

MPONDWE SDA SECONDARY SCHOOL
END OF YEAR ASSESSMENT 2024
PHYSICS S3

Attempt any four items

Duration 2:15min

Item 1

On November 7th 2022, Uganda launched its first satellite named PearlAfricaSat-1 into space with the help of National Aeronautics and Space Administration (NASA). The purpose of the mission was to study weather patterns. Students of physics were availed with data collected over a certain of time and they noticed the following while some places were having day time. Other places were having night time. Various places were having different seasons.

Task:

As a learner of physics

- (a) Explain why some places had daytime while it was night time at other places.
- (b) Explain why different places had weather patterns and how world- wide communication is made possible through satellites.
- (c)) Explain the statement “the sun has a life cycle”.

Item 2.

A brass band was invited to play during a celebration near a tall building, a distance slightly more than 17 m away. Two friends standing in the same direction and in line with the playing band, heard the sound from the band at different intervals of time which attracted them to go and attend the celebration.

On arrival, the sound they heard was unclear, confused and indistinct. Later in the night during the cerebration, coloured lights flashing red, blue and green made the colours of their clothes look different from the original colours which puzzled them. The two friends heard sound after 4 s and 5 s, respectively and were originally wearing yellow clothes.

Task:

As a physics student, help the two friends to understand why;

- (a) they heard the sound at different intervals.
- (b) the sound they heard was unclear, confused and indistinct.
- (c) the colour of their clothes kept changing when coloured lights flashed on them. Speed of sound in air = 330 ms^{-1}

Item 3

While in your literature lesson, your teacher asks your friend to stand up and read for the class a book of Oliver Twist, however your friend always tells your literature teacher that she is unable to see the letters in the books and even when she sits near the board, she's unable to see but your teacher and other fellow literature students think she's bewitched. On the S.4 leaver's

party, a boy of height 120cm stands in front of a lens camera with a lens of focal length 40cm at a distance 160cm from camera.

Task

As a learner of physics,

- (a) By scale drawing find the; nature size and position of the image of the boy on the camera
- (b) explain to your fellow students and the literature teacher the cause of the problem and the would-be possible solution to the above problem

item 4

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?

How can you explain the above in case one of your classmates, siblings or friends is among those who need enlightenment about these astronomical events in order to promote deeper understanding of physics in the school and community at large?

Item 5

During a party, 2 liters of water at 24°C were served to a man and a woman. They complained that it was warm and were given 50g of ice at -10°C blocks. They mixed the water and blocks in a wooden container with a negligible specific heat capacity. They were surprised by the ice cubes disappearing in the water. The man put his mixture in a plastic container ($\text{shc} = 2800 \text{ J Kg}^{-1}\text{K}^{-1}$) while the woman put her mixture in a metallic container ($\text{shc} = 800 \text{ J Kg}^{-1}\text{K}^{-1}$). They were surprised to find their water at different temperatures after some time.

Specific Heat capacity of water = $4200 \text{ J Kg}^{-1}\text{K}^{-1}$

Latent heat of fusion of ice = 340000 J Kg^{-1}

Use your knowledge of Physics to;

- a. Determine if the water cooled when mixed with ice.
- b. Why do the ice cubes disappear when mixed with water?
- c. Explain why there was a difference in temperatures in the water kept in the plastic and the metallic container.