S.3 PHYSICS HOLIDAY WORK

ITEM 1

Mzee Alex leaves home for work at 7:20 am and as a must carries tea in a flask. One morning he needed to prepare the tea he carries but remembered that the only water he had in the house was 5 litres in a sauce pan of 0.2 kg in a deep freezer.

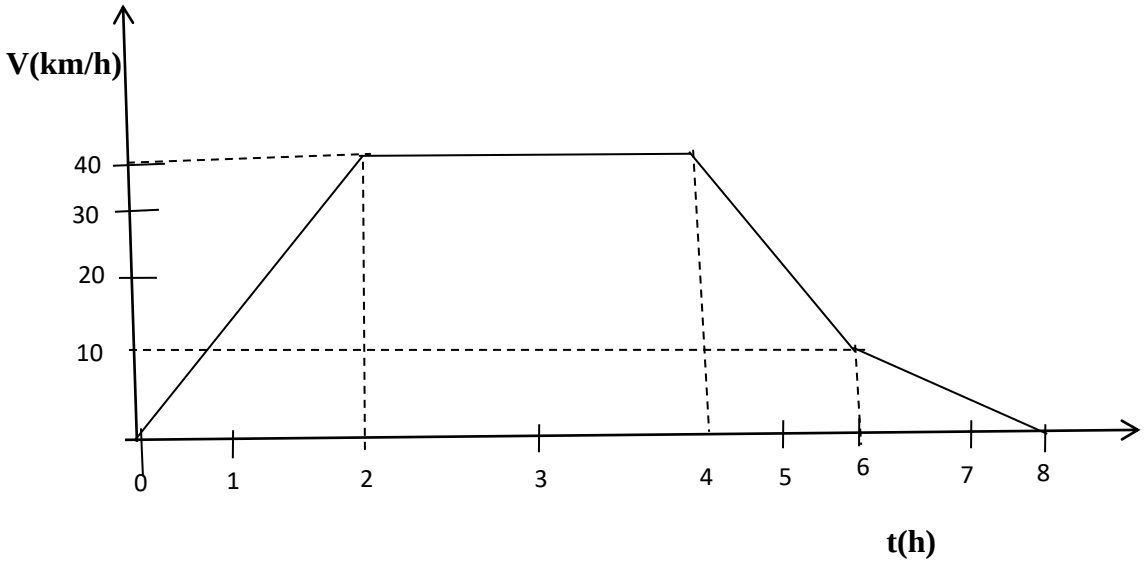
On removing the sauce pan from the deep freezer, he realized that all the water had turned into a block of ice. It was 7: 00am and he was worried about leaving home late, but decided to heat the saucepan containing the block of ice with his heater rated 4.22KW, until all the ice turned into water and the water boiled ready for tea.

Hint

Specific heat capacity of the saucepan	= 900	$jkg^{-1}K^{-1}$
Specific heat capacity of water	= 4,200	$jkg^{-1}K^{-1}$
specific latent heat of fusion of ice	= 336000	jkg^{-1}
density of water	= 1000	kgm^{-3}
Temperature of ice in the sauce	= 0^0C	

Task:
a) Determine how long it took Mzee Alex to boil the tea
b) Explain whether or not Mzee Alex was able to leave home for work at 7:20 am.

ITEM 2
Madam Nuru has hired a tax to take the whole family to the village but is not sure of the total distance from her home to the village. The tax driver has informed her that he charges Sh2500 per km moved and that Mrs. Nuru should not worry about the distance since he installed a machine in his tax that shows the motion of the taxi in form of a velocity time graph.



The taxi has set off from her home to the village and the velocity time graph for the whole journey is as shown below.

On reaching the village, the taxi driver has requested for his payment. However, Madam Nuru has refused to pay until she is helped to understand how the graph drawn by the machine is related to the distance travelled.

Task:

As a physics student , help Madam Nuru to;
a) Understand the motion of the tax from her home to the village.
b) Determine the amount of money she has to pay to the tax driver.

ITEM 3

A certain hotel has its own bathrooms situated on the 3rd floor of a building. A customer of the hotel expects to bathe water at 32^0C. A boiler on ground floor heats water to 80^0C for the customers to use.
The hotel management does not allow its workers to carry the hot water via the stair case.

Task:
Having studied physics;
a) Help the hotel management to determine the quantity of water to be given to a customer for bathing.

b) Advise the hotel management on how to keep the boiled water hot for a long period of time without keeping the boiler on.
c) Explain to the management how the water from the boiler can reach the third floor safely.

Use
- Density of water = $1000kgm^{-3}$
- Specific heat capacity of water = $4200jkg^{-1}K^{-1}$
- Acceleration due to gravity = $10ms^{-2}$

The science club at Townside high school initiated a national science literacy campaign. As part of this effort, they are hosting a series of outreaches aimed at primary school students to foster a better understanding of astrophysics and its relevance to everyday life. The focus of their discussions will include energy production in stars, the importance of the son's energy, the variation in stars' colors, the life cycles of stars, and the importance of space exploration.

Task:
As a student of physics, you have been requested by the school science club to deliver in one of the outreaches to primary school students. Your task is to educates them on;
a) How the sun produces energy needed for live to survive?\
b) The variation in colour and brightness of stars in the milky way in terms of their size and distance from the earth.
c) The different stages in the life cycle of star.
d) The purpose of the international station and its role in space exploration .

ITEM 5
As a student putting on a blue shirt and a yellow trouser stand between two vertical walls. He makes a loud sound while seeking for help. He hears the first echo after two seconds and the second echo after a further 3 seconds. Three members of the rescue team arrived to help. Each of them had a torch producing red, green and white light. The colors of his shirt and trouser changed when light was shone on him at a time. This brought confusion among these students.

Hint:
A speed of sound in air = 330m/s

Task:
As a learner of physics, help this student to understand
a) The origin of the two echoes
b) The distance between the walls
c) Why the colour of the student's clothes changed when colored lights flashed on them.