

MUMSA HIGH SCHOOL MITYANA

END OF TERM TWO SENIOR FIVE

PHYSICS

Paper 1

Time: 2:15mins

INSTRUCTIONS TO CANDIDATES:

- Answer all questions in this paper
- Non-programmable scientific electronic calculators may be used.

SECTION A

ITEM 1

You are an electrical engineer designing power transmission cables. The equation used to calculate electrical resistance must be verified before selecting materials.

Task:

- Identify the fundamental and derived quantities related to electrical resistance.
- Use dimensional analysis to check the equation: $R = \frac{\rho l}{A}$ where R is resistance, ρ is resistivity, l is length, and A is cross-sectional area.
- Explain why using correct dimensions is essential in electrical circuit design.
- Discuss the risks of incorrect resistance calculations in electrical grids.

ITEM 2

You are a basketball coach analysing a **three-point shot**. A player releases the ball at **6 m/s** at an angle of **45°** from a height of **2.5 meters**. You need to determine if the ball will go through the hoop, which is **3.05 meters high** and **7 meters away**.

HINT: Acceleration due to gravity is 9.81ms^{-1}

Task:

- Calculate the **time of flight** of the basketball.
- Determine the **height of the ball** when it reaches the hoop.
- Explain how **shooting technique, ball spin, and angle** affect accuracy.
- Discuss ways players can improve their shooting precision.

SECTION B

ITEM 3

Uranium is one of the most valuable minerals because of it is used to generate energy in nuclear reactors. Uranium has two isotopes that is; $^{235}_{92}\text{U}$ and $^{238}_{92}\text{U}$ and the most commonly used isotope is $^{235}_{92}\text{U}$. So many governments want to shift from other sources of energy to nuclear energy.

$^{235}_{92}\text{U} + {}^1_0\text{n} \rightarrow {}^{95}_{42}\text{Mo} + {}^{139}_{35}\text{La} + 2{}^1_0\text{n} + 7{}^0_{-1}\text{e}$ is one of the typical equations that can be used to generate energy.

Task;

- (a) Define the term isotope.
- (b) Explain in details how uranium can be used to generate energy
- (c) What will Uganda gain and lose if it succeeds at using nuclear energy
- (d) Explain why **some radioactive isotopes remain hazardous** for thousands of years.
- (e) Suggest a practical method for storing nuclear waste safely.

ITEM 4

Peter told John that the specific heat capacity of water is $4200\text{JK}^{-1}\text{kg}^{-1}$. One of the methods to determine the specific heat capacity of liquid is using the continuous flow method. In an experiment to determine the specific heat capacity of the liquid using the above method, when water is passed through a continuous calorimeter at the rate of 100gmin^{-1} , the temperature rises from 16°C to 20°C , when the p.d across the heater is 20V and the current is 1.5A . when another liquid at 16°C is passed through the calorimeter at the rate of 120gmin^{-1} , the same temperature change is obtained at a p.d of 13V and current 1.2A .

Task;

- a) Explain to James what does $4200\text{JK}^{-1}\text{kg}^{-1}$ mean
- b) Explain why water is used as a coolant
- c) Determine the specific heat capacity of the liquid and the rate of heat loss to the surrounding
- d) Give the advantages and disadvantages of the above method.
- e) If a platinum resistance thermometer is used to determine the temperatures. Describe how the platinum resistance thermometer works in monitoring the temperature.

END

“things are harder tomorrow, better done today”