridge | 24 hrs |
| one 3kW electric heater | 3 hrs |

i) Calculate the total power of the appliances used (1mk)

ii) If the operating voltage is 240 V, calculate the current drawn from the mains. (2mks)

iii). Calculate the total electrical energy consumed in 20 days, assuming the power consumption per day is the same. (3mks)

17. (a) An upright object was placed in front of a converging lens. An image magnified 3 times was formed on the screen. If the distance between the object and the screen was 80cm, determine the focal length of the lens. (3 mks)

(b) (i) State two possible causes of long sightedness. (2 mks)

(ii) Illustrate with a diagram the correction of short sightedness. (2 mks)



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