KAMUZU BARRACKS COMMUNITY DAY SECONDARY SCHOOL

2024 - 25 MALAWI SCHOOL CERTIFICATE OF EDUCATION MOCK

PHYSICS

Subject Number: M164/I

June, 2025

Time Allowed: 2.5 hours

07:00 – 09:30 pm

PAPER I

(120 marks)
Theory

Question Number	Tick if answered	Do not write in these columns	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
Total			

Instructions

1. **This paper contains 15 printed pages. Please check.**

2. This paper has **two** sections, **A and B**. in Section **A** there are **nine** short answer questions while in section **B** there are **five** restricted essay questions

3. Use of electronic calculators is allowed.

4. In the table provided on this page, **tick** against the question number you have answered.

5. Hand in the completed question paper when time is called to stop writing.

   IMPORTANT
6. Make sure you write your **Candidate Name** and **Examination Number** in the spaces provided on all the pages before you start answering the questions.

Section A (70 marks)
Answer **all** the questions in this section in the spaces provided.
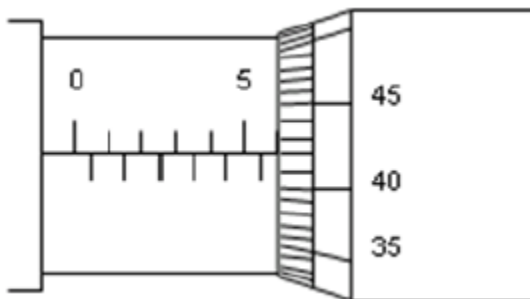
1. **Figure 1** is a diagram of a measuring instrument.

Figure 1

a. Name the measuring instrument.

_____

(1 mark)

b. Calculate the reading as shown by the instrument.

(2 marks)

c. Give the **first two** components of a laboratory report.

_____

_____

(2 marks)

d. Why do scientists prefer using Kelvin scale rather than the Celsius scale?

_____

(2 marks)

2. Figure 2 is a pulley system being used to raise a load by applying a **500N** effort.

Figure 2

a. i.   Determine the velocity ratio of the system.

_____

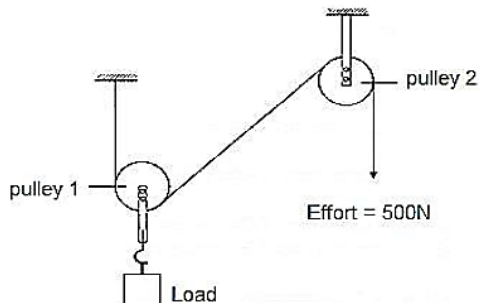   **(1 mark)**

   ii.   Give **any one** method of reducing friction in the pulley system above.

_____

                                                                          (1 mark)

   iii.   The pulley system has an efficiency of **80%**. Workout the maximum load that the
           machine can raise.

                                                                          (4 marks)

b. Explain **any one** application of principles of moments in everyday life.

_____

_____

                                                                          (2 marks)

3. a. Define the term '**Centripetal force**'

_____

_____

(1 mark)

b. A particle of mass **3000g** moves with an angular velocity of **10π rad/s** along a   circular path of radius **20 cm**. Calculate its centripetal force.

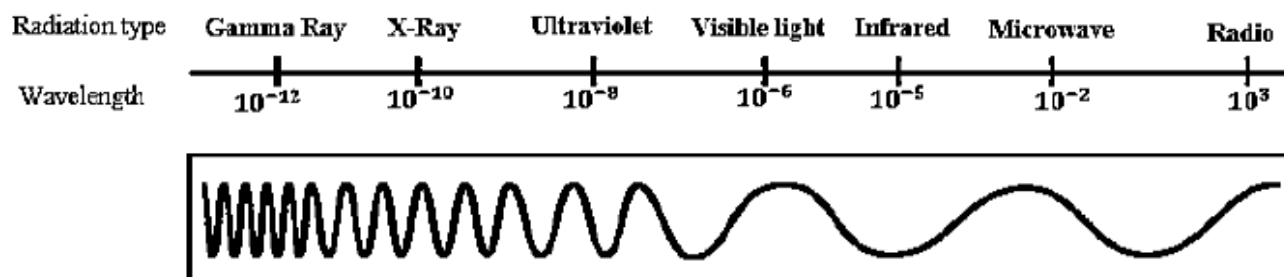**(3 marks)**

c. **Figure 3** shows an electromagnetic spectrum.

