

REPUBLIC OF CAMEROON
Peace-Work-Fatherland

MINISTRY OF SECONDARY EDUCATION

SOUTH REGIONAL DELEGATION

TEACHERS' RESOURCE UNIT
P.O. BOX 77 TEL: 222-284-190



REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie

MINISTÈRE DES ENSEIGNEMENTS SECONDAIRES

DÉLÉGATION RÉGIONALE DU SUD

CELLULE D'APPUI À L'ACTION PÉDAGOGIQUE
B.P. 77 EBOLOWA TEL: 222-284-190

AL GEN

MARCH 2024

ADVANCED LEVEL

The Teachers' Resource Unit in collaboration with the Regional Inspectorate of Pedagogy	SUBJECT CODE NUMBER 0780	PAPER NUMBER 2
GENERAL CERTIFICATE OF EDUCATION REGIONAL MOCK EXAMINATIONS	SUBJECT TITLE PHYSICS	
DATE: Tuesday 19th March 2024 (AFTERNOON)		

Time Allowed: **THREE HOURS**

INSTRUCTIONS TO CANDIDATES

Mobile phones are NOT ALLOWED in the examination room.

Answer ALL questions.

Section I is designed to be answered in 1hour. Section II in 30 minutes. Section III in 40minutes and section IV in 50minutes.

You are advised to divide your time accordingly.

You are reminded of the necessity for good English and orderly presentation IN your answers.

In calculations, you must show all the steps in your working, giving your answer in each stage.

Meet us at www.alstug.com

Non programmable calculators and formulae booklet are allowed.

© TRU/RPI/0780/2/SOREMEX/2024

TURN OVER



SCAN TO VISIT THE WEBSITE

1 | 5

SECTION I : (One hour)

Answer all questions in this section

- 1.(a) Explain what makes an equation relating physical quantities to be physically correct.
 (b) The power radiated per unit area, I , is given by the equation ,

$$I = \frac{E^2}{2c\mu_0}$$

Where, E , is the electric field strength, c is the speed of light in a vacuum, μ_0 is the permeability of free space. Use this equation to determine the base units of E given that the equation is homogenous. **(5 marks)**

- 2.(a) A mosquito of mass 5.0 g, flying at a speed of $1.5 \times 10^{-4} \text{ m s}^{-1}$, collides with a spider web which brings it to rest in 2 ms. Calculate the average force exerted by the mosquito on the web.

- (b) A light object of mass m_1 and a heavy one of mass m_2 have the same momentum. Which of the masses have a smaller kinetic energy? Explain. **(6marks)**

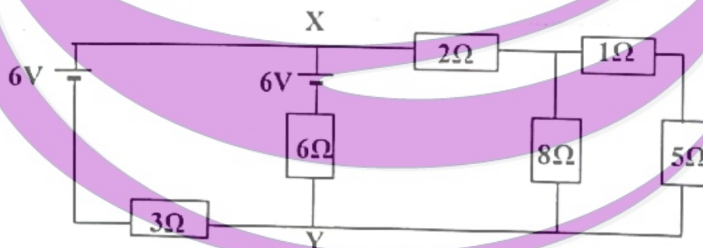
3. A 1.0 mol sample of an ideal gas is kept at 0.0°C during an expansion from 3.0 L to 10.0 L.

- (a) How much work is done on the gas during the expansion?
 (b) How much energy transfer by heat occurs with the surroundings in this process ?
 (c) If the gas is returned to the original volume by means of an isobaric process, how much work is done by the gas? **(7marks)**

4. A submarine A travels through water at a speed of 8.0 m/s emitting a sonar wave at a frequency of 1400 Hz. The speed of sound in the water is 1533 m/s. A second submarine B is located such that both submarines are traveling directly towards one another. The second submarine is moving at 9.0 m/s.

- (a) What frequency is detected by an observer riding on submarine B as the submarines approach each other ?
 (b) The submarines barely miss each other and pass. What frequency is detected by an observer riding on submarine B as the submarines recede from each other ? **(6marks)**

- 5) Consider the circuit in figure below.



