

535/1

PHYSICS

Theory

Paper 1

November 2024

$2\frac{1}{2}$ Hours



ASK INTEGRATED TEACHER'S EXAMINATIONS BUREAU LTD

Uganda Lower Secondary Certificate of Education

END OF YEAR ASSESSMENT 2024

SENIOR TWO

PHYSICS PAPER 1

(Theory)

2 Hours: 30 minutes

INSTRUCTIONS TO CANDIDATES:

*This paper contains two sections A and B. Answer **five** items in this paper*

*Section A is **compulsory** and section B contains two parts i and ii*

Answer one item from each part

*Any **additional item** answered will not be scored*

All responses should be written on the answer booklets provided

SECTION A (COMPULSORY)

Item 1

A dentist on his internship is supposed to examine the tooth of the patient but he had to rush from his home and his cars side mirrors were broken wanted to replace them. 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	10 cm	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.

Help the dentist to select favorable mirror to replace the broken side mirrors

Item 2

One of space exploration team was tasked to identify and study the inner planets of the solar system and atmospheric weather changes. During his investigations he discovered that America has weather changes which are completely different from Uganda and also found out that Uganda was celebrating a new year when in New York were still having 7 hours to celebrate. He also discovered that earth is only planet that supports life

All data collected was analyzed but he failed to explain and concluded that it requires the artificial satellite to track the information perfectly

Task

As a learner of physics help the space exploration team to;

- (a) write a report about the cause of different weather changes and change in time
- (b) Explain the implications of weather changes.
- (c) Explain why among all planets the earth is considered only with life

Item 3

A maid at home has just prepared porridge for breakfast and on pulling out the bucket with sugar to mix in porridge, your two little siblings carrying small iron nails happen to accidentally throw the nails in to the bucket and on rushing to remove the nails just sunk into the sugar crystals. She is in trouble from your parents. You start shouting any magnet? But no one has it. In your search, you come across connecting insulated wires, an iron bar and four Tiger head cells in the radio receiver.

Task

As a student of physics, help the scared maid and your siblings

- (a) To design and describe the system that will solve the problem at hand in absence of a magnet
- (b) How to improve the strength of the system because as you try to lift the nails, some of them fall into the sugar and tell them the necessary precautions that must be taken when you are dealing with such a set up.

SECTION B PART I

Item 4

One of the sub county in Karamoja decided to purchase a tractor work on the roads in the area and other agricultural work like clearing the land.

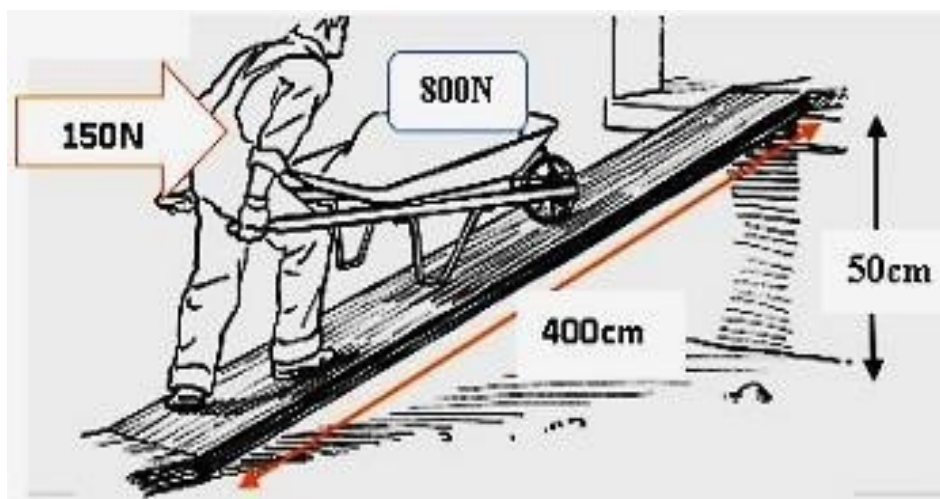


The driver exerts a force of 500N on the brake pedal. The master cylinder piston in a car braking system has a diameter of 0.2cm .the effective area of the brake pads on each of

the four wheels is 30cm^2 . The tractor will also damage the road if the pressure on master cylinder exceeds 20kPa .