Radiation type	Gamma Ray	X-Ray	Ultraviolet	Visible light	Infrared	Microwave	Radio
Wavelength	10^{-12}	10^{-10}	10^{-8}	10^{-6}	10^{-5}	10^{-2}	10^{3}

Figure 3

   i.   Define the term '**electromagnetic wave**'.

_____

_____

(1 mark)

   ii.   Describe the relationship between wavelength and energy in the spectrum.
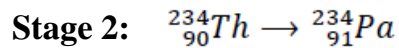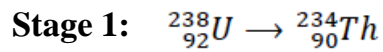
_____

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(2 marks)

iii.   Mention **any two** applications of ultraviolet radiations

_____

_____

(2 marks)

4. a. Define the term '**half-life**' as used in nuclear physics.

_____

_____

(1 mark)

b. Uranium $^{238}_{92}U$, decays in a series of stages as follows:

Stage 1: $^{238}_{92}U \rightarrow {}^{234}_{90}Th$

Stage 2: $^{234}_{90}Th \rightarrow {}^{234}_{91}Pa$

Name the particles emitted at each stage;

Stage 1: _____

Stage 2: _____

(2 marks)

c. Describe the difference between nuclear fission and nuclear fusion.

_____

_____

_____

_____

(2 marks)

d. Explain how radioactivity is used in power generation.

_____

_____

_____

_____

(3 marks)

5. a. Define the term 'pressure'.

_____

_____

(1 mark)

b. State **any three** properties of a hydraulic fluid.

_____

_____

_____

(3 marks)

c. Calculate the temperature of a gas that occupies a volume of **500 cm³** at **27°C** when its volume has been raised to **800 cm³** at constant pressure.

(3 marks)

d. Explain any **one** application of the Boyle's gas law.

_____

_____

_____

(2 marks)

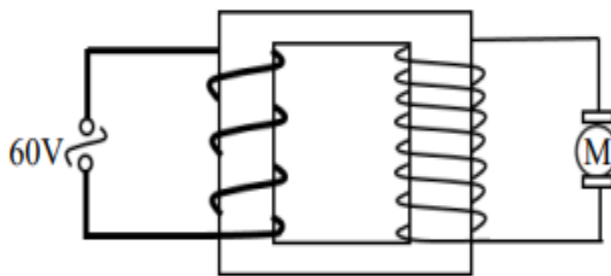6. **Figure 4** shows a transformer whose input voltage is 60V.

Figure 4

a. State the type of a transformer shown in **Figure 4**.

_____

(1 mark)

b. Give any **two** factors that will affect the magnitude of the output a transformer.

_____

_____

(2 marks)

c. In brief, explain how the transformer in **Figure 4** operates.

_____

_____

_____

_____

(3 marks)

d. Given that the transformer in **Figure 4** is 80% effective. Calculate its input current. If the output power of the transformer is 120W.

(4 marks)

7. a. State the law of conservation of linear momentum.

_____

_____

(1 mark)

b. Explain the difference between elastic and inelastic collision.

_____

_____

_____

_____

(2 marks)

c. A **15000g** body moving with velocity of **20 m/s** collides with a **10kg** body moving in the same direction with velocity of **8 m/s** along the same path. If the two bodies join together on impact, find their common velocity.

(5 marks)

d. Describe the **two** main types of lenses.

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(4 marks)

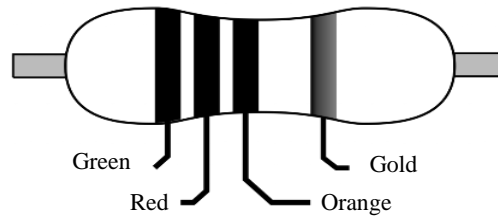**8.** a. **Figure 5** is an electrical resistor.

Figure 5

Find resistance using the color-coded resistor in **Figure 5**.

(2 marks)

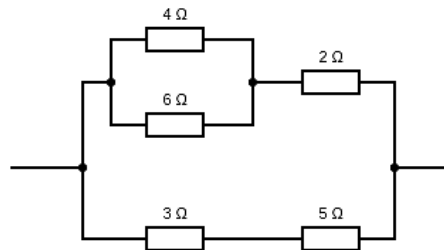b. **Figure 6** is an electric circuit. Use it to answer the questions that follow.

