FORM 4 TERM 1 2021
PHYSICS

INSTRUCTIONS
Answer all questions in the spaces provided.

1. a) Define the term principal focus as used in thin lenses. (2mks)

b) A four times magnified virtual image is formed by an object place 12cm from a converging lens. Calculate the position of the image and the focal length of the lens. (4mks)

2. a) Describe how x-rays are produced. (2mks)

b) Differentiate between hard X-rays and soft X-rays. (2mks)

c) An X-ray tube is operating with an anode potential of 25kV and a current of 20 m A.
i) Calculate the number of electrons hitting the target per second. (3mks)

ii) Determine the average velocity with which the electron strike the target (e = 1.6 x 10^{-19}c, mass of electron = 9.1 x 10^{-31}kg) (3mks)

3. a) Define the term threshold frequently. (1mk)

b) The figure below shows a set up used to demonstrate photoelectric effect using a photocell.
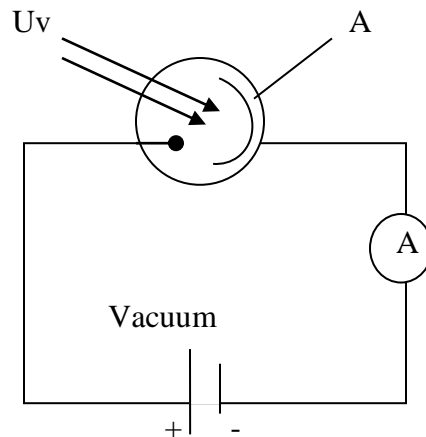
I) Explain why current flow when uv is shown on the part labeled A. (2mks)

ii) Explain why u.v and not infrared radiation is used. (1mk)

iii) Give one reason why the photocell is evacuated. (1mk)

d) In an experiment to observe photo-electric emission from a clean caesium surface, the following readings were observed.

Stopping potential (v)	0.6	1.0	1.4	1.8	2.2
Frequency $(\times 10^{14})$Hz	6	7	8	9	10

i) Plot a graph of stopping potential (v_s) against frequency. (4mks)

From the graph;
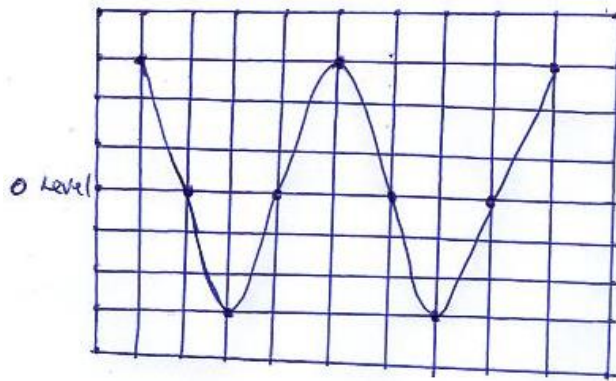ii) Threshold frequency of the surface (1mk)

iii) Threshold wavelength of the surface $(c = 3.0 \times 10^8 \text{ m/s})$ (2mks)

iv) Planck's constant (2mk)

v) Work function of the surface in ev (1mk)

4. a) Give two properties of cathode rays. (2mks)

b) The figure below shows the trace on the screen of an ac signal connected to the y – plates of a CRO with the time base on:

Given that the time base control is 5ms/div and y- gain is at 100v/div, determine

a) The frequency of the a.c. (3mks)

b) The peak voltage of the input signal. (2mks)

5. a) Define the term electromagnetic induction. (1mk)

b) describe two factors that affect the strength of an electromagnet (2mks)

c) A transformer with primary coil of 400 turns and secondary coil 200 turns in connected to 240v a.c mains. Calculate the secondary voltage. (2mks)

6. a) Describe how the following factors affects the centripetal force of a body. (2mks)
i) Mass of the body.

ii) Radius of the path.

b) A car of man 1200kg moving round a bend of radius 50m. If the coefficient of friction between the road and then tyre is 0.8, calculate the maximum speed at which the car should be driven at for it not to skid on the bend. (3mks)

7. The following reaction is part of a radioactive series. Identify the radiation X and determine the values C and Z. (3mks)

$$^{210}_{83}A \xrightarrow{\quad x \quad} {}^{210}_{84}B \xrightarrow{\quad a \quad} {}^{c}_{z}Q$$