MEBU EXAMINATIONS CONSULT

UGANDA LOWER SECONDARY CERTIFICATE OF EDUCATION

END OF TERM 1 ASSESSMENT 2024

SENIOR THREE

PHYSICS

PAPER 1 (THEORY)

TIME: 2 HRS: 30 MIN

INSTRUCTIONS TO CANDIDATES

This paper consists of **seven** (**7**) scenario-based items carrying equal marks with **two** sections **A** and **B**. Section **A** consists of only **three** (**3**) compulsory items.

Section **B** has **two** parts **I** and **II**, each containing **two** (**2**) items.

You are required to attempt any **one** (**1**) question from each part of section **B**. Any additional question(s) attempted shall not be marked.

Silent non-programmable scientific calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate S.I units.

Poor handwriting and untidy work shall lead to loss of marks.

At the end of the examination, fasten all your work securely together.

Where necessary, assume;

- Acceleration due to gravity, g $= 10 \text{ ms}^{-2}$
- Density of water $= 1000 \text{ kgm}^{-3}$
- Specific heat capacity of water $= 4200 \text{ Jkg}^{-1}\text{K}^{-1}$
- Speed of light in vacuum , C $= 3.0 \times 10^{8} \text{ ms}^{-1}$

SECTION A: (COMPULSORY)

Item 1

A long time ago, solar eclipses were considered as a message from the gods since the people in that age dwelt so much in the spiritual realm than the scientific world. However, with the development of science and technology, eclipses can now easily be explained scientifically instead of spiritually. Whenever eclipses occur, many people gather out in open places to watch the beautiful view of the heavenly bodies as they align themselves in a beautiful display.
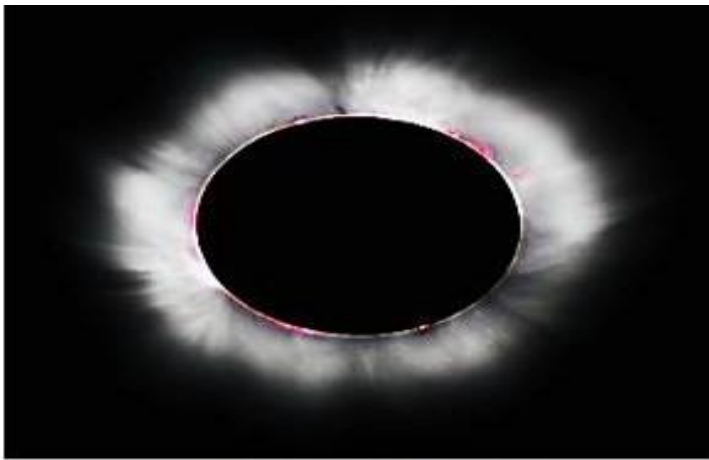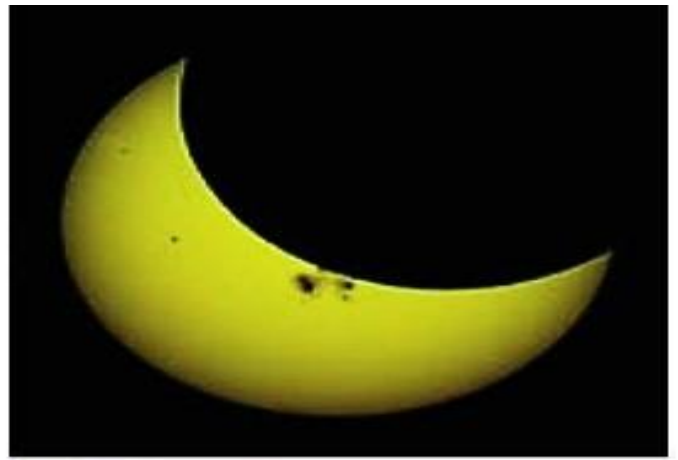
(a)   Total eclipse   **(b) Partial eclipse**

However, in most remote areas of Uganda some people still observe the eclipse directly using naked eyes not aware of the risk they are exposing their eyes to in the long run. The science club of your school has taken an initiative to always once in a while go out into the community and teach the community members about scientific facts. This year you are expected to go out during the day an eclipse is expected to occur to. You are expected to organize for the presentation about eclipses.

Task

As a student of physics and science club at the school, you are required to organize for the presentation about eclipses that you will use to address the community members on the day the eclipse is expected to occur. Conclude your presentation by recommending the best safe ways to watch an eclipse. (You may include ray diagram illustrations). (**20 scores**)

Item 2

Carpenters in your area have been poorly designing boats with no knowledge of density in relation to sinking. Therefore, water accidents are rampant and people have lost their lives and property. You have been selected to advise a carpenter who is supposed to make a boat of density **580 kgm^{-3}** using the following materials below.

- **3100 kg** of timber whose density is **620 kgm^{-3}**.
- Volume of Aluminum is **3 m^3**.

