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PHYSICS
Paper 1
Jul./Aug. 2025
2 ½ Hours



SENIOR EDUCATION CONSULTANTS (SEC) JOINT MOCK EXAMINATIONS, 2025

Uganda Certificate of Education

PHYSICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- This paper consists of **two sections: A and B**. It has a total of **seven** examination items.
- Section A has **three compulsory** items
- Section B has **two parts: I and II**. Answer **one item** from each part.
- Answer **five** items in all
- Any **additional** items answered will not be scored.
- Answers to all items must be written in the answer booklet(s)/ sheets provided.

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SECTION A

Answer all the items in this section

Item 1

A swimming pool is located between two buildings at a certain school. During swimming practice a student accidentally dropped her coin into the swimming pool and she screamed loudly. However she heard two similar screaming at intervals of 0.12 seconds and 0.20 seconds after the original sound had been made but she did not understand the occurrence. When the water surface had settled she saw the coin closer to the water surface but when she tried to pick it she could not reach it.

Hint: velocity of sound in air = 340ms^{-1}

Task

As a student of physics;

- (a) Help the student to understand why she heard herself twice after screaming.
- (b) Explain why she was not able to pick the coin although it appeared closer to the water surface.

Item 2

A student from Uganda travelled to a certain country for studies and arrived when it was day time. He immediately contacted his father who informed him that it was night in Uganda and this incident surprised him. During the course of his study, he realized that as it was in Uganda stars were only on the sky during nights however in some months day time was longer than nights and he did not understand this occurrence.

Task

As a learner of physics;

- (a) Help the student to understand how it would be day time in one country while in another country it would be night.
- (b) Help the student to understand that stars are on the sky during day and night time.
- (c) Explain why in the country daytime was longer than nights in some months.

Item 3

During inter house football competitions in a certain school, a boy got an injury in the leg and was attended to by the schools' nurse but he complained of too much pain and he could not walk by himself. The head teacher instructed the school warden to take the student to a nearby Hospital. When the Doctor examined the boy, he informed the warden that he needed to do a scan using X-rays to investigate the extent of the injury. The warden asked the doctor what X-rays were where they were manufactured from and how the process would be carried out, but the doctor told him that the scan was very urgent depending on the student's state however he assured the warden that the process was safe as he took the student to the laboratory. The warden stayed behind in the doctor's room confused about the safety of their student.

Hint

Wave length of soft X – rays = 1.0×10^{-9} m,

Wave length of hard X - rays = 1.0×10^{-10} m and

Speed of electromagnetic waves = 3.0×10^8 ms⁻¹

Task

As a learner of physics,

- (a) Help the warden to understand the nature and production of X-rays.
- (b) Explain how a safe X – ray scan could be conducted on the student.
- (c) State any health hazards caused by X-rays.

SECTION B

Part I

Answer one item from this part

Item 4

A mother to a newly born child was advised to always bathe her child with water at temperature ranging from 34°C to 38°C . She instructed her maid to boil some water and keep it in a vacuum flask during evening hours of a particular day. In the morning of the day that followed, she got 1.5 litres of water from the flask and instructed the maid to mix it with 4 litres of cold water at a temperature of 25°C in a basin so that she would bathe the child. However the maid was surprised when the water from the flask was still hot in the morning and she did not understand how the flask prevented it from cooling.

Hint :

Temperature of hot water = 70°C

Mass of 1 litre of water = 1kg

Heat capacity of the basin = 1500J K^{-1}

Specific heat capacity of water = $4200\text{J kg}^{-1}\text{K}^{-1}$

Task

As a student of physics;

- (a) Help the maid understand how the vacuum flask prevented the hot water from cooling.
- (b) Determine whether the water mixture in the basin was safe for the child's bath.

Item 5

An employee drives from his home to work place every day but he does not know how far the work place from his home is. One day he asked his son to escort him from home but before he started the engine of the car he poured some cold water into the car radiator which was painted black and had a network of small metallic rods. The son asked his father to explain why he used water but not any other liquids and the importance of the black component but the father did not respond to any of the questions. When he started to drive from the compound, the son realized that his father accelerated the car to a speed of 72kmh^{-1} for 4 minutes, he maintained this speed for 6 minutes. Realizing he would be late, he increased the speed to 90kmh^{-1} in a period of 10 minutes and finally decelerated to stop at his work place for a further 5 minutes.

Task

As a student of physics;

- Explain to the son the importance of the car radiator in a car and why water was preferred to other liquids to be used in the radiator.
- Sketch the velocity – time graph for the entire journey of the employee.
- Help the employee to determine how far it is to his workplace from his home.

Part II

Answer one item from this part.

Item 6

A house hold with various appliances (2900W Cooker used for 3 hours daily, 10 electric light bulbs of 40w each used for 8 hours daily and a 2900W water heater used for 2 hours daily) is connected to a 240V appliances mains supply. The owner was discouraged from connecting the sockets of the appliances in series by an

electrician who also emphasized earthing of the same sockets. The owner also intends to spend at most only UG.sh 12000= on electricity weekly.

Hint.

1 unit of electricity costs UG. Sh890.

Task.

As a learner of physics,

- (a) Explain why the electrician made the recommendations above.
- (b) Determine if the amount budgeted for is sufficient.
- (c) Identify ways of reducing the electricity bill.

Item 7

The welders in a certain workshop are troubled with their tools being shocked by electricity from a generator of 240V. When they visited a technician, they were advised to wind a thick copper wire to 3000 turns around a soft iron ring on the receiving part and also to wind another thick copper wire to output end to give out 120V suitable for their workshop operations in a box. However the welders did not understand how to design the device and how it would be of help.

Task

As a student of physics;

- (a) Help the welders to design the device according to the technician's prescription and explain how it will produce power corresponding to their consumption.
- (b) Explain why the technician preferred using thick copper wires and soft iron to other metals.

END