

535/1
PHYSICS
Paper 1
Jul./Aug. 2024
2 ½ hours



SENIOR EDUCATION CONSULTANTS (SEC) JOINT MOCK EXAMINATIONS, 2024

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 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 on the answer sheets provided.*

Turn Over

SECTION A

Answer all questions from this section

Item 1

- (a) During a Mathematics lesson in senior two which normally takes place in the school main hall, John one of the students has always been complaining that when he sits in front, he is unable to see letters on the chalkboard clearly, he always wants to seat at the back of the class but the teacher doesn't allow him to sit at the back thinking that he will not be attentive. Joan is also a student in this class, she found out that whenever the main hall was occupied by a few students, and noise was made, a lot of repeated sound was heard which is never heard when the main hall was full of students, this has always puzzled her.

TASK

As a physics student;

- (i) Explain to the Mathematics teacher and the entire class the reason why John is unable to see clearly when he sits in front of the class and what should be done to solve this problem..

(05 scores)

- (ii) Explain to Joan the cause of the repeated sounds when the hall is empty and the absence of repeated sound whenever the hall was full and how this problem would be resolved

(04 scores)

- (b) During one of the physics practical lesson light from air was made to strike the surface of a glass block of refractive index of 1.5 such that the incident light made an angle of 20° with the normal at the point of incidence but when it was viewed through the glass, light appeared to be moving in a different direction.

TASK:

As a physics student;

- (i) What physics term is given to this phenomenon and state the laws that govern it. **(04 scores)**
- (ii) Determine the angle which light makes with the normal below the air-glass interface. **(03 scores)**

Item 2

On a study tour, University students from the faculty of technology discovered a precious and rare mineral in a certain part of the country. The tour guide requested them to picked samples and do more research. They picked a few samples and when they reached at the University, they kept the samples in a store of one of the Laboratories where photographic plates are also stored. The mineral was checked on a particular day at various times and they made the following observations;

- All photographic plates had darkened.
- Its mass reduced spontaneously with time as shown below

Mass (g)	800	500	350	200	80	25
Time (min)	0	1.0	1.8	3.0	5.0	7.5

As a physics learner,

- (a) Support the view that the mineral is radioactive. **(02 scores)**
- (b) Draw a suitable graph for the data provided above in the table and use to estimate its half-life of the mineral. **(08 scores)**
- (c) Explain the best way of handling this rare mineral. **(04 scores)**
- (d) What are the dangers people in the community around the source of this rare mineral are likely to face. **(02 scores)**

Item 3

On a certain day at around 1:30pm while in the dining hall, learners watched heavy fog-rains and floods being experienced in a certain outside country on an international T.V live channel. To worsen matters, the floods were happening at night and this risked many natives as many of them were ambushed while asleep. Learners wondered how it would be night and seriously raining in an area yet it was day and the Sun was highly shinning at that time in their school.

Task:

As physics learner help the learners clear their queries about;

- (a) Occurrence of the floods in one area yet it was shining in their school at the same time. **(04 scores)**
- (b) Why it was night in that outside country yet it was day-time in their area? **(04 scores)**
- (c) How T.V signals broadcasted from where the floods were happening reached them. **(04 scores)**
- (d) Explain why the Earth is the only planet that supports life. **(04 scores)**

SECTION B

PART I

Answer **one** item from this part

Item 4.

Two men in a certain village are always contracted by people to dig pit latrines at their homes and in some community schools. They possess the following equipments to carry out their work; a hoe, a wheel barrow, a bow saw, a hammer, ropes, sisal strings, nails, pick axes, spades, plastic bucket a tape measure and a pulley system containing two pulleys in the upper block and one pulley in the lower block. As the pit deepens, a rope is tied on the bucket and it is lowered

down, filled with soil and pulled out to be emptied by use of the pulley system until the task is completed.

Hint. On average their bucket filled with soil weighs 12kg and the efficiency of the pulley system used is 80%

Task:

As a physics student,

- (a) Help the men to categorize any four of their machines in accordance to the class of levers you learnt where possible. **(04 scores)**
- (b) Draw a diagram of the pulley system they use showing how the strings are aligned in simplifying their work. **(03 scores)**
- (c) Determine the effort applied. **(05 scores)**
- (d) Explain to the men why the efficiency of their machine is less than 100% and suggest ways how they could increase its efficiency. **(04 scores)**

ITEM 5

Mary is a new mother who gave birth to a boy child in a certain village last month. When the Doctor was discharging Mary from the hospital, she advised her to bathe the baby with water at temperatures ranging from 35°C to 40°C to avoid skin burn of the new born child. Mary hired a car to take her home and on reaching home the driver requested Mary to help her with some water to cool down his engine whose temperature had risen high. Mary requested her maid to give the driver 5 litres of cold water which she did immediately but she noticed the driver pouring water in an object which was black in colour with small metal wires on its outer surface. When the maid asked the driver to let her know the name of the black object he told her that it was a radiator. Later on Mary requested the maid to boil 2 litres of water up to 70°C after which she mixed the hot water with 3 litres of cold water at 15°C in a basin of mass 3kg.



