

KYOTERA TOWN SCHOOL

MID TERM II EXAMS S .3 PHYSICS TIME: 2 HOURS SECTION A (ATTEMPT ALL ITEMS) ITEM 1

Patience and Pius went outing during holidays. The two went where there was a Pool table. The two became interested to playing pool game. Patience was the first to play. During her time, she knocked one pool ball of mass 3 kg with an initial velocity of 5 ms^{-1} . The ball then moved and collided with another stationary ball of mass 2 kg. The two balls thereafter moved separately. The first ball moved with final velocity of 2.8 ms^{-1} and the second ball moved with final velocity of $V \text{ ms}^{-1}$. Pius also played the ball of mass 4 kg with initial velocity of 3.5 ms^{-1} . The ball then collided with another ball of mass 3 kg moving with initial speed of 6 ms^{-1} . the two balls moved together after collision with the same final velocity $V \text{ ms}^{-1}$. As they were cheering up, a friend told them that the pool balls they played moved elastically and inelastically while obeying law of conservation of momentum.

Tasks: As a physics learner;

- a) Help Patience and Pius identify the type of collisions that the pool balls moved with and state the principle of conservation of linear momentum.
- b) Support Patience and Pius to know the final velocities that the balls moved with after collisions.

In a certain village people collect water from the well for drinking and cooking. One day, a young girl from this village went to collect water from the well with her 20-liter jerrycan. When she deep her jerrycan in water, it was very difficult for the jerrycan to sink below the water surface. Afterwards when some amount of water enters the jerrycan, it was able to sink easily and the girl was able to collect the water for taking home. These two situations puzzle the young girl.

Task: As a physic learner,

- a) Explain to the young why she got difficulties at first and later the collected the water with ease.

ITEM 2

The mother developed a dental challenge but could not identify the exact tooth that should be extracted even after checking using her phone mirror. She decides to go the dental clinic. In the dental clinic, a small mirror was used and the tooth was easily identified. This made the mother to be more interested in the mirror and on checking, it had the following writings. Radius of curvature = 20 cm When she placed her face about 6.0 cm in front of the mirror, her face appeared different with bigger eyes and nose which left her wondering.

As a physics student,

- (a) Make use of a ray diagram to explain how the mirror in the clinic is different from the one at home and how it works.
- (b) Use a graph to support your explanation to the mother about the nature of the image of her face when she tried to look through it.

ITEM 3

During the midday heat of a scorching day, district engineers made a visit to a construction site situated near a primary school. However, one of the engineers expressed concern about a foul odor emanating from the primary school latrines. This prompted him to approach the school administrators, who admitted their lack of knowledge regarding the cause of the odor, attributing it to hot weather conditions beyond their control. A week later the engineers presented their findings:

- Some construction materials lacked sufficient mechanical properties.
- Carrying concrete on their heads posed a risk to the builder's safety. They urged them to continue using concrete however recommended reinforcing concrete for increased strength.
- A small material of the same type as the iron bars used at the site measuring 14cm in length, exhibited an extension of 0.3cm when subjected to a load of 20kg . This information caused confusion among the builders.

Hint: The diameter of the iron sample material was $3 \times 10^{-2}\text{mm}$, the recommended iron bars should have a Young's modulus of at least $4.0 \times 10^9\text{Nm}^{-1}$, acceleration due to gravity, $g = 10\text{ms}^{-2}$

Task

- Having acquired some physics knowledge, help
- a) The builders understand
- i). The emphasized mechanical properties highlighted in the report.
- ii. Why they urged them to continue using concrete, what it means by reinforcing concrete and suggest alternative methods for transporting concrete to higher floors.
- b) The builders evaluate whether the iron bars used were suitable for construction of such structures.
- c) The school administrators understand why the odor worsened only during hot days and provide strategies to minimize the odor.

SECTION B (ANSWER ANY ONE QUESTION) ITEM 4

James was sent by the director of studies to go and pick one box of chalk from the library. The box contained 150 pieces of chalk. Each piece of chalk has a radius of 2mm and a height of 7cm while the box measures 4m \times 3m \times 2m and weight of 120g. Unfortunately, when James was moving, he fell down and the box of chalk had to get broken by leaving $\frac{3}{4}$ of the total pieces into smaller pieces. The school instructed James to replace back the broken pieces of chalk. So what James did, had to go to the market and replace the broken chalk. Each piece of chalk costs UGX.50.

Task

Determine the;

- a) Maximum pressure that was exerted on the ground by the box.
- b) Minimum pressure that could have been exerted on the ground.
- c) Calculate the volume that was occupied by the $\frac{2}{3}$ of the total pieces of chalk
- d) Calculate the number of pieces chalk that were not broken
- e) Find how much did James pay for the broken pieces of chalk

ITEM 5

During a science project, learners are given two mirrors; a concave mirror of focal length 20cm and a convex mirror of focal length 20cm.

Task: As a learner of physics;

- (a) Help the students to determine which mirror forms a bigger image of a man of height 4cm standing 25 cm away from each of the mirror.
- (b) Write a brief report about the nature of image formed by each mirror (c)

Advise which mirror is suitable for use as driving mirror

“END”