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

731/1 **PHYSICS 1**

Time: 3 Hours **Year: 2024**

Instructions.

1. This paper consists of sections **A** and **B** with total of **Fourteen(14)** questions.
2. Answer **all** questions
3. Section **A** comprises **Ten (10)** questions with total of **40** marks, while section B has four questions with total of **60** marks..
4. Cellular phones are **note** allowed in the examination room.
5. Write your **examination Number** on every page of your answer booklet(s).

SECTION A (40 Marks)

Answer **all** questions from this section. Each question has **four (4)** marks.

1. You are requested by the students to orient them on the dimensions of various physical constants. How would you orient them on the following constants?
   (a) Young's modulus
   (b) Coefficient of viscosity
   (c) Planck's constant
   (d) Surface tension.

2. (a) Why the antiseptics used for treating cuts and wounds in human fresh are made of low surface tension? Give a reason.
   (b) In an inkjet printing, the nozzle releases 10 droplets of ink per second. What amount of energy will be liberated if 10 droplets of ink each of $m10^{-8}$ m diameter coalesce to form a large spherical drop? The surface tension of ink is 23.8×10^{-3} Nm.

3. Geography, Geology and Physics teachers believe that, in the interior of the earth, the core is in a molten form. What seismic evidence supports this belief?

4. In the Kagera war of 1978, the fighter jet flew in a horizontal direction from Mwanza military base at a velocity of $340ms^{-1}$ and dropped a bomb to insurgents at Mtukula, Uganda from a height m8400;
   (a) How did the pilot obtain the time taken by the bomb to reach the ground?
   (b) Using the answer in 4 (a), estimate the time taken by the bomb to reach the ground.

5. During winter, Juma complained to her mother that he was feeling cold, her mother advised him to put on a woollen jacket. Briefly explain the reason for that advice.

6. The velocity and acceleration of a body executing simple harmonic motion are always out of phase. How would you justify this statement?

7. Silicon and germanium are tetravalent semiconductor elements found in Group Four of the periodic table. Based on their energy gap, briefly explain which element is mostly preferred to manufacture solar cell devices?

8. A student teacher covered one topic in Physics during the teaching practice and wanted to fill the information in the Physics logbook. What components the student teacher would use to fill the information? Give four.

9. Suppose you were invited to teach a single lesson practice in the nearby school on the sub-topic "Newton's laws of motion." How would you explain to students the implication of first and third laws?

10. After marking the Physics test, a teacher discovered that, most of the students scored below the average marks. The teacher wanted to standardize the students' scores. What four steps would you recommend for carrying out such a task? Give them in chronological order.

SECTION B (60 Marks)

Answer **all** questions from this section. Each question has **fifteen (15)** marks.

11. A physics laboratory technician decided to design a sensor circuit that will control the cooling fan automatically in the laboratory room. The interest was to obtain the switch circuit that switches ON the fan when the room gets too hot during the day light hours. In the Physics preparation room there were only NAND gates.
    (a) What types of sensors do you think the teacher selected?
    (b) Draw the block diagram showing how the fan can be controlled by the selected sensors in 11 (a) using only one logic gate
    (c) How can the logic gate applied in 11 (b) be constructed by using only NAND gate?

12. Two wires, X and Y of the same material and the same length, have cross-sectional areas in the ratio of 2:1, respectively.
    (a) If the same potential difference is applied across each wire, what will be the ratio of currents flowing through them?

    (b) In the measurement of current, a student teacher recorded 10 A passing through a copper wire Y of cross section area of 1 mm^2. If the electrons density is $10^{328} cm^{-}$, determine the drift velocity of the conduction electron.

13. Suppose you have been employed as a Physics teacher to a Form II class of 15 boys and 20 girls registered students, prepare a lesson plan of 40 minutes based on the Current Electricity topic and the Ohm's Law subtopic.

14. A Physics teacher has a plan of conducting practical to all Form IV students before the terminal examinations. Explain five factors you would advise the teacher to consider to achieve his plan.