THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/1 **PHYSICS 1**

(For Both School and Private Candidates)

Duration: 3 Hours **Year: 2025**

Instructions

1. This paper consists of sections A, B and C with a total of **eleven (11)** questions.
2. Answer **all** questions in sections A and B and **two (2)** questions from section C.
3. Section A carries **sixteen (16)** marks, section B **fifty four (54)** marks and section C **thirty (30)** marks.
4. Communication devices and any unauthorized materials are **not** allowed in the examination room.
5. Non-programmable calculators and mathematical tables may be used.
6. Write your **Examination Number** on every page of your answer booklet (s).
7. Where necessary the following constants may be used:
   (i) Acceleration due to gravity, $g = 9.8$ N/kg.
   (ii) Density of water, $\rho = 1000$ kg m^{-3}.
   (iii) Pie, $\pi = 3.14$.
   (iv) Specific heat capacity of water $= 4200 J/kg\,^{\circ}C$.



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SECTION A (16 Marks)

Answer **all** questions in this section.

1. For each of the items (i) - (x), choose the correct answer from among the given alternatives and write its letter beside the item number in the answer booklet provided.

(i) Which of the following ways as applied in Physics can be used by one person to convey the message to another person who is in the nearby village in the form of writings?

A Electronic mails
B Fiber optics
C Headphones
D Radio waves
E Cables

(ii) Carefully study logical steps 1 to 8 and then answer the question that follows:

1 Formulating a testable hypothesis
2 Data interpretation
3 Performing an experiment
4 Problem identification
5 Drawing conclusion
6 Asking questions
7 Data presentation
8 Data collection and analysis

Which steps show the best logical sequence for scientific investigation?

A 8, 7, 6, 5, 4, 3, 2, 1
B 8, 6, 4, 2, 7, 5, 3, 1
C 4, 6, 1, 3, 7, 8, 2, 5
D 4, 6, 1, 3, 8, 2, 7, 5
E 6, 4, 1, 3, 8, 2, 7, 5

(iii) Which precaution should be taken to avoid false reading before using a micrometer screw gauge in measuring lengths?

A The thimble and ratchet should be correctly handled to get rid of mismatch.
B The faces of anvil and spindle should be wiped clean to remove any dirty particles.
C The sleeve and thimble should be wiped clean to remove any dirty particles.
D The anvil and ratchet should be adjusted correctly to get rid of zero error.
E The sleeve and thimble should be held tight on their frame to get rid of parallax error.

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(iv) Why a person cannot push a car from inside when it is stuck in the mud or sand?

A Outside the car, the friction force between the legs and ground produces backward force.

B Inside the car, the friction force between the legs and car produces less forward force.

C Inside the car, the friction force between the legs and car produces backward force.

D Outside the car, the friction force between the legs and ground produces forward force.

E Outside the car, the friction force between the legs and the car produces forward force.

(v) Which action will increase the density of a substance?

A Increasing the mass of the substance while increasing its volume.

B Increasing the volume of the substance while its mass kept constant.

C Decreasing the mass of the substance while decreasing its volume.

D Increasing the mass of the substance while fixing its volume.

E Increasing the mass of the substance while decreasing its volume.

(vi) A drop of water spreads on the surface of a smooth tiles while an equal sized drop of honey refutes spreading. Why are these wonders taking place?

A Water has more cohesive force than honey

B Water has more adhesive force than honey

C Honey has more cohesive force than water

D Honey has more adhesive force than water

E Water has less adhesive force than honey

(vii) When a sharp pencil of 5 g is placed on your hand on its tip, it will exert pressure on the hand. Calculate the maximum pressure the pencil will exert to you if it has dimensions shown in Figure 1.

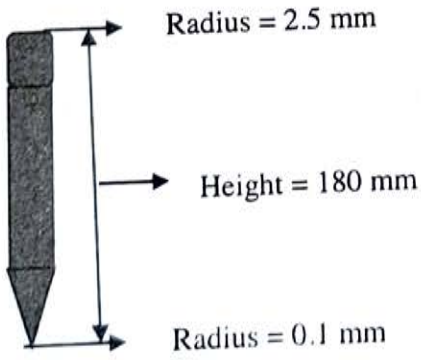


Figure 1

A 1.59×10^{6} Pa B 1.59×10^{3} Pa C 2.55×10^{-3} Pa.

D 2.55×10^{9} Pa. E 2.55×10^{3} Pa.

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(viii) An object of 5 cm is placed 25 cm away from the concave mirror of radius of curvature 24 cm. Deduce the position and characteristics of the image formed.

