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 **Year: 2020**

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 **fifteen (15)** marks, section B **sixty (60)** marks and section C carries **twenty five (25)** marks.

4. Cellular phones and any unauthorized materials are **not** allowed in the examination room.

5. Non-Programmable calculators 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 = 10 m/s^2.
   (ii) Density of water = 1.0 g/cm^3.
   (iii) Pi, $\pi = 3.14$.
   (iv) Speed of light waves = 3.0×10^8 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. **(10 marks)**

(i) Which pairs of instruments is used for measuring lengths?

A A ruler and a measuring cylinder
B A micrometer screw gauge and a beam balance
C A vernier caliper and a micrometer screw gauge
D A pipette and a vernier caliper
E A beam balance and a spring balance

(ii) What are the two factors that determine Buoyancy?

A Volume of fluid displaced and mass of the object.
B Weight and mass of the object.
C Density of the fluid and weight of the object.
D Volume of the fluid displaced and density of the fluid.
E Mass of the object and density of the object.

(iii) Which physical phenomenon is observed when a tea bag is dipped into a cup of hot water?

A Steaming B Diffusion C Osmosis
D Evaporation E Boiling

(iv) In a light experiment, the results showed that less light was transmitted and the image was distorted. Which type of material was used?

A A translucent material B An opaque material
C A luminous material D A transparent material
E A non-luminous material

(v) A stone dropped from the top of a building hit the ground 4 seconds later. What was its velocity when hitting the ground?

A 400 m/s B 45 m/s C 40 m/s
D 4.5 m/s E 0.4 m/s

(vi) Why is Mercury preferred in clinical thermometers as a thermometric of a liquid to water and alcohol?

A It is denser than other liquids.
B It is opaque and does not need colouring.
C It is more sensitive to temperature.
D It is active and does not wet the glass.
E It is a poor conductor of heat.

(vii) A rectangular box of mass 10 kg rests on an inclined plane. If the coefficients of static and dynamic frictions are 0.55 and 0.25 respectively, at what angle will the box begin to slide?
A 14.8° B 24.8° C 28.8° D 38.8° E 48.8°

(viii) Heat would be lost in the thermos flask if the walls of the glass container were not coated with silver. Which process contributes to the heat loss?
A Radiation B Conduction C Convection
D Absorption E Transmission

(ix) A launderer was thinking about a proper day for washing and drying clothes. Which day would he prefer most among the following?
A Dry day B Hot day C Windy day
D Still day E Cold day

(x) Which process is involved in producing reverberation?
A Refraction B Multiple reflection C Interference
D Diffraction E Reflection

2. Match the functions of the features of cathode ray tube in **List A** with the corresponding features in **List B** by writing the letter of the correct response beside the item number in the answer booklet provided.

List A	**List B**
(i) It produces fast moving electrons when heated at high temperature.	A Perrin tube
(ii) Traces the direction of cathode rays in a cathode ray tube.	B X-plate
(iii) Deflects the electron beam vertically.	C Anode
(iv) Deflects the electron beam horizontally.	D Cathode
(v) Accelerates the ejected electrons to the screen	E Y-plate
	F Maltese cross tube
	G Vacuum

(5 marks)

SECTION B (60 Marks)

Answer **all** questions in this section.

3. (a) Three plane mirrors are arranged along three sides of a square. A ray of light is incident on the left side mirror at its midpoint with an angle of incidence of 40° so that the ray is afterwards reflected by other mirrors. Draw the appropriate path of the ray and calculate the angle through which the ray is turned at each of the three reflections. **(6 marks)**

   (b) Explain two functions of the shutter in a camera. **(4 marks)**

4. (a) Use a well labelled diagram to explain the working principle of a hydraulic braking system. **(6 marks)**

   (b) A uniform pencil AB weighing 40 g can be balanced horizontally on a knife edge at 2 cm from the end A when a mass 60 g is hung from this end. What is the length of a pencil? **(4 marks)**

5. (a) Why the recoil velocity of a gun is much less than the velocity of the bullet? Explain by using the principle of conservation of linear momentum. **(5 marks)**

   (b) A hydraulic press consists of a pump, load and two cylinders in which the larger cylinder is eight times the diameter of a smaller one. Use a well labelled cross-sectional diagram of a hydraulic press to determine the value of mechanical advantage of this machine if it is working with efficiency of 90%. **(5 marks)**

6. (a) Carefully study Figure 1. Explain what will happen to the bulbs P and Q in relation to the water levels X and Y when the heater is turned on. **(5 marks)**

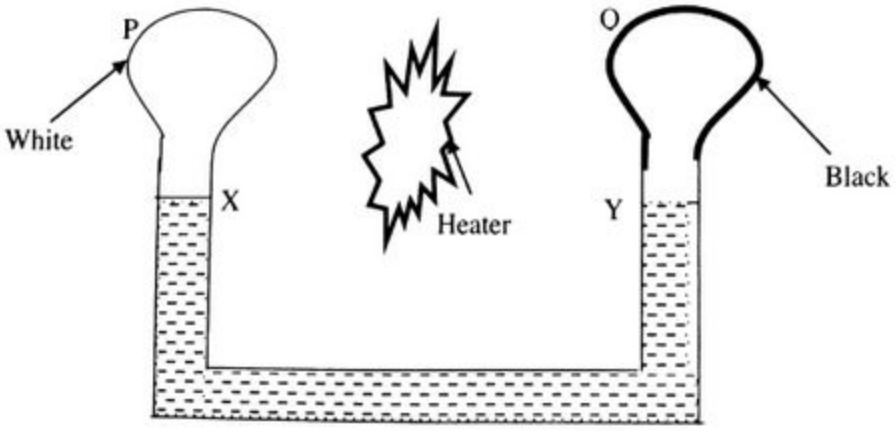

Figure 1

(b) How would the dimensions of a newly constructed Tanzania standard gauge rail line change during the summer and winter days? **(5 marks)**

