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

031/1 **PHYSICS 1**
(For Both School and Private Candidates)

Time:3 Hours **Monday, 10th November 2014 a.m.**

Instructions

1. This paper consists of sections A, B, and C.
2. Answer **all** questions in sections A and B and **one** (**1**) question from section C.
3. Calculators and cellular phones are not allowed in the examination room.
4. Write your **Examination Number** on every page of your answer booklet(s).
5. Where necessary the following constants may be used:

   (i) Acceleration due to gravity, $g = 10\ m/s^2$ or 10 N/kg
   (ii) Electronic charge, $e = -1.602 \times 10^{-19}$ C
   (iii) Refractive index of water = 4/3
   (iv) Pi, $\pi = 3.14$

SECTION A (30 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) What physical phenomenon is observed when a tea bag is dipped into a cup containing hot water?
   A Surface tension
   B Capillary then diffusion
   C Diffusion
   D Osmosis then diffusion
   E Osmosis only.

   (ii) When a gas is compressed at constant temperature, the gas molecules
   A move faster than air outside and the pressure is increased
   B move with uniform speed and the pressure is unchanged
   C gain more kinetic energy and the pressure is decreased
   D increase slightly in size and its pressure remains constant
   E make more impacts per second on the walls of the container.

   (iii) A car moving at steady speed has a frictional force on its surface whose size depends on its
   A speed and surface area
   B speed
   C surface area
   D weight
   E wheels speed.

   (iv) When illuminated by a certain lamp, the shadow of a table-tennis ball on a white screen is uniformly dark. This is because the lamp used is
   A very bright
   B fluorescent
   C very small
   D very weak
   E very large.

   (v) In a black and white television, the image is formed on the screen by
   A varying the intensity or brightness of the electron beam
   B adjusting the number of stations using a remote control
   C limiting the flow of electrons between the cathode and anode
   D increasing the grid's voltage to its maximum value
   E adjusting the antenna to capture waves of short wavelength.

(vi) A green card with red flowers when viewed in a red light will appear
A completely red
B completely yellow
C completely green
D yellow with red flowers
E green with red flowers.

(vii) Figure 1 shows a pattern of waves in a ripple tank traveling from part X to part Y across a plane section Z.

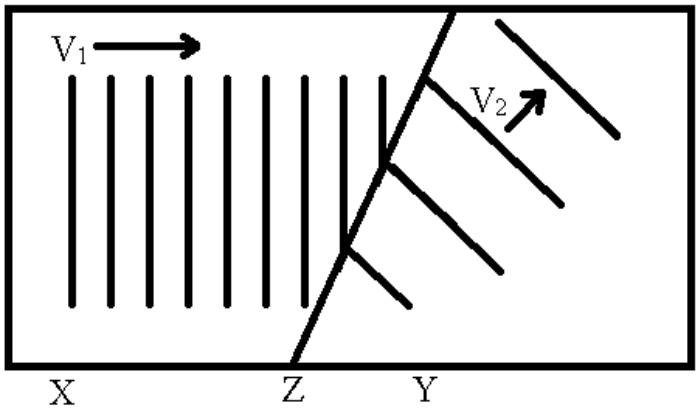

Figure 1

What observation can be made from Figure 1?
A the total reflection occurs at Z
B the wavelength in part X is greater than that in part Y
C the wave speed v_1 in part X is less than v_2 in part Y
D diffraction occurs across Z
E The wave changes in frequency as it crosses Z.

(viii) A solid metal cube has each side doubled to make a solid cube of the same metal eight times bigger in volume. The ration of *resistivity of the new cube to resistivity of the old cube* is
A 8:1
B 6:1
C 1:1
D 1:6
E 1:8

(ix) In a cloud chamber, straight-line trails of vapour are produced by a source emitting
A beta-particles
B gamma-rays
C electrons
D alpha-particles
E light rays.

(x) Which of the following is the correct weight of a body of mass 48 g when placed on the moon surface?

A 0.48 N
B 4.8 N
C 0.80 N
D 0.048 N
E 80.0 N.

2. Match the times in **List A** with reponses 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) Mass of water vapour which is actually present in a unit volume of air at constant temperature	A. Hygrometry
(ii) Rate at which a material transfers heat energy	B. Bimetallic thermometer
(iii) Measurement of the amount of moisture present in the atmosphere.	C. Latent heat
(iv) Mass of water vapour present in a unit volume of air.	D. Liquid-in-glass thermometer
(v) Difference between readings of the two thermometers.	E. Relative humidity
(vi) A measure of the extent to which the atmosphere contains water vapour.	F. Leslies cube apparatus
(vii) It can be found by the method of mixture or electrical heating.	G. Specific heat capacity
(viii) Amount of heat energy required to change the state of a substance.	H. Wet bulb depression
(ix) Measures temperature of inaccessible structures.	I. Humidity
(x) Depends on the electrical properties of materials varying with temperature.	J. Thermal conductivity
	K. Latent heat of fusion
	L. Thermistor thermometer
	M. Absolute humidity
	N. Bi-metallic strip
	O. Thermal expansivity
	P. Absolute temperature

3. For each of the items (i)-(x), fill in the blank spaces by writing the correct answer in the answer booklet provided.

(i) The presence of electric charge in a body can be detected by means of _____ _____.
(ii) The automatic flushing tank uses the working principle of _____.
(iii) The simple a.c. generator works on the converse principle of _____.
(iv) The element that is heaviest of all natural elements is called _____.
(v) The defects of an image formed by a single lens is called _____.
(vi) Most stars in the universe which are visible in the night sky are within our own _____.
(vii) A part of the Earth's mantle and crust containing liquids, crystals and dissolved gases is known as _____.
(viii) A p-type semiconductor is formed when silicon is replaced by _____.
(ix) The electric current can pass through an electric component due to the existence of _____.
(x) The physical state of a substance normally depends on _____.