A 23.1 cm, real, inverted and diminished
B 23.1 cm, real, inverted and magnified
C 25.0 cm, real, upright and diminished
D 25.0 cm, real, upright and magnified
E 23.1 cm, virtual, inverted and diminished

(ix) Suppose an engine raises 200 kg of water steadily through a height of 60 m in 20s. If the upward force used is equal to the weight of water raised, calculate the power in kW.

A 4 kW B 5.88 kW C 3 kW D 5 kW E 7 kW

(x) Which one of the following alternatives will decrease the capacitance of the variable parallel capacitor in a radio receiver if the dielectric materials remain constant?

A Decrease the separation and increase the area of the plates of the capacitor
B Increase the separation and increase the area of the plates of the capacitor
C Increase the separation and decrease the area of the plates of the capacitor
D Decrease the separation and decrease the area of the plates of the capacitor
E Decrease the separation and maintain the area of the plates of the capacitor

2. Match the descriptions of temperature terms in **List A** with their corresponding terms in **List B** by writing the letter of the correct response beside the corresponding item number in the answer booklet provided.

List A	List B
(i) The temperature of melting ice.	A Upper fixed point
(ii) The temperature scale that is used in the SI systems of units.	B Thermodynamic scale
(iii) A measure of the average kinetic energy of the particles in a substance.	C Fundamental interval
(iv) The temperature of boiling water.	D Thermoelectric thermometer
(v) A temperature scale based on absolute scale.	E Absolute zero
(vi) The point in which all molecular motion stops at -273.15 °C.	F Lower fixed point
	G Temperature
	H Kelvin scale
	I Celsius scale

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SECTION B (54 Marks)

Answer **all** questions in this section.

3. (a) Identify the type of lens which fits a person with:

(i) Short-sighted defect **(2 marks)**

(ii) Long-sighted defect **(2 marks)**

(b) Why concave mirrors used as shaving mirrors? Explain with a aid of a well labelled diagram. **(5 marks)**

4. (a) Draw a diagram of simple mercury barometer showing clearly:

(i) The Torricellian vacuum. **(2 marks)**

(ii) The atmospheric pressure and height of the mercury. **(3 marks)**

(b) Figure 2 show rulers balanced at their centers of gravity in Case I and II. Determine the difference in weight between A and B. **(4 marks)**

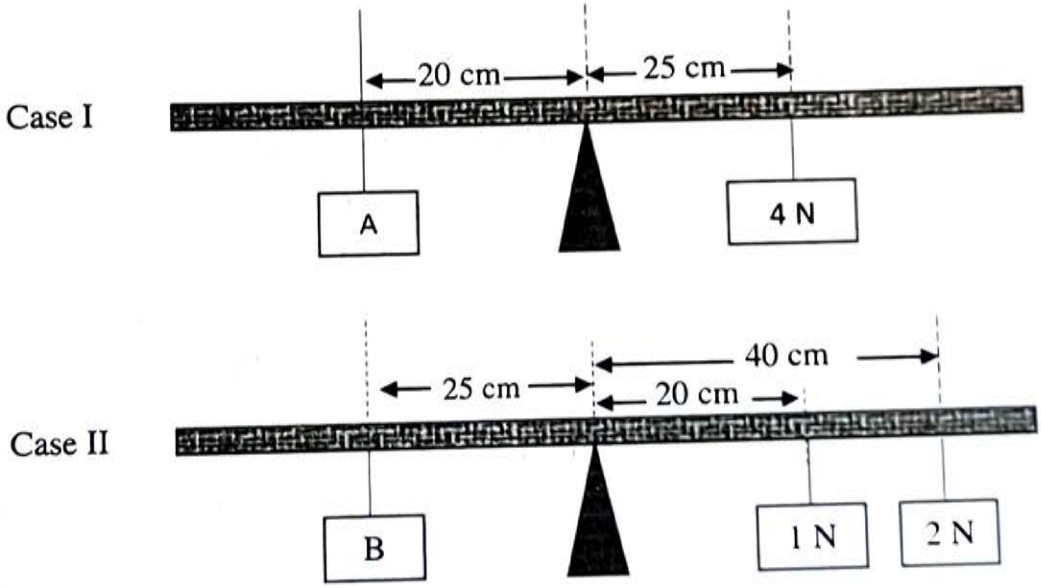


Figure 2

5. (a) (i) Why a person jumping from a high ground to the floor bends knees upon making contact? **(2 marks)**