Task

Prepare an advisory report to the carpenter and the users of the boat on the recommended mass of Aluminium to be used and the maximum load the boat should carry.   (**20 scores**)

Item 3

New vision

Sad news!!!   **Sad news!!!**   **Sad news!!!**

Today in the morning at Fountain of Hope Junior School, two pupils were found dead in a down tank which is **10 meters** long below the ground. The head teacher was arrested immediately and the Vision Group interacted with him and says that, the pupils were fetching water from the tank using a rope tied on the jerrycan which had a capacity of containing water up to the weight of **10 kg**.

The government is taking a step of closing the school tomorrow and to arrest all the teachers.

Support materials

- A rope.

- The same jerrycan.
- A metallic bar or a long moderate piece of wood.
- Wheel of the bicycle.

Task

Help the school come up with a simple machine they can use at the moment to protect it from being closed. Show all the necessary steps and illustration of this machine. Also guide the pupils on how to operate the machine using the least possible energy.   (**20 scores**)

SECTION B:

(ATTEMPT ANY ONE QUESTION FROM EACH PART)

PART I

Item 4

Ibrahim was driving under a light drizzle towards Jinja at **45 kmh^{-1}**. **2 km** after leaving Mukono town, motorcycle rider suddenly skidded off the road **85 m** in front of the car. Ibrahim immediately applied his brakes but it was a useless move. There was an accident but fortunately enough, no one sustained injuries.

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measurements.

(a) .By simply looking at the car tyres, why did the Police Officers conclude that the car was in bad mechanical condition, yet the car was fairly new as it was only one year old?

(04 scores)

(b)   What was the problem between the tyres and the road?   (04 scores)

(c)   What should the tyres have looked like?   (02 scores)

(d) .What should have been the case between the tyres and the road for a car in good mechanical condition?   (05 scores)

(e)   From the above scenario, how is friction useful?   (05 scores)

Item 5

Senior Two students of Fountain of Hope High School visited a textile industry at Kalangala Island. They used MV Kalangala Ferry to cross the lake to the Island. On the Ferry, they loaded all their cargo including the School Bus. They were all amused to see that the ferry could not sink.

On reaching the industrial site, they observed the following:

- Sharp knives being used to cut the cotton bales.
- Factory trucks being lifted up on a hydraulic machine for servicing and maintenance.
- Overhead tanks supplying water to the different sections of the factory.
- Sprinklers watering flowers in the backyard of the factory.
- Small aircrafts (helicopters) airlifting cargo and employees to the mainland.
- Workers using vacuum cleaners to remove dust from carpets.

These learners were eager to understand how all these activities were possible and what principles they operate on.

Supposing you are an industry tour guide, write a detailed explanation for each of the above observations including why the ferry did not sink and how the aircraft is able to fly.

(**20 scores**)

Part II

Item 6

A uniform metallic rod of length **4.0 m** pivoted at its Centre is used at a children's play resort. If a boy of mass **48 kg** sits **1.5 m** from one end. Another boy of mass **40 kg** wants to seat at a distance of **0.6 m** from the Centre on the other end to balance with the boy at the other end.

Support material

Task

Help the guide at the play resort to direct the learners on how to play the game safely. Also analyze what would happen to the beam if one end of the rod was heated by a considerably hot flame when the boys are off the simple machine so that safety is ensured during plays.

(**20 scores**)

Item 7

A musician of mass **60 kg** putting on high heels is found to make contact area with the ground of **0.002 m²** per heel.

(a)   Determine the total pressure she would exert when;

    (i)   Standing on both feet.   (**03 scores**)

    (ii)   Walking.   (**02 scores**)

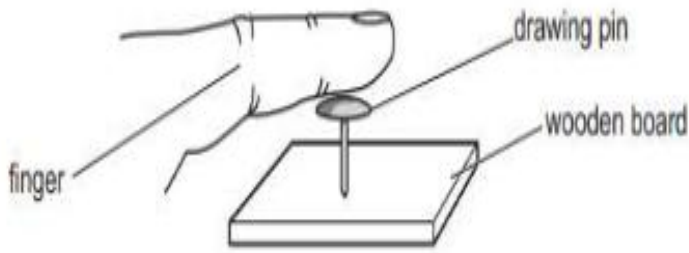(b). What one danger can you identify concerning the choice of shoes by the musician in (a) above towards;

    (i)   Herself.   (**01 score**)

    (ii)   The surface (floor) she walks on.   (**01 score**)

(c) A student pushes a drawing pin into wooden board. The area of contact of pin with the finger is $5.0 \times 10^{-5} \ m^2$. The student pushes with a force of **26 N** and pin has a very small mass.

(i)   Calculate the pressure exerted by the finger on the drawing pin.   (**02 scores**)

(ii) Explain why the drawing pin penetrates into the wooden board but not into the finger.

(**02 scores**)

(d) You are provided with a **1.5 liter** mineral water bottle, cellotape, water, sharp pin and basin. Explain how you can demonstrate and conclude the effect of depth on pressure in liquids.
(**05 scores**)

(e) Explain why after sometime a person carrying a heavy parcel using a thin string feels pain.
(**04 scores**)

THE END