THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
DIPLOMA IN SECONDARY EDUCATION EXAMINATION

731/1

PHYSICS 1

Time: 3 Hours **Wednesday, 14th May 2014 a.m.**

Instructions

1. This paper consists of sections A, B and C.
2. Answer **all** questions in section A and **two (2)** questions from each of sections B and C.
3. Sections A and B carry 30 marks each, section C carries 40 marks.
4. Mathematical tables and non-programmable calculators may be used.
5. Cellular phones are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).
7. The following constants may be used.
   (i) Acceleration due to gravity; $g = 10\ m/s^2$.
   (ii) Density of water = $1000\ kgm^{-3}$.

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SECTION A (30 Marks)

Answer **all** questions in this section.

1. The pressure P was calculated from the relation $P = \frac{F}{\pi R^2}$, where F is the force and R is the radius. If the percentage errors are ±2% for F and ±1% for R, calculate the percentage error for P.

2. (a) Explain how the velocity of a body changes with displacement from mean position during S.H.M.

   (b) The period of oscillation of a body executing S.H.M. is 1.4 sec. With what speed does the body pass through the point half way between the mean position and the position of maximum displacement if the amplitude of the motion is 11cm?

3. State the Newton's laws of motion and from each law write one of its applications in real life.

4. Explain the effect of the following actions to the surface tension of a liquid:

   (a) Rise in temperature of the liquid.

   (b) Addition of very soluble organic substances to the liquid.

   (c) Electrifying the liquid.

5. An equation of progressive wave in a stretched string is given by the formula $y = 5\sin 2\pi\left[\frac{t}{0.04} - \frac{x}{50}\right] cm$. By using this equation perform the following:

   (a) Write the equation of an identical wave travelling in the opposite direction.

   (b) Deduce the frequency and velocity of the wave.

6. A parallel beam of x-ray with a wavelength of 1.47Å strike at a glancing angle of 31° on face of a rock salt crystal. Find the spacing between atomic planes of the crystals of the second order if the maximum diffraction is observed at this angle.

7. Write down three electrical safety rules and regulations to be followed when one is in the physics laboratory.

8. Mention three limitations of multiple choice questions/items.

9. Briefly explain how Physics is related to Chemistry and Mathematics.

10. List three functions of lesson notes in teaching Physics.

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SECTION B (30 Marks)

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

11. (a) What is meant by dimensions of physical quantities?

(b) Using dimensional analysis, determine whether the following equations are dimensionally correct or not:

(i) $\lambda = vt$

(ii) $F = \frac{m}{a}$

(iii) $F = \frac{mv}{t}$

(iv) $h = \frac{v^2}{2g}$

(v) $V = (2gh)^{\frac{1}{2}}$

Where λ and h are lengths and $[F] = MLT^{-2}$. The other symbols have their usual meaning.

(c) The speed (V) of the ocean wave is given by $V = kg^x\lambda^y\rho^z$ where k is constant, g is the acceleration due to gravity, λ is the wavelength and ρ is the density. Derive their relationship using the method of dimension.

12. (a) Define the following:

(i) Surface tension γ of a liquid.

(ii) Free surface energy δ.

(b) Describe how surface tension can be determined when a capillary tube is held vertically in a liquid.

(c) Calculate the surface tension of water when the end of a clean glass capillary tube, having internal diameter $6\times10^{-4}m$, is dipped into a beaker containing water which rises up the tube to a vertical height of $0.05\,m$ above the water surface in the beaker.

13. (a) A $120V$ Motor for a power saw is known to have an internal resistance of 1.5Ω. while operating, it draws $12A$. What is the back emf it generates?

(b) Describe the mode of action of fluorescent tube.

14. (a) Show how an operational amplifier may be arranged to be used as:

(i) An inverting amplifier.

(ii) A non-inverting amplifier.

(b) How is the amplification calculated in case (a)(i) and (ii) above?

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SECTION C (40 Marks)

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

15. Prepare a tabulated interactive lesson plan for 80 minutes period to form three students on the 'propagation and transmission of light.'

16. (a) Analyse five points on the importance of keeping records of student's examination results.

    (b) Explain various means used for keeping students achievements records.

17. Using the knowledge of "pressure due to solids and liquids" as taught in form one class, analyse the following:

    (a) Dependence of pressure on a surface of contact.

    (b) Variation of pressure with depth in a liquid.

18. (a) Explain five purpose of a classroom test in Physics.

    (b) Describe five characteristics of effective assessment.

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