535/1
PHYSICS
Paper 1
July - August 2024
2½ hours

KAMSSA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

PHYSICS

Theory

Paper 1

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 booklets provided.*

SECTION A

Answer all the items from this section

ITEM 1

A student putting on a blue shirt and a yellow trouser stand between two vertical walls. He makes a loud sound while seeking for help. He hears the first echo after 2 seconds and the second echo after a further 3 seconds. Three members of the rescue team arrived to help. Each of them had a torch producing red, green and white light. The colors of his shirt and trouser changed when light was shone on him at a time. This brought confusion among these students.

Hint: speed of sound in air = $330ms^{-1}$.

Task

As a learner of physics, help these students to understand;

(a) The origin of the two echoes.

(b) The distance between the walls.

(c) Why the color of the student's clothes changed when colored lights flashed on them.

ITEM 2

An archeologist discovered a material in the field. He got the sample of it which was monitored using a Geiger muller tube and the following data was obtained.

Count rate (counts per minute)	800	500	350	200	80	25
Time (minutes)	0.0	1.0	1.8	3.0	5.0	7.5

He did not know if this material was radioactive until he got the above data. He had just handled the sample with bare hands thinking it was safe.

Task

As a physics student;

a) Help the archeologist to know the half-life of the material.

b) Help the archeologist to know the possible health hazards he is likely to face since he handled the sample with bare hands.

c) Advise the archeologist on how to handle such materials in future.

ITEM 3

In 2014, Brazil hosted FIFA world cup where different countries participated in the tournament. Some countries such as Uganda did not qualify for the tournament and hence had to watch the matches live on their TV screens. In one of the games, it was evident that it was day time in Brazil yet in Uganda it was night time which puzzled John as he was watching the game live on TV, during the same period of world cup tournament (12^{th} June to 13^{th} July of 2014) it was winter in Brazil which weather affected some of the participant nations in the tournament.

More support information

At John's home there was a satellite DSTV dish.

Task

Using physics knowledge;

a) Help John understand the cause of night in one country for which it can be daytime in another country.

b) Explain the cause of variations in seasons.
c) Explain how communication was possible in this situation.

SECTION B
PART I
Attempt one item from this part

ITEM 4

A young man is planning to build his first house in life. He has no experience in construction work. He approaches an engineer who recommends him to buy the following materials for the foundation of the house:

- Steel bars (Hollow type)
- Dump proof course
- Clay bricks
- Cement
- Gravel

After construction of the foundation, he has to hire a casual worker who uses a force of 80N to push 50kg of soil along a piece of timbre which is 15m long to fill the foundation with soil. The height of the foundation is 2m from ground. The young man complains that these materials are many and some of them should be removed.

Using the knowledge of physics.

a) Explain to the young man why
   (i) Damp proof course is important in this work.
   (ii) Hollow steel bars are necessary
b) Advise the man on how the foundation should be made stronger and stable.
c) Determine the efficiency of the system used to fill the foundation with soil.

ITEM 5

A person has hosted five visitors at his home who are to stay for a night. He has started the process of preparing warm water for bathing. He has an electric kettle of capacity 5 litres. He switches on the electrical heater plugged in the kettle at its bottom and waits until water boils at 100^0C.then the heater switches off automatically. He now mixes this hot water with 20litres of cold water initially at 10^0C.

Support

Density of water = $1000kgm^{-3}$
Specific heat capacity of water = $4200Jkg^{-1}K^{-1}$

Task

As a physics learner;
(a) Advise the host if the temperature of the mixed water is not too high for water to burn the visitors given that the best bathing water should be at 15^0C.
(b) Suggest the number of liters to be used by each visitor if all of them are to use the same quantity of mixed water.
(c) Advise the person on how to keep this mixed water warm for a long time since all the visitors are to use the same bathroom one at a time. Explain your answer.

PART II

Attempt one item from this part

ITEM 6

A person wants to know how much money he should pay monthly after using the following appliances in his home. He has an electrical iron rated 240V, 1000W, a television set rated 240V, 50W, a fridge rated 240V, 100W and two computers each rated 240V, 50W. He switches on the appliances for two hours daily at once. He has to determine the size of the circuit breaker needed to keep these appliances safe.

Support: A unit of electricity costs Ugandan Shs.500

Task

As a physics student;

(a) Help the person to know his monthly bill

(b) Help the person to know the size of the circuit breaker needed and its importance

(c) Advise the best way of connecting the appliances for optimal use

ITEM 7

Small metal pieces are dangerous to be eaten by human beings. However, most of the ground nuts paste on market contain small pieces of these metals from old grinding machines made of iron. Each family is advised to have a mechanism of removing these metallic pieces.

Hint

You are provided with a nail, connecting wires of total resistance $1.6\,\Omega$, 2 dry cells each of e.m.f 1.5V and internal resistance $0.2\,\Omega$, a double cell holder and an insulated copper wire.

Task

As a physics student;

(a) Set up a mechanism for sorting the iron pieces from ground nuts.

(b) Comment on the effectiveness of the designed set up given that current of 2A is enough to create a strong magnet.

(c) Suggest how you can make this magnet stronger.

END