Calculate the

- (i) current through the 8Ω resistor
 (ii) p.d. across the points X and Y

(6marks)



SCAN TO VISIT THE WEBSITE

SECTION II : (30 minutes)

ANSWER EITHER 6 (a), (b) and (c) OR 6 (d), (e) and (f).

EITHER 6 (a), (b) and (c)

(a) Define stopping potential.

(2 marks)

(b) Use Einstein photoelectric equation to explain

(i) Why for a particular metal electrons are emitted only when the frequency of the incident radiation is greater than a certain value.

(ii) Why the maximum speed of the emitted electrons is independent of the intensity of the incident radiation. (4 marks)

(iii) Describe an Experiment to verify Newton's cooling law. Your account should consider a diagram, procedure, precautions, observations and a conclusion. (8 marks)

(c) Figure 2 shows how the frequency (f) of incident radiation on a metal surface varies with the energy of emitted photoelectrons.

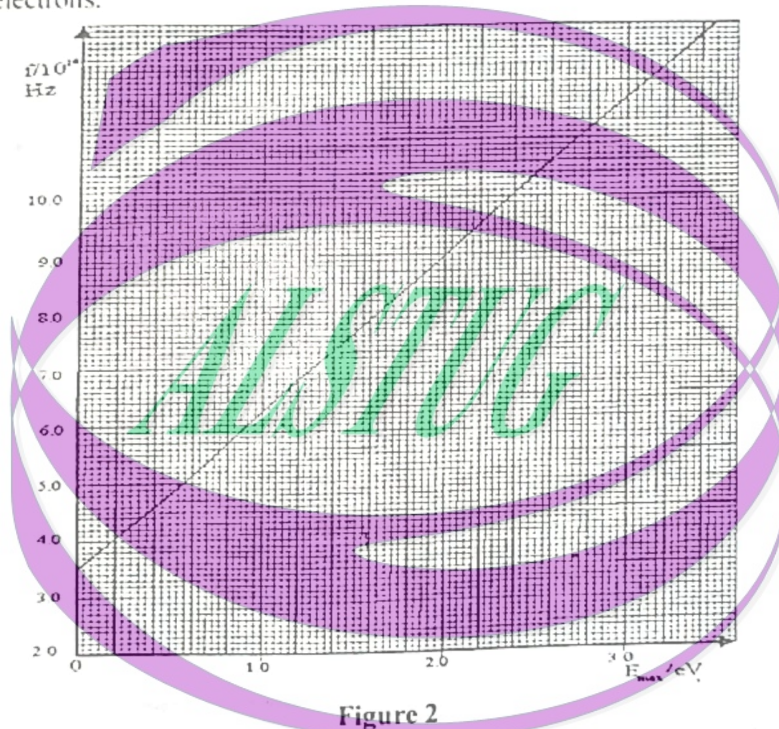


Figure 2

(i) From the graph determine the threshold frequency and calculate the maximum wavelength of the emitted electron. Meet us at www.alstug.com

(ii) Calculate values for the

- Planck's constant
- work function of the metal in joules.

(6 marks)



SCAN TO VISIT THE WEBSITE

OR

6 (d), (e) and (f).

6 (d) (i) Define work function

(2 marks)

(ii) Describe an Experiment to determine planck's constant (h). Your account should consider a diagram, procedure, precautions, observations and a conclusion.

(8 marks)

(e) Two long parallel conductors each carrying a current of 5A in the same direction are placed a metre apart.

(i) With the use of a diagram explain the forces that exist between the wires.

(2marks)

(ii) Calculate the force per unit length on each of the wires.

(2marks)

(f) A segment of steel railway track has a length of 30.0m when the temperature is 0.0°C.

(i) What is the length when the temperature is 40.0°C?

(ii) Suppose that the ends of the railway are rigidly clamped at 0.0°C so that expansion is prevented. What is the thermal stress set up in the rail if its temperature is raised to 40.0°C?

