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 **Tuesday, 07th November 2017 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 **one** (**1**) question from section C.
3. Calculators, cellular phones and any unauthorized materials 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
   (ii) Density of water = 1.0 g/cm^3
   (iii) Specific latent heat of fusion of ice = 336J/g
   (iv) Linear expansivity of steel, $\propto$ = 0.000011/K
   (v) Linear magnification = 5
   (vi) Pi, π = 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 besides the item number in the answer booklet provided.

(i) A gas of volume 900 cm^3 at 27°C when warmed at constant pressure to 87°C will occupy a new volume of

A 900 cm^3 B 720 cm^3 C 1080 cm^3
D 540 cm^3 E 727 cm^3.

(ii) Which of the following scientific statements needs to be proved through scientific research?

A Hypothesis B Principle C Conclusion
D Proposal E Measurement.

(iii) What will be the acceleration of the car while its speed was increasing as shown in Figure 1?

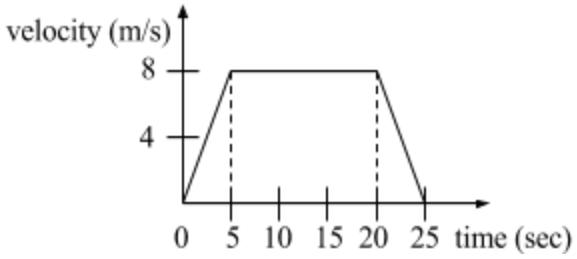

Figure 1

A 0.8 m/s^2 B 0.4 m/s^2 C 2.5 m/s^2
D 1.25 m/s^2 E 3.125 m/s^2.

(iv) Which of the following electromagnetic waves have largest wavelength?

A Ultraviolet B Infrared C Gamma rays
D Radio waves E X-rays

(v) The device which operates under the principle of total internal reflection of light is called

A magnifying lens. B plan mirror C telescope.
D optical fibre. E pin-hole camera.

(vi) If 120 volts are used to light a 30-watt light bulb, what will be the current flowing through that bulb?

A 40 A B 30 A C 0.25 A
D 4 A E 0.30 A

(vii) When a lead-acid accumulator is freshly made it has an electromotive force (e.m.f) of

A 1.5 V B 1.25 V C 2 V
D 3 V E 1 V

(viii) Which among the following radiations can be absorbed by a metal plate?

A Alpha (α) particle. B Gamma (γ) rays. C Beta (β) particle.
D X-rays. E Cathode rays.

(ix) Where do asteroids found in the solar system?

A Between Mercury and Venus. B Between Earth and Mars.
C Between Mars and Jupiter. D Between Saturn and Uranus.
E Between Neptune and Pluto.

(x) What fraction of the atoms would have been disintegrated in 72 hours when the half-life of an element is 24 hours?

A $\frac{1}{8}$ B $\frac{1}{2}$ C $\frac{3}{4}$ D $\frac{7}{8}$ E $\frac{1}{4}$

2. Match the items in **List A** with responses 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) Ability of liquids to rise or fall in a narrow tube. (ii) Tendency of an object to fall or drop to lower level in a fluid. (iii) Capacity of an object to float in a fluid. (iv) Attraction force between molecules of the same substance. (v) Movement of particles from high concentration to low concentration. (vi) Tendency of matter to be in a state of random motion. (vii) Movement of particles from low to high concentration. (viii) Force which resists a fluid to flow. (ix) Attraction force between molecules of different substances. (x) Ability of the surface of a liquid to behave like a fully stretched elastic skin.	A. Osmosis B. Surface tension C. Matter D. Buoyancy E. Cohesive F. Diffusion G. Plasticity H. Brownian motion I. Capillarity J. Viscosity K. Adhesive L. Elasticity M. Sinking

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 velocity of the body as noted by a non-stationary observer is called _____.

(ii) Which method of heat transfer does not involve the actual movement of particles from their mena position? _____.

(iii) What name is given to the angle of incidence when the angle of reflection is 90°? _____.

(iv) A temperature at which solids change to liquids at constant temperature is referred to as _____.

(v) Colours which when mixed in a definite ratio yield white colour are known as _____.

(vi) Which type of a resistor is used to convert moving coil galvanometer into voltmeter? _____.

(vii) Cathode ray tube is used in the production of _____.

(viii) A group of stars that forms a definite shape or pattern when viewed from the earth is called _____.

(ix) Which rule summarizes the relation of force, current and the field being mutually perpendicular to each other? _____.

(x) Which region in electromagnetic spectrum has lowest frequency? _____.

SECTION B (60 Marks)

Answer **all** questions in this section.

4. (a) Mention four applications of thermal expansion of solids.

   (b) Briefly explain why holes are left below the chimneys of kerosene lamp or kitchen.

