**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** **Friday, 09th November 2018 a.m.**

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**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, $g = 10\ m/s^2$ or 10 N/kg
   (ii) Specific heat capacity of mercury is 1395 J/kg°C
   (iii) 1g of water is equivalent to 1 $cm^3$
   (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 besides the item number in the answer booklet provided.

(i) The correct formula to find the elastic force constant (k) of a spring is

A $\frac{\text{tension}}{\text{extension}}$ B $\frac{\text{mass}}{\text{extension}}$ C $\frac{\text{extension}}{\text{mass}}$

D $\frac{\text{extension}}{\text{tension}}$ E $\frac{\text{tension}}{\text{mass}}$

(ii) Why is oil used as a lubricant?

A has low density B is high viscous C it is flammable
D it is inflammable E it is less viscous.

(iii) Which one is a characteristic of a plane mirror?

A It forms an image which is real and opaque
B It forms an image which is larger than the object
C It forms an image which is real and laterally inverted
D It forms an image which has the same size as the object
E It forms an image which is small in size than the object.

(iv) Which one is **not** a region of electromagnetic spectrum?

A radio waves B x- rays C infrared light
D ultraviolet light E invisible light waves.

(v) What quantity of heat is required to raise the temperature of 25 kg sample of mercury from 20°C to 30°C?

A 1,743,750 J B 348,750 J C 345,750 J
D 1,550,750 J E 413,750 J.

(vi) When silicon element is doped with phosphorus atoms, it produces

A a p-type semiconductor B a p-n junction diode
C an intrinsic semiconductor D a bipolar semiconductor
E an n-type semiconductor.

(vii) Which of the following is an example of a scalar quantity?

A Electric current B Force C Velocity
D Displacement E Acceleration.

(viii) What role does the iris play in the human eye?

A To hold the lens in position. B To prevent internal reflection.
C To control the size of the pupil. D To control the thickness of the lens.
E To protect the eye from light.

(ix) Asteroids which manage to reach the earth surface are called

A stars. B meteors. C meteorites.
D constellations. E comets.

(x) What will be the resistivity of a wire 2 metres long with a cross-sectional area of 0.50 $mm^2$ and a resistance of 2.20 Ω

A $5.5x10^{-7}$ Ωm B $6.5x10^{-7}$ Ωm C $2.3x10^{-7}$ Ωm
D $1.1x10^{-6}$ Ωm E $5.5x10^{-6}$ Ωm

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) Materials that can strongly be magnetized. | A Paramagnetic |
| (ii) Substance which are made up of soft iron. | B Temporary magnets |
| (iii) Materials that cannot be affected by magnets. | C Zinc and Copper |
| (iv) Objects which are made up of steel. | D Permanent magnets |
| (v) Groups of magnetic dipoles arranged themselves in a magnetized object. | E Magnetic domains |
| (vi) Field lines of force used for finding locations of different places. | F Earth's magnetic field |
| (vii) The process of aligning the domains of atoms in one direction. | G Induced magnetism |
| (viii) The process of destroying the alignment in a magnetized material. | H Magnetization |
| (ix) Materials that can redirect field lines of force. | I Demagnetization |
| (x) The region around a magnet in which magnetic materials are attracted. | J Permeable |
| | K Neutral point |
| | L Ferromagnetic |
| | M Magnetic field |

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

   (i) The ratio of distance moved by effort to the distance moved by load is referred to as _____.

   (ii) The name given to the heat which is required to raise the temperature of a body by 1 K is _____.

   (iii) The work done when a force of 1 N moves a distance of 1 m in the direction of force is called _____.

   (iv) When a p-type and n-type semiconductors are bounded together they form a single crystal called _____.

   (v) The nuclear reaction which involves joining of lighter nuclei into heavier nucleus is called _____.

   (vi) A device which produces electricity on the basis of electromagnetic induction is called _____.

   (vii) A collision during which the kinetic energy changes is known as _____.

   (viii) The particles in the nucleus of an atom which carry no charge are called _____.

   (ix) The wave which makes particles of the medium to vibrate in a direction perpendicular to the direction of movement of the wave is called _____.

   (x) The sun looks bigger and hotter than other stars because it is near to the _____.

**SECTION B (60 Marks)**

Answer **all** questions in this section.

4. (a) Briefly explain why hydrometer
   (i) is weighed with lead shots.
   (ii) has a narrow stem.