7. (a) In Figure 2, the labels A, B, C and D are identical electric bulbs connected in a circuit. Explain what will happen to the bulbs A, B and D when bulb C blows off and the key K is closed. **(4 marks)**

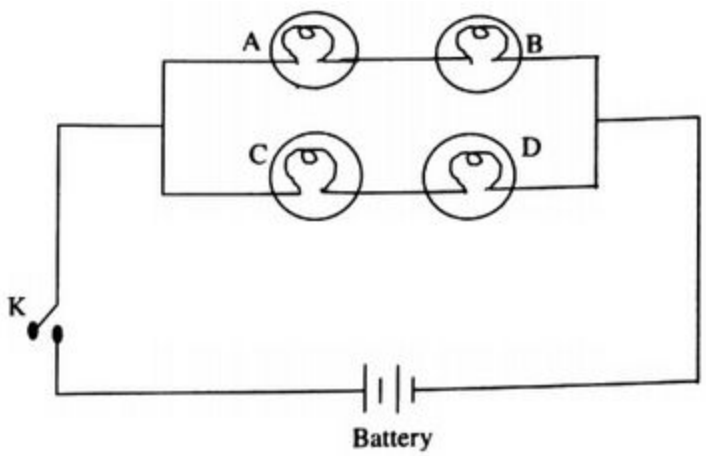

Figure 2

(b) Rutherford proton-neutron model shows that there are no electrons in the nucleus of an atom. How is it possible for a radioactive element to emit beta particles (electrons) from its nucleus? **(6 marks)**

8. (a) Figure 3 shows the profile of a radio wave. Study it carefully and determine its wavelength. **(4 marks)**

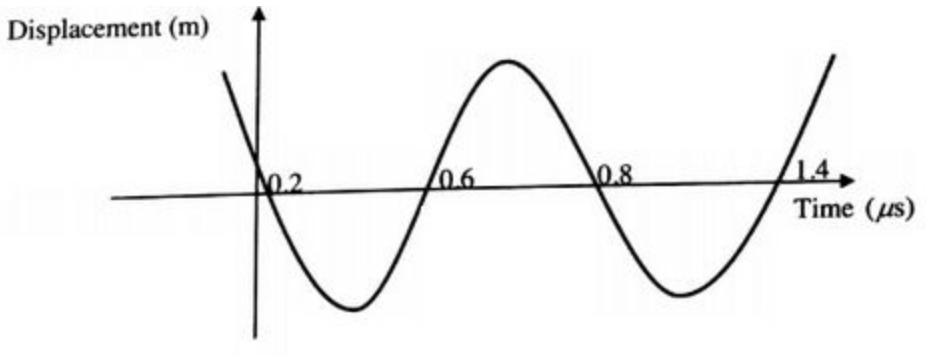

Figure 3

(b) Explain how an earthquake occurs. **(6 marks)**

SECTION C (25 Marks)

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

9. (a) A piano wire and turning fork are devices which produces sound. Show clearly three ways in which a piano wire can be tuned to emit a note of the same frequency as a vibrating turning fork. **(6 marks)**

   (b) You are provided with a moving coil galvanometer of a coil resistance 20Ω and can carry a maximum current of 15 mA. How will you design this galvanometer to register 10 mA full scale deflection? **(6.5 marks)**

10. (a) Distinguish the concepts of conductors, semiconductors and insulators in terms of their energy bands. **(6 marks)**

    (b) Figure 4 shows an electric circuit. Carefully study it and calculate the value of current x and r. **(4 marks)**

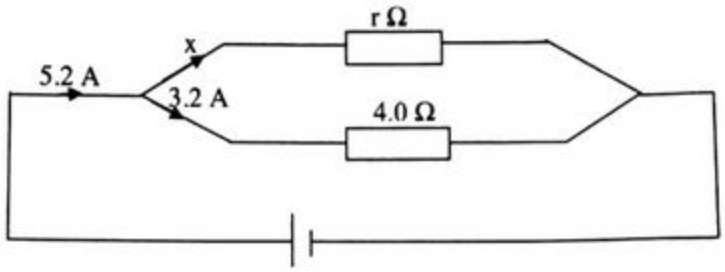

Figure 4

   (c) From part (b), determine the effective resistance. **(2.5 marks)**

11. (a) Describe the mechanism of doping intrinsic semiconductor to obtain p-type semiconductor. **(6 marks)**

    (b) Why most of the transistors in use are n-p-n transistors? **(2.5 marks)**

    (c) Form One students were shouting in their classroom. Briefly explain how other students in the next room can hear them shouting. **(4 marks)**