THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

FORM TWO NATIONAL ASSESSMENT

031 **PHYSICS**

Time: 2:30 Hour **SOLUTIONS** **Year: 2025**

Instructions

1. This paper consists of sections A, B and C with a total of **ten (10)** questions.
2. Answer **all** questions.
3. All answers must be in spaces provided.
4. Section A and C carry **fifteen (15)** marks each and section B carries **seventy (70)** marks.
5. All writing must be in **blue** or **black** ink.
6. Communication devices and any unauthorised materials are **not** allowed in the examination room.
7. Write your **Assessment Number** at the top right corner of every page.

SECTION A

1. For each of the items (i)-(x) choose the correct answer among the given alternatives and write its letter in the box provided.

(i) Why is it important to study Physics in real-life situations?

A. It is useful for career development

B. It is used to clarify the existence of historical sites

C. It explains physical properties of matter

D. It is applied in the manufacturing and design of electronic devices

E. It helps in experimental discoveries

Answer: C, D, E, and A. Physics explains properties of matter, is applied in engineering and electronic design, helps in experimental discoveries, and is useful for career development.

(ii) Figure 1 is a warning symbol used in the laboratory. What does the symbol represent?

A. The substance is corrosive

B. The substance catches fire easily

C. The substance oxidizes the air and speeds up burning

D. The substance produces radiation

Answer: B.

(iii) Which one is a renewable energy whose source is heat from the Earth's interior?

A. Wind energy

B. Solar energy

C. Geothermal energy

D. Water energy

Answer: C, because geothermal energy comes from heat within the Earth.

(iv) Imagine two groups of equal number of people are pulling a rope by hand, each group trying to overcome the opponent's force. What kind of force does each group exert on the rope?

A. Tension force

B. Normal force

C. Frictional force

D. Stretching force

Answer: A, because the rope is under tension from opposing pulls.

(v) What does a clinical thermometer measure?

A. Ice point of a solid

B. Steam point of a liquid

C. Temperature of a human body

D. Room temperature

Answer: C, because a clinical thermometer is designed to measure body temperature.

(vi) Why is hot soup tastier than cold soup?

A. It has higher surface tension

B. It has lower surface tension

C. It has higher capillary action

D. It has lower capillary action

Answer: A, because heat can enhance the perception of taste and aroma, which relates to surface interactions.

(vii) Which set represents ferromagnetic materials?

A. Aluminium, cobalt, and nickel

B. Chromium, cobalt, and steel

C. Steel, nickel, and aluminium

D. Cobalt, nickel, and steel

Answer: D, because cobalt, nickel, and steel exhibit strong magnetic properties.

(viii) A student was given a plane mirror and observed that its reflecting surface was very smooth so the image of an object emitting light was very clear. Which type of reflection resulted from such observation?

A. Diffuse reflection

B. Reflection of light

C. Regular reflection

D. Selective absorption

Answer: C, because the smooth surface caused regular reflection forming a clear image.

(ix) After coming late to school, a student ran into the classroom and closed the door to hide from the teacher. What type of force did the student use to close the door?

A. Normal force

B. Turning force

C. Compressional force

D. Stretching force

Answer: B, because the student applied torque or turning force to rotate the door.

(x) If you want to detect the presence of electric charge in an object, which electrical device would you use?

A. Electrophorus

B. Galvanometer

C. Voltmeter

D. Electroscope

Answer: D, because an electroscope detects electric charges.

2. Match each of the physical quantities in List A with its corresponding unit in List B by writing the letter of the correct answer in the table provided.

List A:	**List B:**
(i) Temperature	A. Ampere
(ii) Electric current	B. Kilogram
(iii) Displacement	C. Kelvin
(iv) Momentum	D. Meter
(v) Mass	E. Meter per second squared
	F. Kilogram meter per second
	G. Mole

Answer:

List A	(i)	(ii)	(iii)	(iv)	(v)
List B	**C**	**A**	**D**	**F**	**B**

SECTION B

3. (a) Why can a tractor with wide tyres not get stuck in muddy places as compared to a car with narrow tyres?

   Wide tyres distribute the weight of the tractor over a larger surface area, reducing pressure on the ground and preventing it from sinking into mud.

(b) List three factors on which the pressure of liquids depends.

Pressure of a liquid depends on the

(i) density of the liquid

(ii) depth of the liquid

(ii) gravitational acceleration.

(c) Calculate the area of a surface of an object which exerts a pressure of 0.2 N/m² when the force acting on it is 2 N.

Area = Force / Pressure

= 2 ÷ 0.2 = **10 m²**

4. (a) When a body is totally immersed in a liquid, its weight becomes less than its weight in air. Why does the body's weight decrease in a liquid?

   The apparent loss of weight occurs because the body experiences an upward buoyant force equal to the weight of the displaced liquid.

(b) If the density of object X is 1.4 g/cm³, predict if it will float in water. Give a reason for your choice.

Object X will sink because its density is greater than water (1 g/cm³).

(c) The weight of a piece of aluminium in air is 42.0 N and 25.5 N when completely immersed in water. What is the relative density of aluminium?

Relative density = Weight in air ÷ (Weight in air − Weight in water)

= 42 ÷ (42 − 25.5) ≈ **2.47**

5. (a) State Newton's third law of motion.

   For every action, there is an equal and opposite reaction.