(given that for steel, $\alpha = 11 \times 10^{-6} / ^\circ\text{C}$ and $Y = 20 \times 10^{10} \text{ N/m}^2$)

(iii) What if the temperature drops to -40.0°C, what is the length of the unclamped segment ?

(6marks)

SECTION III (40 minutes)
COMPULSORY QUESTION:7
DATA ANALYSIS.

An Experimental measurements of the rate of emission of radiant energy from the surface of a body shows that the rate of emission of radiant energy per unit area E varies with the absolute temperature T as follows:

$$E = AT^n$$

Where A and n are constants. The table below gives data for the rate of emission of radiant energy per unit area as a function of temperature in $^\circ\text{C}$

$E / 10^8 \text{ W m}^{-2}$	$\theta / ^\circ\text{C}$
0.85	5950
1.40	6798
2.00	7419
2.60	7917
3.20	8339
3.75	8706
4.28	9033
4.90	9329
5.50	9600

- Plot a suitable graph that can be used to determine the values of A and n .
 - Hence determine the values for A and n from your graph.

(11 marks)

(8 marks)

- What is the physical significance of A ?

(1 mark)

(Total = 20 Marks)



SCAN TO VISIT THE WEBSITE

SECTION IV : OPTIONS (50minutes)

Answer any two questions from the four options

OPTION 1: ENERGY RESSOURCES AND ENVIRONMENTAL PHYSICS

1. a) Distinguish between renewable and non-renewable energysources. (2 marks)
- b) A hydroelectric power station has an efficiency of 70% and the reservoir is 425 m above the turbines.
 - i) Calculate the volume of the water per seconds that must flow through the turbine chamber in order to give a power output of 180 MW.
 - ii) State two advantages of implanting hydroelectric power in Cameroon.
 - iii) Describe two problems that are likely to be encountered with the use of this hydroelectric power scheme. (6marks)
- c) i) What do you understand by the term 'climate change'? State two evidences.
- ii) Explain how each of the following factors contribute to the greenhouse gases in the atmosphere
 - Deforestation
 - Burning of fossil fuels

(7 marks)
(Total = 15 Marks)

OPTION 2: COMMUNICATION SYSTEMS

9. a. Draw the diagram of a simple radio receiver. (4 marks)
- b. (i) briefly explain the difference between FM and AM transmission. (3marks)
- (ii) A tuning circuit contains an inductor of inductance 12.7mH . If a capacitor of capacitance $2.00\mu\text{F}$ is connected to the circuit. Calculate the frequency to which the circuit is
- c. (i) State two physical quantities that can be varied in order to capture a particular radio station using a mobile phone. (2 marks)
- (ii) State and explain two uses of cell phones. (3 marks)

(Total = 15 Marks)

OPTION 3: ELECTRONICS

10. (a) (i) What is meant by thermionic emission? (2 marks)
- (ii) Distinguish between n-type and p-type semiconductors. (2 marks)
- (b) You are given two circuits consisting of:
 - (i) A resistor of 500Ω and a capacitor connected in series to 9.0 V dc supply.
 - (ii) An inductor and a resistor of 500Ω connected in series to 9.0 v dc supply
 Sketch current-time graphs for these circuits and explain the differences between them. (4marks)
- (c) (i) Explain how a transistor is used as a switch. (4 marks)
- (ii) State in words and in the form of a truth table, the action of an OR logic gate with two inputs. (3 marks)

(Total = 15 Marks)

OPTION 4: MEDICAL PHYSICS

11. a. Compare X-rays and ultrasound in medical diagnosis (3 marks)
- b. A person's near point is 100cm . Explain using a diagram how the defect can be corrected (3 marks)
- c. (i) Draw a simple labelled diagram of the human heart. (3 marks)
- (ii) State any three main functions of the heart (3 marks)
- (iii) What is a heart pacemaker? List any two types of pacemakers (3 marks)

(Total = 15 Marks)



SCAN TO VISIT THE WEBSITE