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

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

Time: 3 Hours   **Monday, 11ᵗʰ October 2010 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. 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:

    Acceleration due to gravity, $g = 10 \text{m/s}^2$

    $\pi = 3.14$

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.

    (i)   Which one of the following statements about alpha and beta particles is correct?
            A   They carry the same charge.
            B   Each alpha particle has four times the mass of the beta particle.
            C   Alpha particles have a larger range in air than beta particles.
            D   When in motion, they are deflected in opposite directions by a magnetic field.
            E   Alpha particles cause ionization while beta particles do not.

    (ii)   Light waves differ from sound waves because
            A   light is an electromagnetic wave but sound is a mechanical wave.
            B   sound waves do not travel in water but light waves do.
            C   the speed of light is independent of the medium it travels but the speed of sound depends on the medium.
            D   interference is obtained with light waves but not with sound waves.
            E   the speed of sound waves is greater than that of light waves in the same medium.

    (iii)   In a laboratory, the diameter of a piece of wire can accurately be measured by
            A   Vernier Calliper
            B   Micrometer screw gauge
            C   Engineer's Calliper
            D   Rate meter
            E   A thread wound round it once.

    (iv)   A basic condition for diffraction of a wave when it passes through an opening is that
            A   the wavelength of the incident wave must be greater than the size of the opening.
            B   the amplitude of the wave must be smaller than the size of the opening.
            C   the wavelength of the wave must be shorter than the corresponding size of the opening.
            D   the wavelength of the wave must almost be equal to the size of the opening.
            E   the amplitude of the wave must be greater than the opening.

    (v)   A specific latent heat of fusion of a substance is defined as energy required to
            A   change a unit mass of the substance from solid to liquid.
            B   change a unit mass of a substance from solid to liquid at constant temperature.
            C   change the mass of a substance from solid to liquid at constant temperature.
            D   cause a unit temperature rise of a substance.
            E   cause a unit mass of water to freeze at 0°C.

(vi)　For an oscilloscope just to display the wave form of an a.c supply which controls should be adjusted.
　　A　Y-shift then X-time base
　　B　X-time base then Y-shift
　　C　Y-shift then brightness
　　D　X-time base then Y-gain
　　E　Y-gain then focus.

(vii)　A regular rise and fall in loudness of a music played at a distance is called
　　A　intensity
　　B　timbre
　　C　pitch
　　D　beats
　　E　resonance

(viii)　Which of the following are non-magnetic metals?
　　A　Iron and steel
　　B　Aluminium and Zinc
　　C　Nickel and Cobalt
　　D　Nickel and steel
　　E　Iron and Cobalt

(ix)　The temperature of liquid in a thermos flask remains unaltered for a long time because heat loss by
　　A　conduction is minimized
　　B　convection and radiation are reduced
　　C　radiation and convection are minimized
　　D　conduction and radiation are reduced
　　E　all modes of heat transfer are reduced.

(x)　A body is said to be in equilibrium if
　　A　the body moves with uniform speed
　　B　the net force acting on the body is zero
　　C　the upward forces on the body counter balance some of the downward forces
　　D　its centre of gravity is low positioned
　　E　its centre of gravity is high.

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

List A	List B
(i) Newton's 3rd Law of motion (ii) Kelvin (iii) Proton (iv) Voltameters (v) Kwhr (vi) Radiation (vii) Intrinsic semiconductor (viii) γ-radiation (ix) Venus (x) Total Lunar eclipse	A Cells with conducting materials used in electrolysis B Used in forming thick and real images C A measure of electrical work D Can be detected by means of scintillation counter E Is used in covering wounds in hospitals F The moon is in penumbra of the shadow of the Earth G Action equals reaction H Thermodynamic temperature I The moon is in the umbra of the shadow of the Earth J Rate of change of momentum K Degrees centigrade L Measure of power generated M Heat transfer which requires material medium N Applied in construction for reinforcing concrete structures O A morning star P A positive charge Q The heat transfer that does not require matter R A shooting star S Pure semiconductor in which external impurity is not added T Impure semiconductor with a hole

SECTION B (60 Marks)

Answer **all** questions in this section.