Item 5

There was need to design a machine to lift construction materials to first floor of the building under construction which is 50 cm high. One worker designed an inclined plane which rises **50 cm** for every **400 cm** length of the plane as shown below. Another worker designed a pulley system with two pulleys in lower block and two pulleys in upper block. The construction engineer wanted to choose one machine that is at least 50% efficient. The pulley system was to apply same effort as the inclined plane.



Task

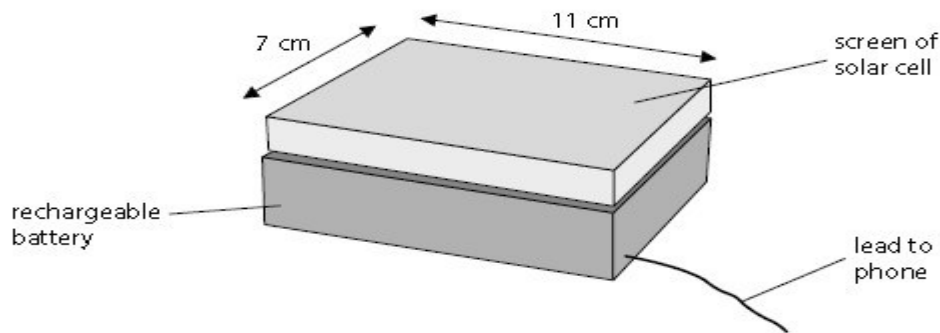
Help the engineer to select the machine

Explain how the machine selected can be improved

PART II

Item 6

(a) Students of s.2 during their innovations and creativity decided make a project of a solar-powered charger for a mobile phones. The screen of the solar cell takes in energy from the Sun. They made all plans necessary and completed their project with a design. On presentation of their project, they were asked the following to defend their project



- i. Describe the energy transformations from the Sun to the phone battery.
- ii. Each second, 0.12 J of energy from the Sun reaches 1 cm² of the screen.
Determine the total amount of energy reaching the whole screen in 10 seconds
- iii. How long can the cell take to fully charge a phone that requires 5000 joules
- iv. Help the group to defend their project

(b) The table below shows energy sources and the percentage of usage in Uganda

Energy source	2022	2030
Hydroelectricity	80%	55%
Biogas	10%	5%
Heavy fuel oil	7%	28%
Solar power	3%	8%
Wind	0%	4%

Due to the discovery of oil and advancement in technology, Uganda is expecting that there will be significant changes in the percentage usage of energy by 2030.

There was a need to sensitize people through broadcasting centres on energy consumption and conservation.

Also to inform the community how the changes in energy is likely to influence the environment

