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

031/1 **PHYSICS 1**
(For School Candidates Only)

TIME: 3 Hours *Thursday, 15th October 2009 a.m.*

Instructions

1. This paper consists of sections A, B and C.
2. Answer all questions in sections A and B and **two** (2) questions from section C.
3. Section A carries 20 marks, section B carries 60 marks and section C carries 20 marks.
4. Electronic calculator and cellular phones are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. Whenever necessary use the following constants:
   - Acceleration due to gravity, $g = 9.8\ ms^{-2}$.

This paper consists of 8 printed pages.

SECTION A (20 Marks)

Answer **all** questions in this section.

1. For each of the items (i) – (x) choose the correct answer from among the given alternatives and write its letter beside the item number.

(i) Relative humidity is defined as
- A the percentage saturated vapour pressure of water at a dew point
- B the percentage of the volume of the water in air required to saturate it at the same temperature
- C the percentage of moisture in air
- D the percentage of the mass of water vapour actually present in a unit volume of air required to saturate it at the same temperature
- E the percentage of the volume of water in air at S.T.P.

(ii) A rod is brought close to the cap of a charged electroscope causing the leaves of the electroscope to collapse. This indicates that
- A the rod and the electroscope must be oppositely charged
- B the rod and the electroscope must have the same charge
- C the rod must be uncharged
- D the rod may have an opposite charge to the charge on the electroscope or may be uncharged
- E the rod must be charged.

(iii) A pin-hole camera gives a sharp image
- A because the image is small
- B if the hole is small
- C if the hole is extremely small
- D because the object is a long way from the hole
- E because the screen is in a short distance from the hole.

(iv) When a metal X is copper plated in electrolysis
- A X is the cathode and alternating current is used
- B X is the anode and direct current is used
- C X is the cathode and direct current is used
- D X is the cathode and very high current is used
- E X is the anode and should first be cleaned.

(vi) What happens when a liquid changes into a gaseous state?

A some surface molecules absorb latent heat of vaporization and escape
B it gives its own latent heat that can be used to heat up the surrounding
C the potential and kinetic energies of the molecules increase
D the molecules attractive forces to one another increase and their average kinetic energy decreases
E there is no adhesive force between molecules.

(vii) The electromotive force of a dry cell is derived from chemical reaction of

A ammonium chloride jelly
B the powdered carbon
C carbon rod and zinc can
D manganese dioxide powder
E the brass cap.

(viii) What do you find when conducting an experiment of expansion of solids, liquids and gases at the same temperature change?

A solids and gases expand at the same rate
B solids expand more than liquids and gases
C liquids expand more than gases and solids
D gases expand more than solids and liquids
E all expand at the same rate.

(viii) Ocean tides are caused by

A rotation of the earth about the sun
B rotation of the moon about the earth
C gravitational force of the earth on the moon
D rotation of the earth about its axis
E gravitational force of the moon on sea water.

(ix) In electromagnetic induction

A induced e.m.f is produced wherever a conductor carrying an electric current has its magnetic flux changed
B speed of motion determines direction of the induced current
C Lenz's law gives direction of induced e.m.f
D induced e.m.f opposes its production methods
E Faraday's law gives direction of induced e.m.f.

(x) The nuclear reaction

$$^{235}_{92}U + x \longrightarrow {}^{144}_{56}Ba + {}^{90}_{36}Kr + y$$

is the one which can be used in power generation. In this case the values of x and y are

A	α	and	4n
B	n	and	2n
C	γ	and	n
D	β	and	n
E	e	and	n

2. Match the items in **List A** with the responses in **List B** by writing the letter of the correct response beside the item number.

List A	List B
(i) Surface tension effect	A A Resistor connected to the output circuit
(ii) Maximum displacement of pendulum bob	B Floating object displaces its own weight
(iii) Cooling by evaporation	C Frequency of oscillation
(iv) Thermopile	D Refractive index
(v) Impulse	E Bar magnet
(vi) Tesla	F SI unit of magnetic flux
(vii) Ferromagnetism	G Amplitude
(viii) Geiger-Muller counter	H A property of solid materials that are strongly affected by magnetism
(ix) Snell's law	I Solid – state detector
(x) Voltage amplification	J Detects radiant energy
	K Product of force and time
	L Radioactive element
	M Capacitor connected parallel to the resistor in the emitter
	N Detects radioactive radiations
	O SI unit of magnetic flux density
	P Floating without wetting
	Q Dogs hand out their tongues during hot weather
	R Materials that are attracted by a strong magnetic field
	S Depends on the boiling temperature
	T Force of attraction between liquid molecules

SECTION B (60 Marks)

Answer all questions in this section.

3. (a) Define the terms:
   (i) Force
   (ii) Pressure

(2 marks)

(b) (i) Briefly explain, when does a force become weight? (1 mark)
   (ii) A car of mass 1200kg is brought to rest by a uniform force of 2000N, in 30 sec. What was the speed of the car? (2 marks)

(c) A rectangular log of wood of density 200kg/m³ has dimensions: 0.3 m x 0.5m x 0.6m.
   (i) Calculate the maximum pressure it can exert on the ground. How is it experienced? (2.5 marks)

   (ii) Calculate the minimum pressure it can exert on the ground. How can this be observed? (2.5 marks)

4. (a) Explain the following:
   (i) Most materials become less dense as their temperature is increased (1.5 marks)

   (ii) Latent heat of fusion and latent heat of vaporization are 'hidden'. (1.5 marks)