   (b) A piece of rubber of volume 100 $cm^3$ and the density of 0.45 $g/cm^3$ floats in water. Calculate:
   (i) The volume of rubber that partially immersed in water.
   (ii) The force required to immerse the rubber completely.

5. (a) List four factors which affect the rate of evaporation of liquids.

   (b) (i) Define relative humidity.
   (ii) Calculate the relative humidity given that the reading on dry bulb hydrometer is 24°C and the wet bulb temperature reading is 16°C.

   (c) With the aid of a sketched graph, explain how temperature affects the saturated vapour pressure of water.

6. (a) Define the following terms as used in sound waves:
   (i) Audibility range.
   (ii) Ultrasonic sound.

   (b) Why notes of the same pitch played on a violin and flute has different quality?

   (c) A string of length 75 cm has a mass of 8.2 g. If the tension in the string is 18 N, calculate the frequency of the first and third harmonics.

7. (a) What is meant by radioactive decay?

   (b) A certain sample with half-life of 8 days contains 16 g of iodine 131.
   (i) Write an expression to show the decay process of the sample.
   (ii) Use an expression in (b) (i) to sketch the graph then estimate the mass of sample which will remain undecayed after 20 days.

   (c) Describe the use of Geiger-Muller (G-M) tube in detecting nuclear radiations.

8. (a) Give two examples which illustrate the rectilinear propagation of light.

   (b) (i) The refractive index of light passing from water to air is 3/4. Calculate the critical angle.
   (ii) Outline two differences between primary and secondary rainbows.

   (c) In Figure 1, identify the names of colours labeled A, B, C, D, E, F and G.

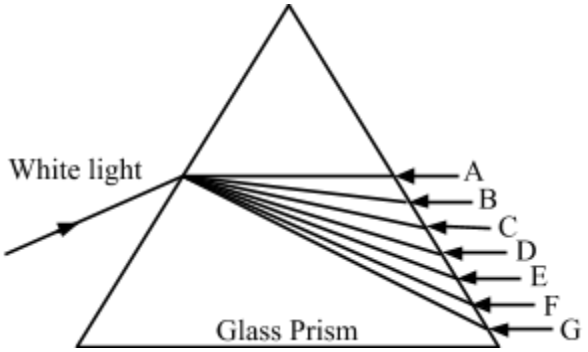



**Figure 1**

9. (a) (i) Define the term astronomy.
(ii) Enumerate three importance of astronomy to mankind.

(b) (i) Specify the difference that exists between galaxy and a planet.
(ii) Outline three defining characters of a planet.

(c) Briefly explain the importance of stratosphere to living things on the earth's surface.

**SECTION C (10 Marks)**

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

10. (a) State the following rules:
(i) Cork screw rule.
(ii) Dynamo rule.

(b) (i) Give one structural difference between A.C. and D.C. generators.
(ii) Mention one application of induction coil.

(c) Figure 2 shows a transformer used to step down power. Assuming that there are no power losses, what will be the ammeter reading on the output part?

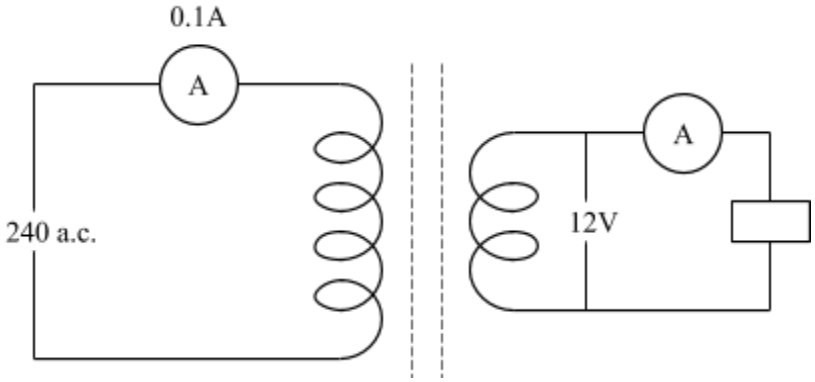



**Figure 2**

11. (a) (i) What is meant by the term thermal expansion?
(ii) Mention two applications of thermal expansion of solids.

(b) (i) List three areas where bimetallic strips are used.
(ii) Why a bimetal strip made of brass and invar is curved outside with brass?

(c) Describe how simple fire alarm system operates.