Student's name: ……

SCHOOL: …… RANDOM: ……..

P535/1
PHYSICS
Paper 1
July/Aug. 2024
$2\frac{1}{2}$ **hours**

ASK INTEGRATED TEACHERS MOCK
EXAMINATIONS BURREAU

AITEL JOINT MOCK EXAMINATIONS 2024.

Uganda Certificate of Education

PHYSICS PAPER ONE

2 HOURS AND 30 MINUTES

INSTRUCTIONS

*This paper consist of t**wo** sections **A** and **B.***

*Section A contain **three compulsory** items*

*Section B consist of two parts 1 and 2 . choose **one item** from each part*

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

All items must be answered on answer sheets provided

Every item must be began on its own fresh page

Graph papers are provided

SECTION A; (COMPULSORY)

ITEM 1

You are a nuclear physicist working at nuclear power plant. Your task is to ensure the safe operation of the plant and prevent any potential accidents or radiation leaks. One day you receive an alert about a potential malfunction in the reactor core. You quickly analyse the situation and realize that there is an increase in the rate of nuclear fission reactions within the core. To prevent a melt down you propose using control rods made of a highly neutron absorbing material such as boron or cadmium.

These control rods will be inserted into the reactor core to absorb the excess neutrons, effectively reducing the rate of fission reactions. After implementing this you monitor reactors, temperature, and pressure and radiation levels to ensure stability.

(a) You also conduct experiments and analyze atomic properties of different materials to find optimal conditions for safety.
(b) Explain the dangers of radiation leaks and how they can be minimized
(c) Explain how the process can be used in generation of electricity.

ITEM 2

A man attended a live concert of his favorite band at a large outdoor venue which was near from the tall building. He noticed sound of the band returning from the building and heard it after 6 seconds when original is produced. As the sun sets, the stage lights up with vibrant colors and the stage becomes the center of attention. The heavy bassline begins to thump through the speakers resonating throughout his body. The singers powerful voice fills the air as the crowd erupts with excitement. As he decided to enclose the stage his color of clothing changed

Hint

The stage was illuminated with blue, green and red lights
The man was wearing yellow shirt with blue strips and cyan trouser
Speed of sound in air $320ms^{-1}$
Task
As a learner of physics help the man to;

(a) Determine the distance from the band to the tall building
(b) Understand why the color of his clothing changed
(c) Prepare a write up about applications of reflection of sound to the community

ITEM 3

One of the most misunderstood branches of physics for many years has been space physics (Astronomy). Some of the examples of such misunderstandings include the following. The Catholic Church at one time thought that other heavenly bodies, including the sun, orbited around the earth, rather than the earth. This was the problem that Catholic hierarchy had with Galileo. For example, the Church tried and arrested Galileo Galilei for supporting Sun-centered view of the universe.

While watching the world cup which took place in Brazil in 2014 at 9pm East African time, the football fans watching the game in East Africa realized that it was still daytime in Brazil, some of them were puzzled by this?

While it snows (winter) in most European countries in December around Christmas season, the people in East Africa have never seen any snow fall in East Africa and some of them wondered why it is this way?

Task, as a learner of physics,

Write a report to the community on enlightenment about these astronomical events in order to promote deeper understanding of physics in the school and community at large.

SECTION B
PART I
Choose one item from this sections

ITEM 4

An engineer and his employee had a disagreement on the best type of simple machine to use when raising the tank of weight 600N the top of a raised platform on a building of height 12m. the machines available were a block and tackle pulley system of velocity ratio 5 and 36 m long requiring an effort of 250N and an inclined plane 244 m long requiring an effort of 400N. the tank was to be be used to supply cold water at 20^0 c to the rooms of clients to mix it with hot water of 80^0 c to attain the bathing temperature of water at 35^0 c

Hint

Each heater in every room boils 2.5 liters of water

Specific heat capacity of water is 4200J/kg/K

Density of water 1000kg/m^3

Task

As a learner of physics

(a) Analysis the information and use it to settle the disagreement
(b) Help the engineer to determine the amount of cold water that will be supplied to clients

ITEM 5

Conrad is required to prepare a bath for his younger brother Alex. According to the advice got from his mother, the bath should be between 40^o c and 42^o c. Conrad however has 2 liters of hot water at 100^o c and 6 liters of cold water at 20^o c. All that Conrad has to do is mixing in an aluminum pan of mass 3.5 kg and specific heat capacity 660J/kg/k.

As a learner of physics

Help Conrad to establish and inform his mother whether the water is warm enough for Alex to bath.

In what ways would you prevent the water from cooling very fast

Help Conrad to understand why water is used as a coolant in engines

Use

Density of water $1000kgm^{-3}$

Specific heat capacity of water $4200jkg^{-1}k^{-1}$

Acceleration due to gravity $10ms^{-2}$

PART II:
Choose one item from this part

ITEM 6

During an evening down pour, a sharp flash occupied with loud sound were witnessed. As a result the whole village experienced a total blackout. Later it was discovered that a transformer had been damaged by the sharp flash. The village organized a meeting to solicit funds to purchase a new transformer. In attendance was the area Member of Parliament who promised the members that he was to purchase a device which can safeguard the transformer against other damages from such a flash. People wondered how the device can protect a transformer. After two weeks the funds were realized and a committee was selected to go to town and buy the new transformer. The transformer dealer presented to the committee a transformer which supplies 12 V when connected to 240 V mains supply and it takes a current of 1.1 A from the mains when used to light ten 12 V, 24W lamps in parallel. The convinced the buyers that the transformer had an efficiency of at least 96%. They were not sure of how the dealer arrived at the value.

Task

Using knowledge of physics,

(a) Find out whether the trader was trustworthy when he stated the above value
(b) Sensitize the community on how the device would safeguard the transformer against such destruction

Item 7

A certain family in your community was using monthly bill of electricity (analog). Beginning with this year they complained of being cheated by UMEME officials like overcharging. The family members decided to submit their complaint to UMEME main offices to revisit their home and analyses electricity usage however some other family members had proposed to switch to prepaid payment of electricity (Yaka) but they refused. The UMEME official reported that each month the family consumes electricity equivalent to amount of shs 650,000/=

The information below shows electric appliance in the house and their usage

Appliance	Power rating	Time switched on per day
Refrigerator	5000W	24 hours
Flat iron	600W	2 hours
Blender	750W	45 minutes
5 electric lamps	50W@	10 hours
Oven	5000W	$3\frac{1}{2}$ hours
Television	150W	14 hours

Hint each unit of electricity costs shillings 800/=

TASK;

As a learner of physics help the family,

(a) Determine whether it was cheated by UMEME officials
(b) Prepare a write about advantages of prepaid method of paying electricity over analog

END