DEPARTMENT OF PHYSICS
END OF TERM ONE 2024
S2 PHYSICS
TIME ALLOWED: 2 Hrs

Intructions: Attempt all questions

1. A student visited the school sick bay when she had developed a fever. The nurse obtained a clinical thermometer to measure the temperature of the student. The nurse later found out that the calibration had faded to an extent that she could not make a reading. The nurse used the thermometer to measure the student's temperature. The nurse established that the distance from the bulb to the lower fixed point is 1.5cm, the distance from the bulb to the mercury thread is 4.62 cm and the distance from the bulb to the upper fixed point is 95mm. Later, the student asked the nurse which thermometric liquid the thermometer uses and the nurse mentioned mercury.
   Task

   (i) Describe the process the nurse can follow to calibrate the thermometer?

   (ii) Help the nurse to determine the temperature of student?

   (iii) Explain why mercury is a suitable thermometric liquid?

2. A fish farmer along the showers of lake victoria wants to design a fish cage along the showers in the shape of a cuboid. The fish cage is to be designed using wire mesh. The length of the cuboid is 0.01 km, the width is 3m and the height is 8m. The ground at the bottom of the lake is to act as the base of the cage. The farmer went to a nearby hardware shop and found out that one square meter of wire mesh costs 3500 shillings. During the construction, the builders found a glittering stone that they suspected to be gold. The builders found out that the mass of the stone is 400g and its volume is $20.725\,cm^3$. The builders observed a ship made of metal(steel) floating on water which was quite surprising to them. They also observed a submarine rise to the surface of water and later sinks into the water.
   Task

   (i) Determine the total cost of the wire mesh required?

   (ii) Help the builders decide whether the glittering stone is gold or not? (Density of gold is $19300\,kgm^{-3}$)

   (iii) Explain why a ship made of steel can float on water?

   (iv) Explain how a submarine is able to rise to the surface of water and sink to the bottom of water.

3. Students traveled a long distance to Kidepo National park in kaabong in the school bus for camping. The students observed that the new tyres of the bus were worn out. During the night, the campers poured paraffin in the lantern lamps so as to provide light. The following day, the students played the tug-of-war. The group on side A applied a total force of 40N and those on side B a force 50N. During lunch, four boys

fought for a carton of soda. Tony applied a force of 6N in the north, Robert applied a force of 2N in the south, Ismail applied a force of 7N in the east whereas Ashraf applied a force of 4N in the west. The students also observed insects moving on the surface of water in a nearby pond.

Task

Figure 1: The tug of war

Figure 2: A lantern lamp

Figure 3: worn out tires

(i) Explain why tires of the bus were worn out?

(ii) Suggest ways of reducing the factor mentioned in (3i) above in other machines?

(iii) How does the lantern lamp work?

(iv) Which team won the tug-of-war. Explain why?

(v) What was the effect of the forces on the carton of soda. (Include some mathematical explanation if necessary)

(vi) Explain why insects were able to walk on water?