

**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)

Time: 3 Hours

Friday, 08th November 2019 a.m.

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. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
4. Non-programmable calculators may be used.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. Where necessary the following constants may be used:
 - (i) Acceleration due to gravity, $g = 10 \text{ m/s}^2$.
 - (ii) Density of water = 1.0 g/cm^3 .
 - (iii) Pi, $\pi = 3.14$.
 - (iv) Coefficient of linear expansivity of the brick = $1.2 \times 10^{-5} \text{ K}^{-1}$
 - (v) Speed of light in air = $3 \times 10^8 \text{ m/s}$.
 - (vi) Speed of sound in air = 340 m/s .

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SECTION A (15 Marks)

Answer **all** questions in this section.

1. For each of the items (i) - (x), choose the correct answer among the given alternatives and write its letter beside the item number in the answer booklet provided.
- (i) Which pairs of instruments would you use to correctly measure the diameter of a small ball bearing?
- A Measuring tape and vernier caliper
B Slide rule and micrometer screw gauge
C Vernier caliper and slide rule
D Micrometer screw gauge and vernier caliper
E Metre rule and micrometer screw gauge
- (ii) A piece of cork of volume 100 cm^3 is floating on the surface of water. If the density of the cork is 0.25 g cm^{-3} , what volume of the cork is immersed in the water?
- A 100 cm^3 B 0.25 cm^3 C 25 cm^3
D 100.25 cm^3 E 0.025 cm^3
- (iii) A layer of colorless water floating on a blue copper (II) sulphate solution becomes blue after sometime. Which physical process supports the observation made?
- A Diffusion B Cohesive C Surface tension
D Adhesive E Osmosis
- (iv) A pin-hole camera 200 mm long produces an image of 2 mm diameter of the sun. If the sun's distance from the earth is about $1.5 \times 10^8 \text{ km}$, what is the diameter of the sun?
- A $1.5 \times 10^8 \text{ km}$ B $1.5 \times 10^6 \text{ km}$ C $3 \times 10^5 \text{ km}$
D $7.5 \times 10^4 \text{ km}$ E $3.0 \times 10^3 \text{ km}$
- (v) Which phenomena is a result of the earth being exactly along the same line between the centre of the sun and the moon?
- A Lunar eclipse B Penumbra C Solar eclipse
D Umbra E Reflection
- (vi) Which metals become strongly magnetized when subjected to a magnetic field?
- A Nickel and copper B Zinc and aluminium C Cobalt and iron
D Aluminium and lead E Iron and zinc
- (vii) A body moved upward a distance of 20 m. Calculate the time taken to reach the maximum height.
- A 2 s B 5 s C 10 s D 15 s E 11 s

SECTION B (60 Marks)

Answer **all** questions in this section.

3. (a) In a light experiment, a narrow beam of light directed onto a glass prism leaves the prism and falls on a white screen. Draw a labelled diagram to show the experimental set-up and observation seen on a screen. **(5 marks)**
- (b) Explain two ways in which lens cameras differ from the human eye. **(5 marks)**
4. (a) Why a bubble of air increases in volume as it rises from the bottom of a pond of water to the surface? Briefly explain. **(5 marks)**
- (b) A half meter rule AB is freely pivoted at 18 cm from end A and balances horizontally when a body of mass 35 g is hung 48 cm from end B. Calculate the mass of the rule. **(5 marks)**
5. (a) Figure 1 shows a simple machine B which has to be used to pull the packing case of 2000 N into the car by an effort of 500 N. Calculate the efficiency of machine B. **(5 marks)**

