

KIYALA HIGH SCHOOL

MID-TERM ASSESSMENT TEST 2025

PHYSICS

S.4

Time: 2 Hours

INSTRUCTIONS:

- The paper contains **five** items.
- Attempt **only three** items from this paper.
- Any **additional item** answered will not be counted.

Item 1

You are a nuclear physicist working at nuclear power plant. Your task is to ensure the safe operation of the plant and prevent any potential accidents or radiation leaks. One day you receive an alert about a potential malfunction in the reactor core. You quickly Analyse the situation and realize that there is an increase in the rate of nuclear fission reactions within the core. To prevent a meltdown, you propose using control rods made of a highly neutron absorbing material such as boron or cadmium. These control rods will be inserted into the reactor core to absorb the excess neutrons, effectively reducing the rate of fission reactions. After implementing this you monitor reactors, temperature, and pressure and radiation levels to ensure stability.

- (a) You also conduct experiments and analyze atomic properties of different materials to find optimal conditions for safety.
- (b) Explain the dangers of radiation leaks and how they can be minimized (c) Explain how the process can be used in generation of electricity.

Item 2

Of recent, a tall building being constructed in Kampala near Munyonyo collapsed and too very many lives. When the police tasked the contractor to explain the cause of the collapse, he stated that a client did not provide enough money to buy the appropriate materials for constructing the building given that the site is affected by hash weather conditions, however when the KCCA engineer was tasked to Annalise the situation, he reported building near such sites. The young modulus of steel should be about $2 \times 10^{11} \text{ Nm}^{-2}$. His statement confused the public the more. A force of 500N causes an extension of 20mm on an iron bar of length 100cm whose cross sectional area is 0.05 cm^2

Task

As a physics practitioner, you have been tasked by police to produce a report about the scene to help the police carry out the investigation on the contractor.

Item 3

A school has a tank which supplies water to students at their dormitory on weekend. The learners observed that as they collect water from the taps, a time comes when the flow of water is very slow.

Task

As a student who has studied physics, explain;

- a) The causes of the slow flow of water.
- b) Why the school decided to construct a stand for the tank to produce at least 50,000Pa of water pressure.

Item 4

A man attended a live concert of his favorite band at a large outdoor venue which was near from the tall building. He noticed sound of the band returning from the building and heard it after 6 seconds when original is produced. As the sun sets, the stage lights up with vibrant colors and the stage becomes the center of attention. The heavy bassline begins to thump through the speakers resonating throughout his body. The singers powerful voice fills the air as the crowd erupts with excitement. As he decided to enclose the stage his color of clothing changed

Hint

The stage was illuminated with blue, green and red lights

The man was wearing yellow shirt with blue strips and cyan trouser

Speed of sound in air 320ms^{-1}

Task

As a learner of physics help the man to;

- (a) Determine the distance from the band to the tall building
- (b) Understand why the color of his clothing changed
- (c) Prepare a write up about applications of reflection of sound to the community

Item 5

One of the most misunderstood branches of physics for many years has been space physics (Astronomy). Some of the examples of such misunderstandings include the following. The Catholic Church at one time thought that other heavenly bodies, including the sun, orbited around the earth, rather than the earth. This was the problem that Catholic hierarchy had with Galileo. For example, the Church tried and arrested Galileo Galilei for supporting Sun-centered view of the universe.

While watching the world cup which took place in Brazil in 2014 at 9pm East African time, the football fans watching the game in East Africa realized that it was still daytime in Brazil, some of them were puzzled by this?

While it snows (winter) in most European countries in December around Christmas season, the people in East Africa have never seen any snow fall in East Africa and some of them wondered why it is this way?



Task

As a learner of physics, write a report to the community on enlightenment about these astronomical events in order to promote deeper understanding of physics in the school and community at large.

SUCCESS