NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES

DEPARTMENT OF PHYSICS

2024_2 EXAMINATION

COURSE CODE: **PHY 391**

COURSE TITLE: **PHYSICS LABORATORY II**
CREDIT UNIT: **2**
TIME ALLOWED: **(2 HRS)**

INSTRUCTION: ***Answer question 1 and any other two questions***

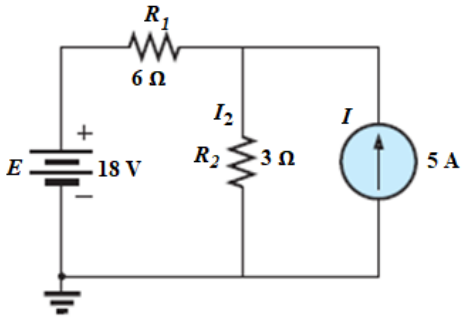
QUESTION ONE

(A) i. List two circuit elements used as a filter in a d.c. Power supply design.

ii. State any three precautions when constructing a d.c. power supply

(B) State superposition Theorem

(C) Using the superposition theorem, determine the current through resistor R_2 in the circuit network below;



(D) State one difference and one similarity between latent heat of fusion and latent heat of vaporization.

(E) i. What is an Opamp?

ii. What are the names of the 2 inputs of an opamp?

(F) Explain the effect on the signal applied at the 2 inputs?

(G) Draw a ray diagram with labels to show how a virtual image of an object is formed by a converging lens.

QUESTION TWO

(A) The resistance of the thermistor (R_T) and temperature are related by the equation

$$\ln(R_T) = \ln(R_0) + \frac{E_g}{2K}\frac{1}{T}$$

where,

$R_T$is the resistance at temperature, T

$R_0$is resistance at OK,

E_g is the band gap of the material, K is the Boltzmann's constant

When a straight-line graph of $\ln(R_T)$ against $\frac{1}{T}$ is plotted;

i. What is the slope?

ii. How will you determine $\ln(R_0)$?

iii. What is the value of the energy band gap?

iv. What is the meaning of the band gap of material?

(B) Differentiate insulators, semiconductors and metals in terms of band gap.

(C) State two precautions taken in Calibration of thermistor.

QUESTION 3

(A) Mention six apparatus needed for the determination of focal length of a given convex lens experiment.

(B) In an optics experiment, a student obtained the following readings:

Distance of object from lens $u(cm)$	Distance of image from the object $X(cm)$
14.0	64.0
18.0	50.0
26.0	46.0
40.0	56.0
55.0	68.0

(i) Prepare a composite table containing v the image distance from the lens, $u + v$ and uv for each reading above.

(ii) Plot a graph of uvagainst$u + v$

(iii) Obtain the slope K from the graph

(iv) What is the physical meaning of K ?

(Hint: $v = X - u$)

(C) Give two precautions for the experiment in 3(a).

QUESTION FOUR

(A) What is polychromatic light?

(B) State four differences between converging lens and diverging lens

(C) List four (4) methods that can be used to determine the focal length of a convex lens.

(D) An object 9.0 cm high is 27 cm in front of a concave lens of focal length -18 cm. Determine;

(i) the position of its image

(ii) height of the image; and

(iii) where the image was formed

QUESTION FIVE

(A) Define the terms, (i) latent heat of fusion and (ii) specific latent heat of fusion .

(B) A $0.02\ kg$ ice at 0^0C is dropped into a vacuum bottle originally holding 0.4kg of water at 35^0C.

Assuming that any loss or gain of heat by the vacuum bottle is negligible, determine;

(a) the heat to melt the ice, and

(b) the final temperature after thermal equilibrium is attained.

(Specific latent heat of fusion of ice$=\ 3.36\ X\ 105\ Jkg^{-1}$ and specific heat capacity of water $=$ $4200JkgK^{-1}$)

(C) Draw a cooling curve of a solid to show the three distinct regions;

(i) cooling region for liquid

(ii) region during which the change of phase takes place

(i) cooling region for the solid

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