Figure 6

Work out the total resistance for the circuit in **Figure 6**.
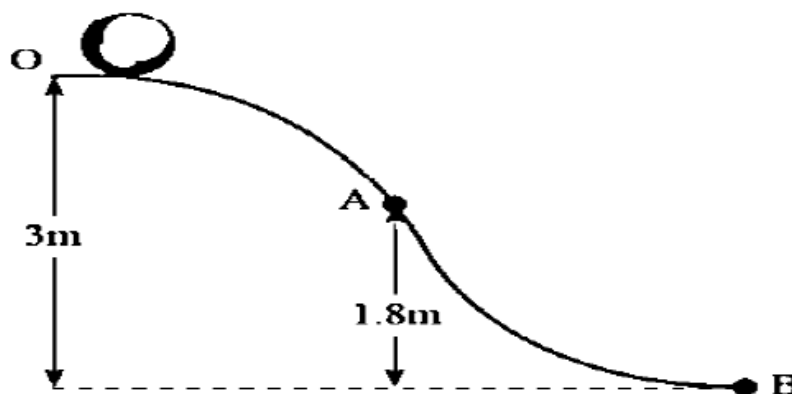
(3 marks)

9. a. Define the term '**inertia**'.

_____

_____

(1 mark)

b. Explain any **one** positive effect of anomalous behaviour of water.

_____

_____

(2 marks)

c. A ball of mass **2000 grams** slides on a frictionless surface as shown in the diagram below.

Determine the following:

i.   Potential energy at point **O**, **A**, and **B**.

_____

_____

_____

(3 mark)

ii.   Gain in kinetic energy at **A**.

_____

_____

(1 mark)

Section B (50 marks)
Answer **all** questions in the spaces provided.

10. With the aid of a well labelled diagram, describe an experiment that could be carried out to verify Charles law given the following materials: thermometer, metal container, rubber band, water, capillary tube, heat source and oil.

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(10 marks)

11. a. With the aid of a well labelled diagram and a truth table, explain how a **NAND** logic gate operates

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_____

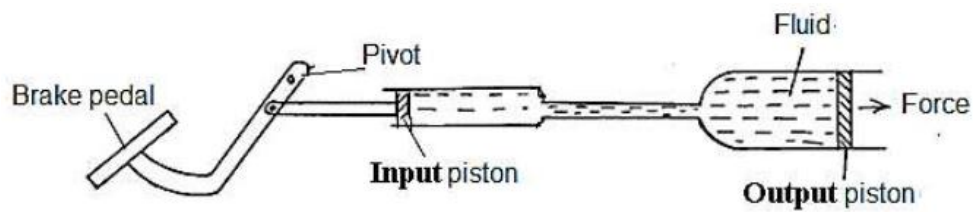**(6 marks)**

b. **Figure 7** shows a fluid braking system.

Figure 7

A force of 45N is acting on the input piston of area 0.3m^2. Calculate the force on the output piston of area 0.7m^2.
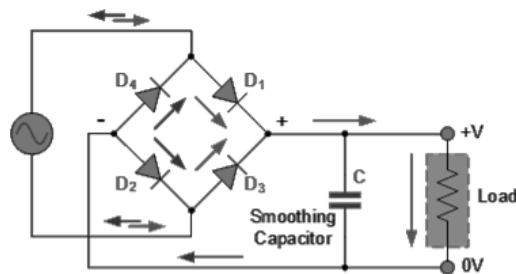
(4 marks)

12. a. With the aid of a well labelled diagram, explain how an **n-p-n** transistor works.

_____

_____

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_____

_____

_____

(5 marks)

b. Study the electric circuit below.

Name the function of the circuit, and explain how it operates.

_____

_____

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_____

_____

_____

(5 marks)

13.   a.   Explain how shrink fitting is done when provided with two metal tubes of the same diameter.

_____

_____

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_____

_____

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_____

(5 marks)

   b.   With the aid of a well labelled diagram, describe an experiment that could be carried out to show that pressure in liquids increases with depth.

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(5 marks)

14. a. With the aid of a well labelled diagram, describe an experiment that could be carried out find the effect of mass on the frequency of an oscillating spring.

_____

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_____

(5 marks)

b. With the aid of a well labelled diagram, describe how you can detect a type of radioactive emission by using an electric field.

_____

_____

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_____

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_____

(5 marks)

END OF QUESTION PAPER

NB: This paper contains 15 printed pages.