3. (a) What is meant by the terms heat capacity and specific heat capacity? State how they are related. **(3 marks)**

    (b) Explain briefly how heat losses have been prevented in a vacuum flask. **(3 marks)**

    (c) A heater of 500W is used to raise the temperature of 50 kg of material of specific heat capacity of 960J/kg K, from 18°C to 38°C. Assume that all of the heat from the heater is given to the material. Calculate:
    (i) heat capacity of the material **(2 marks)**
    (ii) the time taken in seconds. **(2 marks)**

4. (a) (i) Explain the terms opaque and translucent and give an example of each. **(2 marks)**
    (ii) Danger signs along the road as well as tail and brake lamps of motor vehicles rear are painted red. Briefly explain the reason behind. **(1 mark)**

    (b) What is the basic difference between real and virtual image as formed by curved surfaces. **(2 marks)**

    (c) (i) Give two reasons why convex mirror are used as driving mirror? **(2 marks)**
    (ii) A convex mirror of focal length 18cm produces an image on its axis 6cm away from the mirror. Calculate the position of the object. **(3 marks)**

5. (a) (i) Define the terms astronomy and asteroids. **(2 marks)**
    (ii) Is scorpion a galaxy or a constellation? Give reason for your answer. **(1 mark)**

    (b) Distinguish between:
    (i) a planet and a star **(1 mark)**
    (ii) a comet and a meteor **(1 mark)**

    (c) Which planet in the solar system is
    (i) closest to the Sun? **(1 mark)**
    (ii) furthest from the Sun? **(1 mark)**
    (iii) closest to the earth? **(1 mark)**
    (iv) surrounded by rings? **(1 mark)**
    (v) the second largest planet? **(1 mark)**

6. (a) (i) State Ohm's Law. **(1 mark)**
    (ii) Explain briefly, with the aid of a circuit diagram, how you would verify Ohm's law in the laboratory. **(3 marks)**

    (b) How would you know when is necessary to recharge an accumulator? **(2 marks)**

(c) (i) State briefly the variation of the potential over a pear-shaped conductor and the variation of density of the charge. **(2 marks)**

(ii) An electron passes between two plates, one of which A, carries a positive charge and the other B a negative charge. What is the effect on the electron? **(2 marks)**

7. (a) (i) What is meant by the terms solenoid and electromagnetic induction? **(1 mark)**

(ii) List down two applications of electromagnetics. **(1 mark)**

(b) Describe the structure and mode of action of a simple d.c. motor. **(3 marks)**

(c) (i) Draw a diagram of an electric bell showing the polarity of the electromagnet, the direction of the current, the core, the yoke, spring and the armature. **(3 marks)**

(ii) Explain what will happen to the mode of action of the electric bell if the core and yoke are made of steel instead of soft iron. **(2 marks)**

8. (a) (i) What particle are emitted in thermionic emission? Explain why they are emitted. **(2 marks)**

(ii) What do you understand by the term transistor? **(1 mark)**

(b) (i) How a common emitter arrangement of a transistor is stabilized for temeperature changes? **(2 marks)**

(ii) Show the circuit symbol for pnp-transistor and npn-transistor. **(2 marks)**

(c) Draw a simple common emitter amplifier circuit using npn-transistor as a current amplifier. **(3 marks)**

SECTION C (20 Marks)

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

9. (a) Define acceleration due to gravity and state Newton's first Law of motion.
(2 marks)

   (b) An object is seen to fall from an aeroplane and observed to take 15 seconds in reaching the ground. Assuming that air resistance is negligible, calculate:
   - (i) the height of the plane. **(2 marks)**
   - (ii) the velocity with which the object strikes the ground. **(2 marks)**

   (c) (i) Find the average force required to stop a train weighing 200 tons traveling at 54 km/h in two minutes from the application of the brakes.
   - (ii) What distance will the train travel in that time? **(4 marks)**

10 (a) (i) Distinguish between longitudinal and transverse waves. **(1 mark)**
   - (ii) Explain how beats are formed. **(2 marks)**

   (b) A light wave is refracted into an optically less dense medium. What change will occur in:
   - (i) the frequency **(1 mark)**
   - (ii) the speed **(1 mark)**
   - (iii) the wavelength. **(1 mark)**

   (c) (i) What is an echo? **(1 mark)**
   - (ii) A sound is sent out from the ship and its reflection from the floor of the ocean returns one second later. Assuming that the velocity of sound in water is 1500 m/s, how deep is the ocean? **(3 marks)**

11. (a) (i) Define electromagnetic field. **(1 mark)**
   - (ii) Show electromagnetic field lines pattern due to a solenoid. **(1 mark)**

   (b) With the aid of a well labeled diagram, explain how an electric bell operates.
(4 marks)

   (c) How can you make a galvanometer read
   - (i) higher current values? **(2 marks)**
   - (ii) higher voltage values? **(2 marks)**