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PHYSICS
Paper 1
July | August 2025
2 ½ Hours

ASSHU KIGEZI REGION JOINT MOCK EXAMINATIONS 2025

UGANDA CERTIFICATE OF EDUCATION

PHYSICS

Paper 1

Theory

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 answers must be written in the answer sheets provided.*

SECTION

Attempt all items in this section.

Item 1

During a Sky News update on a television station, citizens of a certain country were informed to prepare for a national phenomenon where Earth will not receive sunlight during broad daytime for about five minutes. Citizens were cautioned not to use their naked eyes to view the event, but this precaution left many confused. The reporter went on to inform viewers that an asteroid is moving close to Earth's orbit and may collide with planet Earth. Some viewers were concerned, while others doubted the information as they couldn't imagine how such information from space can be collected. Later residents were gathered in the room of size 17m by 17m to be told more about the event but most of them complained of not hearing clearly.

HINT

No resident in the room had hearing problem.

Speed of sound in air $=330ms^{-1}$

Task:

As a learner of Physics, help the viewers understand

(a) (i) The natural phenomenon that was announced to take place soon.
(ii) Why the reporter precautioned them not to use naked eyes

(b) The composition of the solar system in order to take the information serious.

(c) How space agencies are able to get these upcoming events.

(d) Why the residents who had gathered in the room for more information did not hear clearly

Item 2

In some national park, researchers and tour guides are finding difficulty in establishing the exact locations of some animals whose behavior is under study during night time in darkness. The tour guides are proposing that if possible special tracking devices may be fixed to some particular animals and automated light systems installed at specific points in the park. An entrepreneur is interested in implementing the proposal from the guides but does not understand whether it is possible and how the proposed systems work to solve the problems.

Task.
Help the entrepreneur understand how the systems will work in solving the problems identified.

Item 3

Smoke detectors are increasingly becoming an important device in domestic kitchens, public buildings like school dormitories, hotels and offices.

The material used in smoke detectors is Americium-241 because it emits a highly ionising radiation. If you open a smoke detector to replace a battery, you may see a yellow and black hazard sign in figure 1.

Fig 1

A sample of Americium of activity 200 counts per minute is used in the detector until its activity reduces to back ground radiation level of 50 counts per

The half-life of Americium = (1.92 x the half-life of P).

The decay equation of Americium is $^{241}_{94}Am \longrightarrow {}^{237}_{92}U$ *+.....+ Energy*

a .

A license to operate a bo ng section, the director needs to understand the following in relation to smoke detectors as mentioned in the above context:
Ionising radiation, the radiation emitted by Americium, back ground radiation, half-life, how long the sample will be used before it is replaced, how the radiation emitted helps the functioning of a smoke detector and why there is a hazard warning in the smoke detector

The graph in figure 2 represents the activity of isotope **P**.