$$1 \text{ L} = 1 \text{ kg}$$

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HINT:

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

Specific heat capacity of the material of the basin = $400 \text{ J kg}^{-1} \text{ K}^{-1}$

Take 1 liter of water = 1 kg

Task

As a physics student;

- (a) Help Mary to know if the water has cooled to the required temperature as directed by the Doctor. (06 scores)
- (b) Explain the meaning of $4200 \text{ J kg}^{-1} \text{ K}^{-1}$. (02 scores)
- (c) Give reasons why the driver requested for cold water and not any other liquid to cool the car engine. (04 scores)
- (d) Help the maid to understand why the radiator was painted black and the purpose of the small metal wires. (04 scores)

SECTION B**PART II**

Answer one item from this part

Item 6

A certain household has a set of appliances as listed in the table below.

Appliance	Power rating	Duration of use
Flat iron	1500W	5 hours each week
Cooker	2500W	4 hours every day
4 electric lamps	20W each	13 hours every day
Electric fence of low resistance wire	2200W	10 hours every day

$$T.C = P(kw) \times T(hr) \times \text{unit cost}$$

The owner of the household while making a budget for how much money would be required every week to cater for the electricity bill, wondered how the sockets for those appliances would be connected to ensure high current flows and why low resistance instead of high resistance wire is used.

Hint; The owner only intends to spend sh.50000 on electricity every week and the unit of electricity is UGX 797

Use your knowledge of Physics to;

- (a) Determine if sh. 50000 would be enough to cater for the electricity bill for a week. **(08 scores)**
- (b) Explain how the sockets of the appliances should be connected to ensure maximum current flows. **(02 scores)**
- (c) Explain why low-resistance wires are used for the electric fence. **(02 scores)**
- (d) Suggest measures on how to reduce the electricity bill. **(04 scores)**

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 copper wire to 3000 turns around a soft iron ring on the receiving part and also to wind another copper wire to output end to give out 120V suitable for their work shop operations fixed in a box. However, the welders seem bothered of how this will be of help.

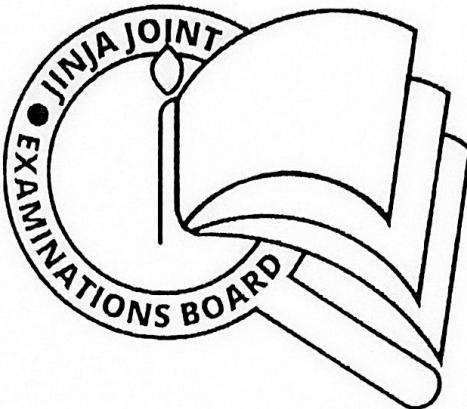
Task

As a learner of physics,

- (a) Help the welders to design the device according to the technician's prescription and explain to them how it will produce power corresponding to their Consumption. **(07 scores)**
- (b) Help the welder to determine the number of turns to be wound on the output part of the device. **(03 scores)**
- (c) Why did the technician prefer use of copper wires to other metals? **(02 scores)**
- (d) Advise the welders on how to improve the efficiency of the device. **(04 scores)**

END

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535/3/Inst. Sc.
PHYSICS
PRACTICAL
INSTRUCTIONS
Paper 3
JULY / AUGUST, 2024



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Uganda Certificate of Education

MOCK EXAMINATIONS – JULY / AUGUST, 2024

PHYSICS

PRACTICAL

INSTRUCTIONS

Paper 3

INSTRUCTIONS TO THE LABORATORY TECHNICIAN:

Great care should be taken that the information given below does not reach the candidates either directly or indirectly.

The candidates will be instructed not to write out a detailed description of the apparatus.

But the teacher responsible for preparing the apparatus must give details (on the report form attached) about some of the items of apparatus he/she has supplied. The form should be signed by the invigilator, the teacher responsible for preparing the apparatus and the Head teacher.

In addition to the apparatus in the lab, each candidate should be provided with:

Question One

- ✓ 1- Retort stand
- ✓ 1- Spring *Nullified type*
- ✓ 1 metre rule
- ✓ 6- Masses each 0.100kg

Question Two

- ✓ 1 – lens of focal length 15cm
- ✓ 1 – torch bulb in holder
- ✓ 2 – fresh dry cells
- ✓ 3 – connecting wires
- ✓ 1 – switch K
- ✓ 1 – Screen with a hole
- ✓ 1 – white screen
- ✓ 1 – metre rule

Question Three

- ✓ 7 – pieces of connecting wires
- ✓ 1 – switch K
- ✓ 1 – voltmeter (0 - 5V)
- ✓ 1 – Ammeter (0 – 1A)
- ✓ 2 – fresh dry cells 1.5V, size D in cell holders
- ✓ 1 – 1.0Ω resistor
- ✓ 2 – 2.0Ω resistors
- ✓ 1 – resistor labelled X (make a coil (SWG – 30) on a manilla paper with 1cm terminal left on either end) Mask the coil with cello tape to ensure that the coils do not overlap