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, $g = 10\ m/s^2$.
   (ii) Density of water = $1.0\ g/cm^3$.
   (iii) Pi, $\pi = 3.14$.
   (iv) Coefficient of linear expansivity of the brick = $1.2x10^{-5}\ K^{-1}$
   (v) Speed of light in air = 3×10^8 m/s.
   (vi) Speed of sound in air = 340 m/s.

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 $1.5x10^8$ km, what is the diameter of the sun?

A $1.5x10^8$ km B $1.5x10^6$ km C $3x10^5$ km
D $7.5x10^4$ km E $3.0x10^3$ 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

(viii) The temperature of a certain liquid is measured to be 300K. What will be its temperature in degrees centigrade?

A 273°C B 100°C C 57°C
D 37°C E 27°C

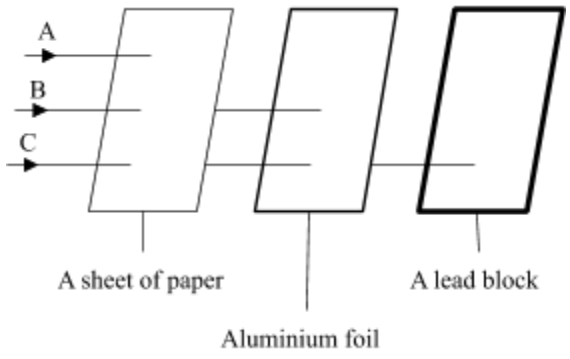
(ix) Which factors influence friction between tyres of a car moving with constant speed and surface of the road?

A Weight and speed
B Speed and nature of the surface
C Nature of the surface and weight
D Surface area of the tires and speed
E Acceleration and nature of the surface

(x) When the sun shines on the dark-coloured driving wheel of a car, the wheel feels warm. Why?

A It is because the sun warms the car by induction.
B It is because the sun gives energy to the wheel by convection.
C It is because the sun radiates thermal energy to the wheel.
D It is because the sun conducts thermal energy to the wheel.
E It is because the sun conducts thermal energy to the wheel.

2. Match the properties of radiations in **List A** with the corresponding radiations in **List B** by writing the letter of the correct response beside the item number in the answer booklet provided. The responses might be used more than once.

List A	List B
(i) Has weak-moderate ionising power. (ii) Is deflected towards south pole of the magnet. (iii) Has high penetrating power but stopped by lead sheet. (iv) Has the least penetrating power but stopped by a sheet of paper. (v) Has a speed up to 10% times the speed of light in vacuum.	

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)**

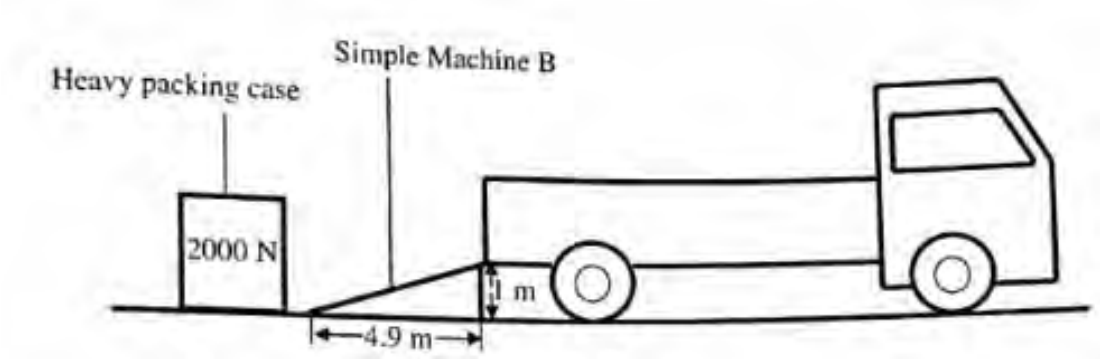


Figure 1

   (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)**

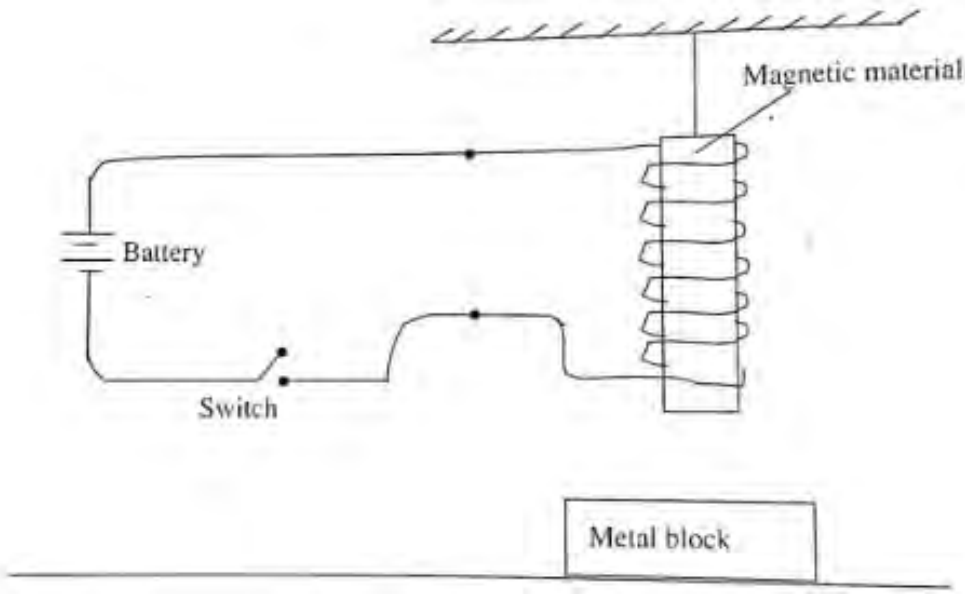


Figure 2

(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 ${}^{14}_{6}C$ has a half-life of 5700 years. What fraction of ${}^{14}_{6}C$ 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)**