   (c) A steel tyre of diameter 150 cm at 10°C is to be fitted on to a train wheel of diameter 151 cm. What temperature must the tyre be heated to just fit the wheel?

5. (a) (i) Why convex mirrors are used as driving mirrors? Give two reasons.
   (ii) Calculate the critical angle for the light emerging from a glass of refractive index 1.50.

   (b) (i) How people with short-sighted defect differ from those with long-sighted defect?
   (ii) Calculate the focal length of a lens when a projector is used to produce a sharp image of an object being at a distance of 120 cm from the screen.

6. (a) (i) What peculiar property does the effort has in all classes of levers?
   (ii) A metre rule of weight 1.0 N is supported horizontally on two knife edges each placed 10.0 cm from its ends. If the weight of 1.5 N is placed at its mid-point, calculate the reaction at the supports.

   (b) (i) State the law of floatation.
   (ii) Find the fraction of the cork that partially immersed when a piece of cork of density 0.25 g/cm^3 and a mass of 20 g floats in water.

7. (a) (i) What is the essential of kinetic theory of matter?
   (ii) Sketch a graph showing how force applied in a stretched string varies with its extension.

   (b) (i) State Hooke's law.
   (ii) List two applications of gamma rays.

8. (a) (i) Define the term wavelength.
   (ii) How does the size of the gap in the barrier affect the diffraction of waves?

   (b) (i) State two ways in which visible light differ from radio waves.
   (ii) List two applications of gamma rays.

(c) Figure 2 and 3 shows a wave travelling across water. Carefully study it then answer the questions that follow:

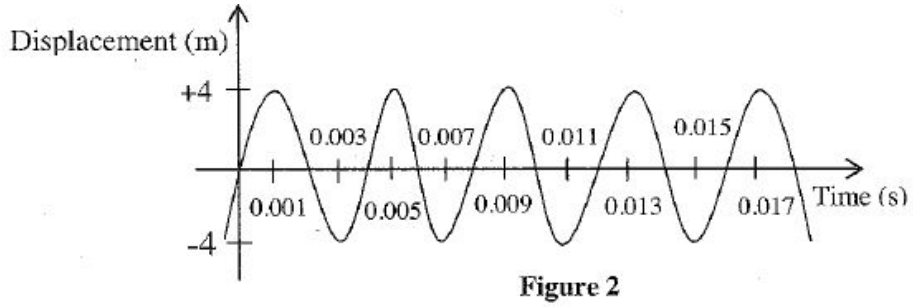

Figure 2

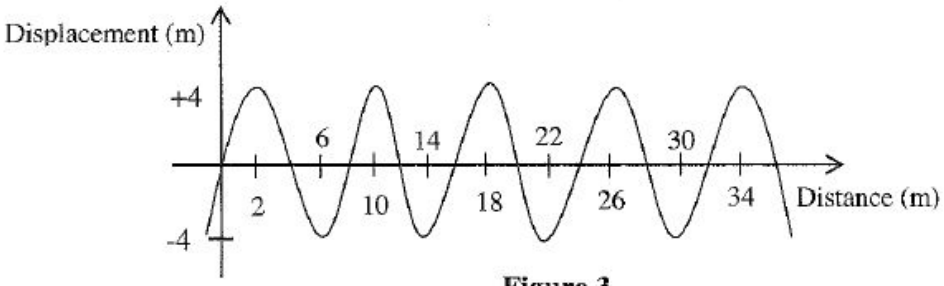

Figure 3

Determine the

(i) Frequency of the wave.

(ii) Velocity of the wave.

9. (a) (i) What is meant by mutual induction.

(ii) Illustrate how the right hand grip rule is used to determine electric current and magnetic field directions.

(b) (i) Draw the diagram of direct current (d.c) generator showing its important parts.

(ii) Briefly explain how simple a.c dynamo can be converted to simple d.c dynamo.

SECTION C (10 Marks)

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

10 (a) (i) Define the term semiconductors.

(ii) How do intrinsic semiconductors differ from extrinsic semiconductors?

(b) (i) List four properties of cathode rays.

(ii) Describe how x-ray tube is used to produce x-rays.

(c) (i) Mention three uses of induction coil.

(ii) Briefly explain the working principle of a bicycle dynamo.

11. (a) How does the increase of length and cross-section area of a conductor affect its resistance?

(b) (i) State the function of a circuit breaker in a wiring system.

(ii) Determine the ratio of resistance of wire A to that of wire B which are made up of the same material such that wire A has half the length and twice the diameter of wire B.

(c) An electric kettle contains 720 W heating units:

(i) What current does it take from 240 V mains?

(ii) How long will the kettle take to raise the temperature of 2 kg of water at 30°C to its boiling point?