   (b) A monkey has a mass of 45 kg and climbs on a rope which can withstand a maximum tension of 550 N. If the monkey climbs with an acceleration of 5.5 m/s², find the force that will make the rope break.

   Force = Weight + ma = (45 × 9.8) + (45 × 5.5)

   = 441 + 247.5 ≈ 688.5 N;

   the rope will break because 688.5 N > 550 N.

6. (a) Write three equations of uniformly accelerated motion.

   Answer:

   $v = u + at$

   $s = ut + \frac{1}{2} at^2$

   $v^2 = u^2 + 2as$

   (b) A car starts from rest, accelerates uniformly at 4 m/s² for 12 s, then moves at constant speed for 30 s, and decelerates uniformly to rest in 5 s. Calculate:

   (i) Maximum speed reached: $v = u + at = 0 + (4 \times 12) = 48$ m/s

   (ii) Total distance covered: $s_1 = \frac{1}{2} at^2$

   $= 0.5 \times 4 \times 144 = 288$ m;

   $s_2 = v \times t$

   $= 48 \times 30 = 1440$ m

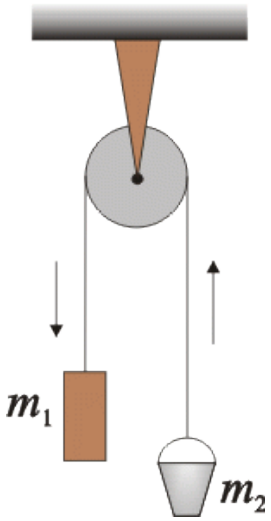
   $s_3 = \frac{1}{2} v \times t$

   $= 0.5 \times 48 \times 5 = 120$ m

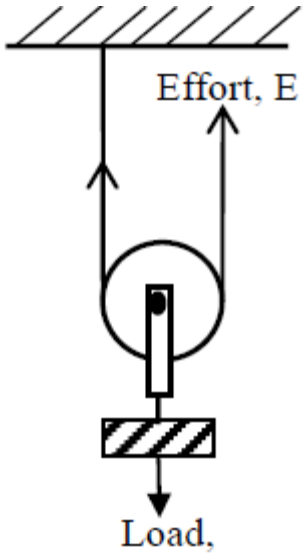
   Total = 288 + 1440 + 120 = **1848 m**

7. (a) With well-labelled diagrams, differentiate a fixed from a movable pulley. Give two differences.

   Fixed pulley changes direction of force but does not change magnitude;



   movable pulley reduces effort needed but moves with the load.



   (b) A pulley system has mechanical advantage of 4. An effort of 100 N is applied. If efficiency is 75%, determine the maximum load lifted.

   Answer: Load = MA × Effort × Efficiency = 4 × 100 × 0.75 = 300 N

i. (a) Outline five forms of energy.
Kinetic energy

a. potential energy
b. thermal energy
c. chemical energy
d. electrical energy

(b) An object of mass 200 kg is lifted to a height of 12 m in 10 s. Calculate the power of the crane.

Power = Work / Time = mgh / t

$= (200 \times 9.8 \times 12) \div 10 \approx 2352$ W

i. (a) State systematically six steps involved in measuring the volume of an irregular object using a Eureka can.
Fill Eureka can

a. note initial water level
b. immerse object fully
c. note new water level
d. subtract levels to get displaced volume
e. record result.

(b) What is the function of a micrometer screw gauge?

Answer: It measures small lengths or diameters with high precision.

(c) Draw a micrometer screw gauge and label its four parts.

Frame, anvil, spindle, thimble

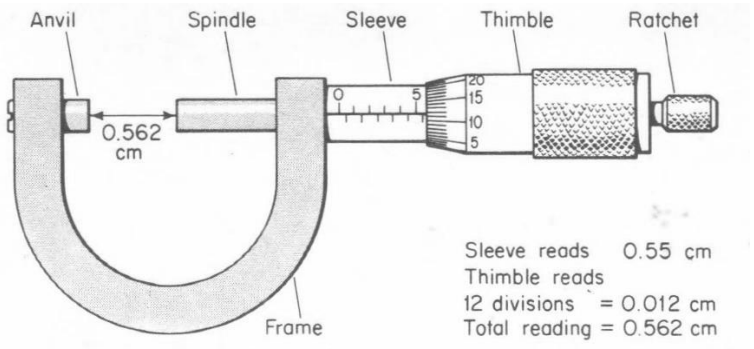


Fig. 1.6. Micrometer screw gauge

SECTION C

10.(a) State Ohm's law.

The current through a conductor is directly proportional to the voltage across it, provided the temperature remains constant.

(b) Outline the procedures of conducting an experiment to verify Ohm's law (at least five steps).

i. Connect circuit with variable resistorammeter, and voltmeter
ii. adjust voltage
iii. record current
iv. repeat for different voltages
v. plot V against I
vi. verify straight line passing through origin.

(c) Show that the total resistance of two resistors connected in parallel is given by $1/R = 1/R_1 + 1/R_2$, where R_1 and R_2 are individual resistances.

Using $I = I_1 + I_2$ and $V = IR$

$= V/R_1 + V/R_2$,

$1/R = 1/R_1 + 1/R_2$

(d) Consider the electric circuit in Figure 2.

(i) Find the equivalent resistance

Total resistance = $2 + ((4 \times 3)/(3 + 4)) = 3.71$ ohms.

(ii) Determine the current flowing in the circuit

Current = $V/R = 12/3.71 = 3.2$ A