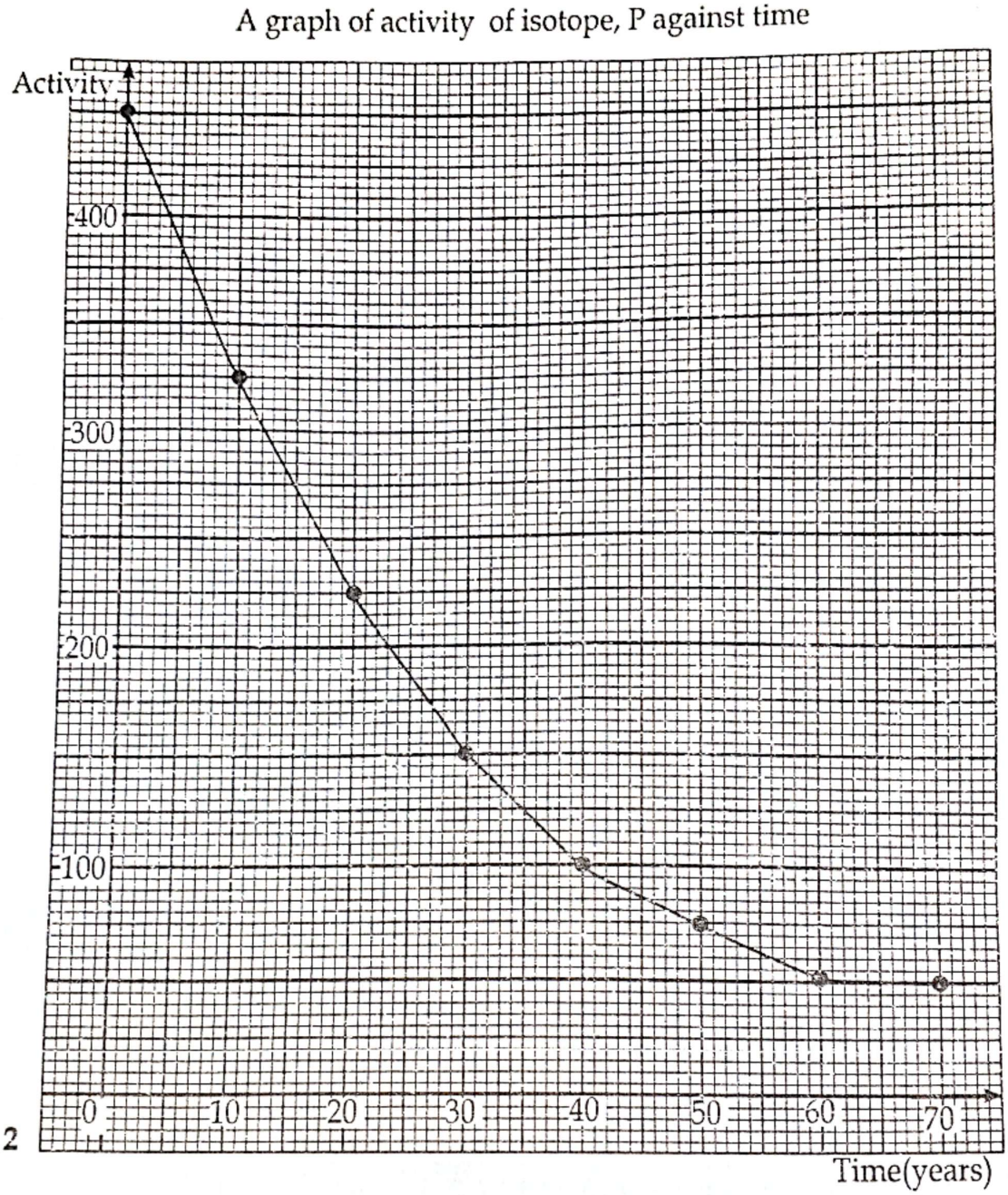

Fig 2

Task.

Help the school director with all the information in regard to the challenges faced

SECTION B

PART ONE

Item 4

During the installation of a metallic gate in a wall fence, a worker was assigned to use a water level while marking levels at two corners of the fence with one side at a height of 200 cm and the other at 100 cm above the ground, the water spilled out of the pipe leaving the worker stranded and wondering how it happened. In an attempt to drain and refill the water level pipe, he encountered difficulties. The worker later realized that the gate to be installed had acquired a bend upon leaving it on hot day sunshine and required to be straightened.The vehicle that was to transport the gate was observed to slow down whenever they would reach on the slanting road or even humps. The workers in the vehicle wondered what is causing this abrupt stoppage/slowing down.

Support information:

- Acceleration due to gravity $=10\ ms^{-2}$
- Density of water $= 1000\ kgm^{-3}$

Task:

As a learner of Physics, assist the worker to;

a) (i) Understand why the water in the pipe spilled while taking levels.
(ii) Explain what could have been done to prevent the spilling of water from the pipe.

b) Realize how the gate got bent.

c) Avoid future bends after installation of the gate.

d) Understand why they realized the type of motion and how it works

Item 5

Two motorists **P** and **Q** will be representing their motor club in a racing competition. However, they will first take part in a prequalification driving test in which whoever covers at least 500m in a time not exceeding 30s wins 25 litres of fuel. In addition, they will have to undergo a written interview to assess their awareness before they are allowed to represent

their club. During the test, they originated from the same place, **accelerated uniformly** from rest. **P** attained a maximum **velocity** of 30 ms^{-1} in 10 seconds while **Q** attained a maximum velocity of 40 ms^{-1} in the same time. Both motorists maintained their respective velocities for 10 seconds and then retarded uniformly. **P** came to rest in 5 s while **Q** came to rest in 8 s. As a safety measure the motorists will have their car radiator fins painted black and use only water to cool the engine in case of overheating. In the written interview, the motorists are required to:

- explain the underlined terms
- present their velocity time graphs on the same axes
- determine their respective accelerations
- Establish if they have each won the 25 litres of fuel.
- Explain why the standards stated are appropriate in ensuring the engines do not over heat.

With all this information and results of the prequalification test, the motorists have reached out to you for help as they prepare to attempt the interview.

Task.

Help the motorists with all the relevant information in regard to their awareness assessment test.

PART TWO

Item 6

A factory that specializes in manufacturing metallic products uses a system/device to sort and separate different metallic raw materials. The device draws a current of 10 A during operations, efficiently segregating the materials to streamline production from the surface. Each system unit consumes 100W of electricity per hour and typically operates for 6 hours a day. The manager wanted to understand the principle of operation of the system and why it is overheating and also noticed that heavy metals were not segregated. He has been advised to improve energy efficiency by decreasing energy consumption by 25%, and strengthen the device/ system but he lacks the knowledge of doing, and whether there is any other application of the device.

Task

As a student of Physics, assist the factory manager:

a) Understand the system and how it operates

b) Find out the energy required to run the system efficiently without overheating.

c) Explore how to enhance the system and any other application of it.

Item 7

The manager of a carpentry workshop recently acquired a new electromagnetic relay to be used in switching on and off of the motor in one of the plaining machines. Unfortunately the relay did not function as expected and this prompted its opening to find out if the components were all there and well arranged.

Figure 4 shows the components and their arrangement as found after opening.

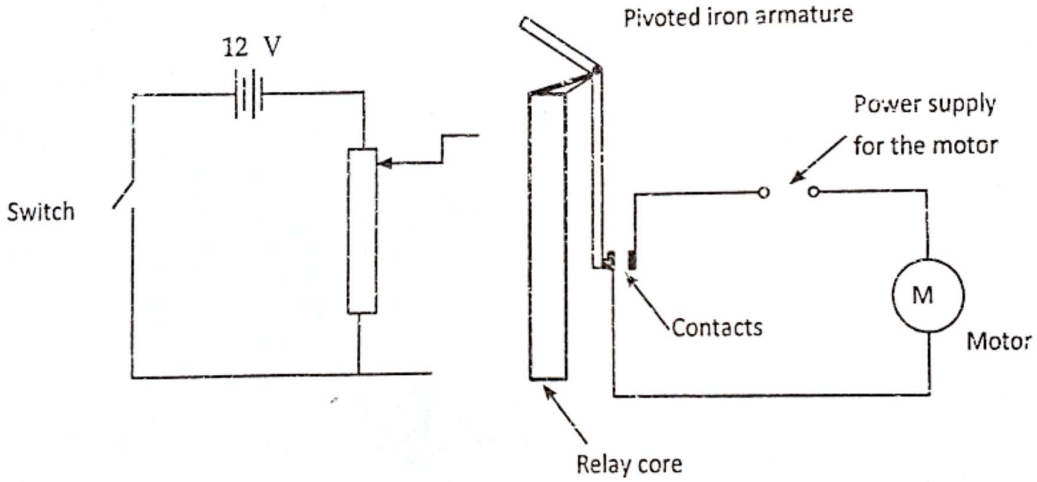

Fig 4

After opening it up, the manager discovered that it was missing a major electrical component and thinks that the components found are not properly arranged.

Hint:

The relay operates at a current of atleast 0.75A in the coil and apd of 6v across the coil.

You may also use a long connecting wire of resistance 7.5Ω.

As a student of physics help the manager

(a) To solve this problem through identifying the missing component and preparing an alternative one.

(b) Understand how the electromagnetic relay switches on and off the motor.

(c) Comment on the effectiveness of the relay and mark the position of the slider on the potential divider when the relay just operates.

END