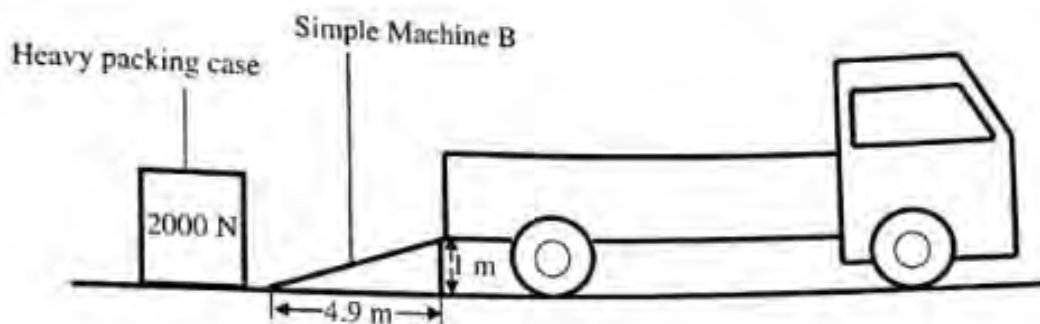


Figure 1

- (b) With the aid of a clearly labelled diagram, describe an experiment to investigate the relationship between the force acting on a body and the acceleration produced. **(5 marks)**
6. (a) A beaker containing ice is heated from -5°C to 0°C and then from 0°C to 15°C . With the aid of a diagram, explain the variation of density with temperature. **(5 marks)**
- (b) A brick at 20°C has a dimension of 30 cm, 18 cm and 10 cm for length, width and height respectively. If a brick is heated to a new temperature of 150°C , calculate the new dimensions. **(5 marks)**

7. (a) With the aid of a diagram, explain the function of a fuse in an electrical appliance. **(5 marks)**
- (b) A circuit in a house is protected by a 10 A fuse. The circuit is connected to the 240 V mains. The following appliances are connected to the circuit:

Appliance	Power rating
Bulb 1	100 W
Bulb 2	75 W
TV	300 W
Heater	1500 W

- Determine whether the fuse will blow on or off if all appliances are turned on. **(5 marks)**
8. (a) Why the inner core of the earth is solid while the outer core is liquid? Briefly explain. **(5 marks)**
- (b) The frequency obtained from a plucked string when the tension is 2 N is 400 Hz. Calculate the frequency when the tension is increased by 6 N. **(5 marks)**

SECTION C (25 Marks)

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

9. (a) Carefully study Figure 2 which shows a design for an electrical operation model for lifting metal objects. Briefly explain three things you can do so that a heavier iron metal block can be lifted. **(6 marks)**

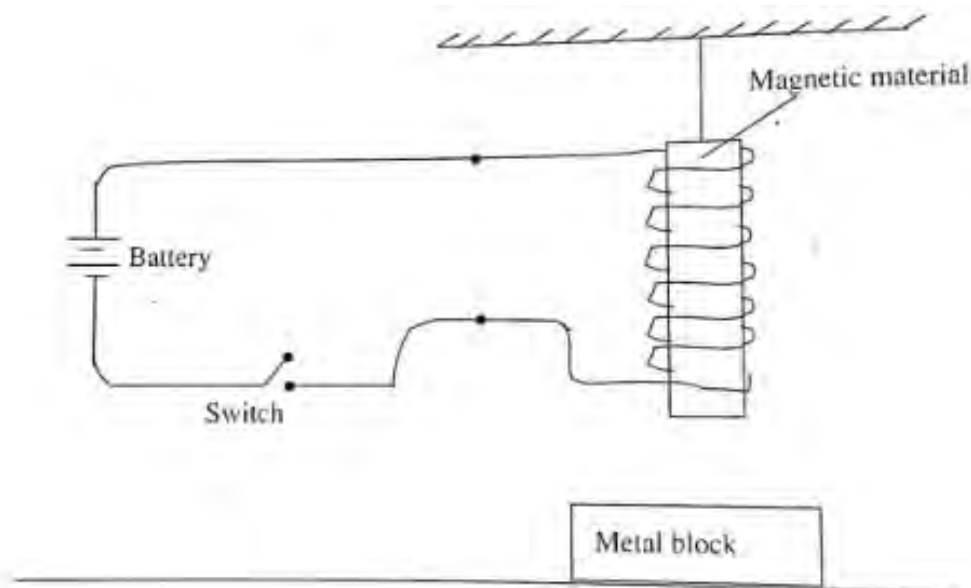


Figure 2

- (b) Why a musician must retune a stringed instrument if its temperature changes? **(2.5 marks)**
- (c) During a thunderstorm, the time between the flash of light and the thunder is 10 s. How far away is the thunderstorm? **(4 marks)**
10. (a) A sample of carbon isotope $^{14}_6\text{C}$ has a half-life of 5700 years. What fraction of $^{14}_6\text{C}$ will remain after 11400 years? **(6 marks)**
- (b) Describe the construction and mode of action of the PN junction semiconductor. **(6.5 marks)**
11. (a) Electrical energy is distributed in all parts of Tanzania by the National grid system which transmits alternating current at a very high voltage. Explain why is it necessary to have a very high voltage? **(5.5 marks)**
- (b) A generator producing a varying current from 0 to 10 A was allowed to flow in a coil of magnetic field. After a time interval the current was observed to be 4 A. Describe how back e.m.f. Was induced in a self-induction. **(7 marks)**