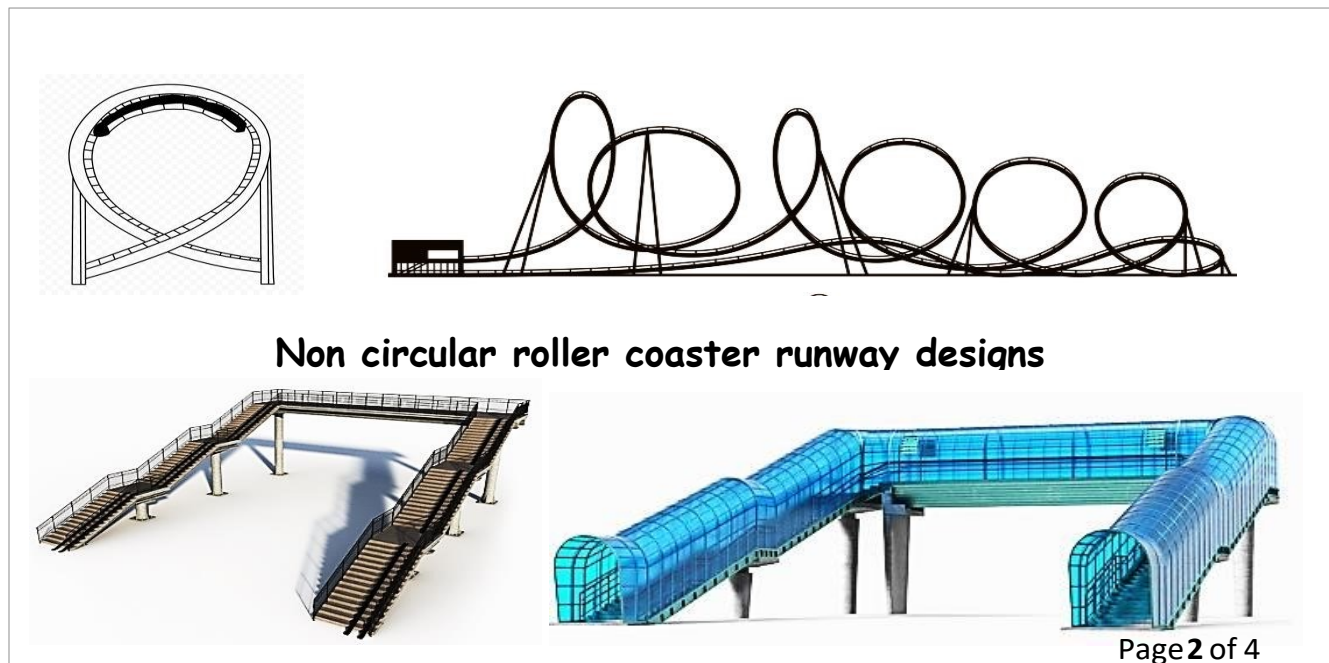
Task;

(a) Help the ministry of energy to analyze the and how they will provide the report to the community

(b) Explain how usage of electricity influences the environment and how the community can reduce usage of it

Item 7

A rich man in your town wants to construct a **roller coaster** fun trip **runway** for the children's festival which is to be held during Christmas season. His main problem is lack of adequate capital for the energy needs of the roller coaster trip. He does not want a design which will cost him a lot of money on energy bills.



Circular loop roller coaster runway designs

- (a) If you are the engineer and you are provided with following roller coaster runway designs, how will you be able to identify the best and most energy efficient system which can exploit (make use) of law of conservation of energy to save your boss from energy demands of the trips run by the roller coaster on the runway.

Explain why you chose that design of all the runway designs provided above.

- (b) If the total mass of the children on the roller coaster is **150 kg** and acceleration due to gravity is **10 m/s²**.

How high above the ground should the maximum height of the roller coaster runway be built if it is required to generate a maximum of **30,000 J** of energy needed for the trip.

Item 8

In a certain village, most citizens distil crude waragi called enguli from crushed ripe bananas after fermentation. The enguli is sold in the village and even to neighboring

villages for consumption. Most people who use to consume the product are sickly and look funny. The district healthy officer got concerned and took a small sample and analyzed it in the laboratory. The analysis showed that the enguli had impurities. Which were toxic. The citizens were advised to measure the temperature of the vapor of the distillate to ensure a relatively pure distillate. The citizens collected funds and ordered some mercury in glass thermometers such that their job is improved and safe. Unfortunately, the thermometers obtained were not calibrated and needed to be calibrated before they are used.

Task

- (a) Help the citizens of the village, using illustrations to understand how to mark points on the instrument
- (b) Explain to the citizens some precautions when calibrating and using their thermometer
- (c) Help the people to understand why mercury was used in glass capillary instead of alcohol.

END



Total
scores

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