GOOD SAMARITAN HIGH SCHOOL

END OF TERM 1 EXAMINATION 2024

PHYSICS PAPER ONE FOR S.4

TIME: 2 HOURS

INSTRUCTIONS:

Attempt all items in this paper.

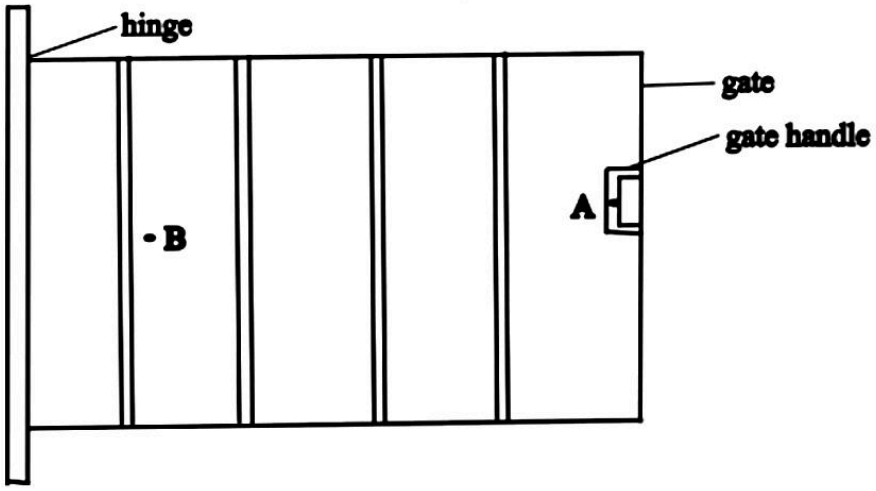
You may use the following information where necessary.

Acceleration due to gravity, g = $10ms^{-2}$

ITEM 1.

A trader at Arua park opens a wide gate from a point A and closes it from the end B as shown in the figure below. The trader realizes that opening the gate from point A is easy compared to closing the gate at point B.

*F*He continued to the shop but did not have a weighing balance. The trader used a uniform beam of mass $1.5kg$ of length $1m$ to determine the mass of the remaining sugar. The beam balanced with the pivot at $70cm$ and the sack of sugar at $90cm$. The trader



later observed a bus being loaded at the base.

Task.

(a) Explain the trader's experience at the gate.

(b) Help the trader determine the mass of sugar.

(c) Why is it necessary to load a bus at the base? Explain how a similar reason is applied in the design of racing cars.

ITEM 2.

During the interclass athletics competitions at Good Samaritan High School, the school nurse examined the participant's body temperature before the race started. Mr. Ben, the games master then started the race and recorded the distance covered by the participants with time taken as shown in the table below.

Distance(m)	0	20	40	60	80	100
Time(s)	0.0	2.5	5.0	7.5	10.0	12.5

John, one of the participants unfortunately collapsed after the **100m** race.

Support information.

- The normal human body temperature is **37^0C**
- According to old records, John normally runs at an average speed of **$5ms^{-1}$** without collapsing.

Examination results of John who collapsed.

- Body temperature before the start of the race was **39^0C**.
- Body temperature after the race was **44^0C.**

Task.

If you are Mr. Ben or the school nurse, how can you use the above examination results to scientifically investigate the cause of the collapse of this athlete? Conclude by commenting on the results you have obtained from your investigations and provide a suitable recommendation(s) to John.

ITEM 3.

A dentist on his internship is supposed to examine the tooth of the patient. The dentist is to use a mirror whose focal length is 10cm.The dentist is not so sure of the right position where the patient's tooth from the mirror should be. The possible positions of the tooth from the mirror are positions P, Q, R, S and T.

Support information.

Position	P	Q	R	S	T
Object distance (u)	5cm	10cm	15cm	20cm	25cm

Where "u" is the position of the tooth of the patient from the mirror.

Task.

Using Physics knowledge, explain how you will help the dentist to select the best position of the patient's tooth from the mirror and give reasons why you did not select each of the other remaining positions.

ITEM 4.

The Head teacher of your school wishes to buy two batteries each of emf **9V** and internal resistance **2Ω** each to be used on the school lighting system. The lighting system can use a maximum voltage of **9V**.The Head teacher would also wish to buy the connecting wires. Wire **A** has a diameter of **0.1mm** and costs **1500** Uganda Shillings per metre and the Wire **B** has a diameter of **0.15mm** and costs **2500** Uganda Shillings per metre. He is not sure of the wire to buy.

More support information.

- The batteries are to be connected to a bulb of resistance **5Ω**.
- The bulb may blow up if the current exceeds **3A**.

Task.

(a) Advise the Head teacher on how best he can arrange the batteries and the type of wire to be used. Conclude by commenting on the advantage(s) of the arrangement chosen and the wire used.

(b) Prove mathematically if the current produced by the arrangement designed in task (a) above is safe for the bulb.