(ii) State the law or principle that supports your answer in (a) (i). **(2 marks)**

(b) A wooden plank is used to raise a heavy load from point A to point B as shown in Figure 3. Use Figure 3 to show that velocity ratio = $\frac{1}{\sin\theta}$. **(5 marks)**

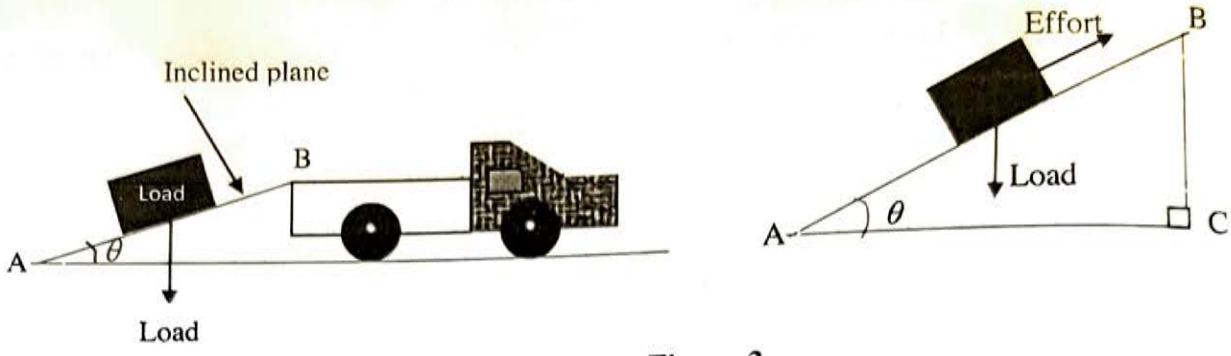


Figure 3

6. (a) (i) How can a bimetallic strip be made? Briefly explain. **(2 marks)**

(ii) By using a simple diagram, show how a bimetallic strip made of iron and brass is formed when heated with the same temperature. **(3 marks)**

(b) Suppose 105 g of water at 75 °C is added to 215 g of cold water at 15 °C and the mixture is well stirred, determine the final temperature of the mixture if the heat absorbed by the container is neglected. **(4 marks)**

7. (a) Briefly explain the three factors that determine the quantity of heat generated by an electric current. **(4.5 marks)**

(b) In a certain experiment, the p.d across the terminals of the cell was 1.1 V when a current of 0.20 A was being drawn from the cell and the p.d across the terminals of the same cell was 1.30 V when the current drawn from the cell was 0.10 A. Calculate the;

(i) Internal resistance of the cell. **(2.5 marks)**

(ii) Electromotive force of the cell. **(2 marks)**

8. (a) Why is Venus nicknamed as twin planet of the Earth? **(4 marks)**

(b) Briefly explain:

(i) Two negative effects of volcanic activity on the earth's surface. **(2.5 marks)**

(ii) Two positive effects of volcanic activity on the earth's surface. **(2.5 marks)**

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SECTION C (30 Marks)

Answer **two (2)** questions from this section.

9. (a) The cloud chamber is used for detecting ionized nuclear radiation. Explain how you can use it to detect the alpha and beta particles. **(3 marks)**

(b) One of the nuclear laboratory scientists recorded the information such that the mass of received sample X was 20 g and after 150 days was 0.652 g.

(i) How many half-lives had elapsed for sample X to decay to 0.652 g? **(3 marks)**

(ii) Using information obtained in (b) (i), determine the half-life of sample X. **(3 marks)**

(c) Draw a well labelled diagram to show the components of a cathode ray tube. **(6 marks)**

10. (a) Briefly explain three applications of diffraction of waves. **(6 marks)**

(b) One scientist was investigating the impact of tension on the frequency of vibrating wire. The following data were recorded:
Length of a stretched wire was 30 cm, tension of wire was 900 N and slotted masses of 3 g and 12 g.
Use these data to show how the masses on the vibrating wire affects its frequency. **(4 marks)**

(c) Draw the PNP and NPN transistor circuit symbols and indicate their three layers of the transistors and the direction of conventional current. **(5 marks)**

11. (a) Draw a well labelled electric bell circuit and explain how it works. **(6 marks)**

(b) Use the Fleming's left-hand rule to explain the direction of the force in a current carrying wire. **(3 marks)**

(c) (i) What makes the efficiency of a transformer to be less than 100%. Briefly explain. **(2 marks)**

(ii) With reference to Faraday's law of electromagnetic induction, determine two factors which affect the magnitude of the induced e.m.f of the conductor. **(4 marks)**