535/1
PHYSICS
Paper 1
March -April 2025

RBBK MID OF TERM 1 EXAMINATIONS
Uganda Certificate Of Education
S4 PHYSICS
Theory
Paper 1 hour
2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- This paper consists of two sections;**A** and **B.** It has **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 item (s) answered will not be scored.
- **All** responses **must** be written in the booklets provided.

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SECTION A
Answer all items from this section.

ITEM 1

A physics teacher provided the following figures as learning aids during a physics lesson in a theme of optics to the senior three learners in a certain school .
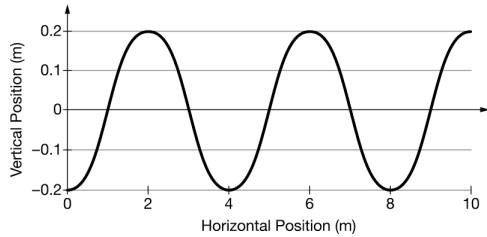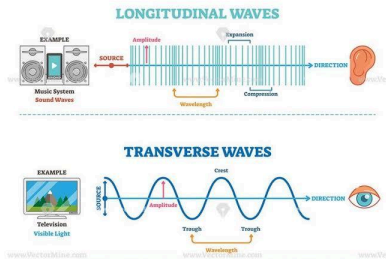

Fig.(a)

Fig.(b)

Fig.(c)

Task

a) (i) Name the phenomenon shown in the **fig.(a)**.
   (ii) Which type of the phenomenon was shown?
   (iii) State the laws of the phenomenon named in (a)(i) above

b) Using **fig.(b)**, calculate the speed of the wave shown if it travels at a frequency of 80Hz.

c) Using **fig.(c)**, clearly distinguish between sound waves and light waves.

ITEM 2

It is established that a dairy company produces pasteurized milk that contains harmful bacteria. To ensure the effectiveness of the pasteurization process and monitor bacterial growth, the company adds a radioactive isotope tracer, Phosphorus-32 (P-32) to the milk. The tracer helps in tracking and ensuring that the bacteria are destroyed during the pasteurization process. However, P-32 is harmful for human consumption until its activity is reduced to a safe level. To monitor the activity of P-32 in the milk to safe levels, the company uses a Geiger-Muller (GM) tube to measure the activity over time. The results obtained from the GM tube measurements are given inTable1.

Table 1: GM tube measurements.

Activity/ counts per minute	22,000	16,000	11,400	8,200	5,800	4,000	3,000	2,400
Time (days)	0	2	4	6	8	10	12	14

Hint:

Phosphorus becomes inactive after its activity goes below 6000 counts per minute.

Task:

As a learner of physics,

(a) Help the company to understand when the milk will be safe for human consumption.

(b) Advise the company to understand the dangers that may be involved and how safe to guard themselves.

(c) without the presence of the pasteurized milk, the GM-tube could still indicate some reading. Help the company owners to understand this.

(d) The GM tube has failed to detect X-rays which has puzzled everyone. Help the company owners to understand this.

ITEM 3

One of the most important components of our solar system is the sun. Another important component of our solar systems are the big masses called planets.

Task

(a) Name all the planets found in our solar system.

(b)(i). Identify the planet that sustains life in our solar system.

ii). How are the times and seasons of the year explained on the planet mentioned in(b)(i) above?

(c) Explain the statement that "the sun has a life cycle.

SECTION B
Part I
Answer one item from this part.

ITEM 4

As a school administration of certain school plans to install an electric bell, a big rim of a vehicle has been improvised.   To the surprise of the head teacher, the string used to hold the rim broke just after fixing it. He has been advised to use a string of Young's modulus 1.7 x104Nm^{-2}

The available strings are 1m long with a cross-section area of 0.02m^2 and it stretches by 0.3m for every 100N.

By midday, it was discovered that the temperature of the aluminum had changed by 20K.

Hint:

The specific heat capacity of aluminum is 900 Jkg^{-1}k^{-1}.The weight of rim is 300N.

Task

As a learner of physics

a) Explain to the headteacher if the available string will work.

b) Help the head teacher understand how the temperature of the rim changed and how much heat was absorbed.

ITEM 5

An investor seeking to establish a ceramics company requires guidance on using a hydraulic press to manufacture concrete pavers, blocks, and bricks. The hydraulic press supplier contacted, provided a manual booklet with a sketch drawing to help the investor understand the technical aspects. The manual has instructions for the hydraulic press to be operated effectively. One of the instructions given is that the temperature of the hydraulic fluid in it should not rise beyond 20°C. This is crucial to ensure the press's efficiency and longevity.

Hint:

(i) The specific heat capacity of the hydraulic fluid is 1750 Jkg^{-1}K^{-1}

(ii) The minimum energy input for the press to start working is 1600 J

(iii) 1 liter = 0.001 m³

(iv) Density of hydraulic fluid = 800 kgm⁻³

Task:

As a learner of physics;

(a) Explain to the investor the principle of working of the machine.

(b) Explain why oil is the most suitable to be used.

(c) If 340000 J of heat in the fluid is generated. Explain whether the system will

remain efficient when 10 liters of oil is put in the machine.

(d) If the hydraulic press has an efficiency of 80% and needs to press concrete requiring output work of 2000 J. Advise whether it will be in position to start

operating.

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Part II

Answer one item from this part.

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ITEM 6

Small pieces of metal which are unsafe to be eaten by chickens were found in feeds that had just been bought from a milling company by a poultry farmer. The small pieces of metal were later identified as iron. The farmer thought of disposing off the feeds but remembered that the pieces of metals could be sorted with a magnet which he did not have.

Hint:

A nail connecting wires of resistance 0.5Ω, two dry cells each of 1.5V were available to the farmer.

Task:

As a student of physics;

(a) Help the farmer to remove the pieces of iron from the feeds.

(b) Comment on the effectiveness of what you have designed, given that the current of 4A is enough to create a strong magnet.

ITEM 7

In a certain town, it is a must for drivers to be tested with their vehicles for road- worthiness. On a certain day, a car started from rest and accelerated to 50 ms⁻¹

in 10 seconds. The driver maintained that velocity for 20 seconds and suddenly decelerated to rest in 2 seconds causing him to crash into the windscreen. As a result, the car tyres wore out on the tarmac causing a lot of heat on the ground. **Support material**.

Task

You have been tasked to write a report to explain the scene. In your report include a motion graph, find the rate at which the car's velocity reduces and explain, with reasons, why the driver crashed into the wind screen. Advise by stating whether the driver's average speed exceeded the speed limit of 8 ms⁻¹,and how he would prevent the crushing.

END.