(b) (i) Mention three differences between temperature and quantity of heat. (3 marks)

   (ii) What is the use of a clinical thermometer? (1 mark)

(c) In a mercury centigrade thermometer the distance between 0°C point and 25°C point is 4 cm. What is the distance between its 0°C point and 100°C point? (3 marks)

5. (a) (i) Distinguish between spectrum and dispersion of light. (2 marks)
   (ii) Draw a diagram to show an angle of deviation when a ray of light passes through an equilateral glass prism. (2 marks)

(b) (i) How does the additive theory of light differ from the subtractive theory of light?
   (ii) What are primary colours and complementary colours in the subtractive theory of light? (2 marks)

(c) A converging lens produces an upright image four times the object height. If the focal length is 15cm, find the object distance. (3 marks)

6 (a) (i) Mention two (2) methods of making a semiconductor more conducting. (2 marks)

(ii) What are the charge carriers in P – type doped semiconductors? (1 mark)

(b) One end of an N-type doped semiconductor is heated.

(i) State what is expected to develop between the heated and the cooled ends. (1 marks)

(ii) Identify the negative end of the two ends. (1 mark)

(c) (i) Explain the property of a semi conducting diode that makes it ideal in the rectification of an alternative current. (2 marks)

(ii) Sketch a graph of voltage against time for half-wave rectification of an alternating current. (3 marks)

7 (a) (i) What is meant by a transformer? (1 mark)

(ii) Why does a transformer work with alternating current (a.c) only? (2 marks)

(b) State two (2) ways in which power is lost in a transformer. (2 marks)

(c) A 240 V main transformer has 1000 turns in primary and N turns in the secondary. It is used to supply energy to a 12 V, 24 W lamp.

(i) How many turns are there in the secondary? (2 marks)

(ii) What is the efficiency of the transformer if the current drawn from 240V supply is 125 mA? (3 marks)

8 (a) Define the terms

(i) Radioactivity (1 mark)

(ii) Mass number (1 mark)

(b) Study Figure 1 below, then answer the questions that follow:

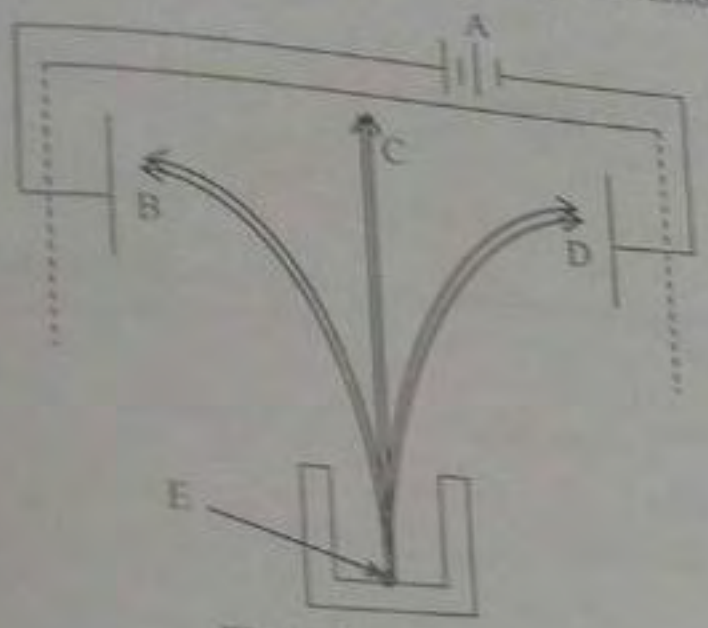


Figure 1

(i) What does each of the letters represent? **(2.5 marks)**

(ii) Suggest a chemical element for symbol E. **(1 mark)**

(iii) Write the basic differences between the rays represented by symbols B and D. **(1.5 marks)**

(c) A radioactive element nucleus M decays into an element N by β - emission according to the following equation:

$$^{238}_{92}M \rightarrow {}^{x}_{y}N + \beta$$

(i) Write the values for x and y. **(1 mark)**

(ii) What is the number of proton in N? **(1 mark)**

(iii) What are the mass numbers of elements M and N? **(1 mark)**

SECTION C (20 Marks)

Answer two (2) questions from this section.

9. (a) State the law of flotation. (1 mark)

(b) A piece of cork with volume $100cm^3$ is floating on water. If the density of cork is $0.25g/cm^3$.

(i) Calculate the volume of cork immersed in the water.

(ii) What force is needed to immerse the cork completely? (Assume mass of 1g has weight of 0.01N) (4 marks)

(c) Ice has a density about $0.9\ g/cm^3$. What fraction of the volume of an iceberg is submerged in water? (2 marks)

10. (a) (i) Define the term energy. (1 mark)

(ii) A ball of mass 0.2 kg is dropped from a height of 20m. On impact with the ground it looses 30J of energy. Calculate the height it reaches on the rebound. (2 marks)

11. (a) (i) What is a transistor? (1 mark)

(ii) How can the transistors be connected to form an amplifier circuit? (3 marks)

(b) Draw a fully stabilised common emitter amplifier circuit and explain the function of the components used. (3 marks)

(c) Draw the graphs for the common emitter transistor characteristics. (3 marks)

12. (a) (i) Define thermionic emission. (1 mark)

(ii) What are the x-rays" (1 mark)

(iii) Mention two uses of x- rays. (1 mark)

(b) With the aid of diagram explain how x- rays are produced. (4 marks)

(c) Draw a well labelled diagram of a cathode ray oscilloscope. (3 marks)