SECTION B (60 Marks)

Answer **all** questions in this section.

4. (a) Give two practical examples where impulse and momentum play an important role.

   (b) (i) Distinguish between elastic collisions and inelastic collisions.

   (ii) A box of mass 50 kg is raised vertically with a uniform acceleration 'a' when a force of 700 N is acting in a rope. Calculate the uniform acceleration 'a'.

   (c) (i) State Newton's second law of motion.

   (ii) Sand falls gently at a constant rate of 50 g/s onto a horizontal belt moving steadily at 40 cm/s. Find the force in newtons exerted by the sand on the belt. State any assumptions made in your calculation.

5. (a) What is meant by the following terms?
   (i) Resonance
   (ii) Overtones.

   (b) Briefly give reasons for the following:
   (i) the fundamental frequency may alter during the day.
   (ii) notes of the same pitch played on a violin and a flute sound different.

   (c) The frequency obtained from a plucked string is 400 Hz when the tension is 2 N. Calculate:
   (i) the frequency when the tension is increased to 8 N.
   (ii) the tension needed to produce a note of frequency of 600 Hz.

6. (a) State the parallelogram law of forces.

   (b) (i) Distinguish between absolute velocity and relative velocity.

   (ii) Wind is blowing 30° west of north at 20 km/hour. A bird is flying in the wind and its velocity relative to the ground is 90 km/hour at 75° west of north. Calculate the velocity and direction of the bird.

   (c) (i) Define the coefficient of dynamic friction.

   (ii) A body of mass 40 kg is placed in a straight track sloping at an angle of 45° to the horizontal. If the body is held from slipping by friction, calculate the normal reaction and the force of friction.

7. (a) (i) What is meant by refraction of light?

   (ii) Mention three points to be considered when drawing a ray diagram to show the formation of images on a concave mirror.

(b) (i) Briefly explain why part of the road ahead of a person apparently looks as if it has a pool of water on a sunny day?

(ii) A pin is at the bottom of a vessel 16 cm deep. When the vessel is filled with water the pin appears to rise when viewed form above. Find the height to which the pin appears to rise.

(c) Paraffin has a greater refractive index than water. What can you say about the

(i) relative velocity of light in paraffin and in water?

(ii) path of a ray of light when passing from water into a layer of paraffin?

8. (a) (i) What is meant by radioactive decay?

(ii) Give two effects of beta (β) particle on the nucleus of an atom.

(b) (i) Define the term isotope of an element.

(c) (i) How would you test whether a car battery needs recharging? (Give three points).

(ii) Two resistors each of 5 Ω Are connected in parallel across the same battery of e.m.f. 5 V and negligible internal resistance. If the battery is fully charged and then discharged within 20 hours, calculate the storage capacity of the battery.

9. (a) What is meant by the following terms?

(i) Volcanoes

(ii) Non-renewable sources of energy.

(b) (i) Mention two merits and two demerits of volcanoes.

(ii) Briefly explain two hazards associated with earchquakes.

(c) (i) List down two disadvantages of non-sustainable energy sources.

(ii) State two applications of energy generated from water.

SECTION C (10 Marks)

Answer **one (1)** question from this section.

10 (a) (i) What is meant by saturation current?
(ii) Give one peculiar property of a diode as a rectifier.

(b) Briefly explain the function of each of the following apparatus:
(i) Geiger-Muller (G-M) tube.
(ii) Diffusion cloud chamber.

(c) Figure 2 shows a section of a cathode-ray oscilloscope.

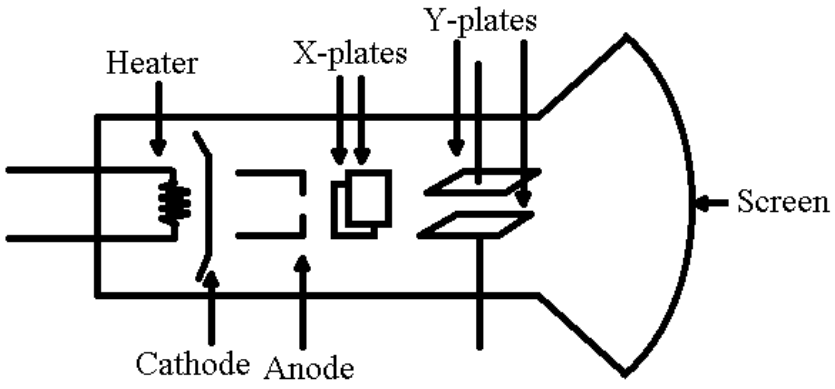

Figure 2

What changes should be done in order to produce the following on the screen:
(i) a brighter trace
(ii) a vertical line
(iii) a wave pattern
(iv) a horizontal line.

11. (a) (i) Use the kinetic theory to explain why solids expand when heated.
(ii) Mention two experiments which can be done in the laboratory to verify thermal expansion of solids.

(b) Explain how each of the following works:
(i) a bimetallic thermostat.
(ii) a bimetallic thermometer.

(c) (i) What is an induction coil?
(ii) Describe the structure of an induction coil and briefly explain its mode of action.