

S3 END OF TERM TWO EXAMS

PHYSICS PAPER 1

TIME: 2 HOURS 15 MINUTES.

1. Imagine you are a diver diving in Lake Victoria, and you decide to explore a shipwreck resting on the lake floor at a depth of 5000 centimeters. As you descend, how does pressure change around you, and what factors do you need to consider to ensure your safety while exploring the shipwreck?



Calculate the amount of pressure that you will experience while at the floor bed of the lake.

(take the density of the water = 1000 kgm^{-3})

2. You are an optician working at a renowned eye clinic. Patients with various eye defects come to you seeking solutions to improve their vision. Nantumbwe visits your clinic complaining that when she sits at the back of the class, she clearly sees the work on the board but when she sits in front, she barely sees anything. She is seeking for clarification about the following;

- (a) Type of eye defect she is suffering from,
- (b) Cause of the eye defect
- (c) Type of lens she will have to use
- (d) Using diagrams, explain how the lens mentioned above can be used to correct the defect.

3. Imagine you are designing a system to lift heavy crates of weight 2000 N in a warehouse using pulleys. If the effort required is about 1000 N, and you have five pulleys available;

- (a) explain how would you strategically arrange and combine the pulleys to maximize the mechanical advantage and reduce the effort required to lift the crates? *You can use a diagram for illustration.*
- (b) Calculate the mechanical advantage of the pulley system that you have designed
- (c) Calculate its efficiency

4. You are a food and nutrition expert hosting a cooking class where you introduce various cooking techniques, the ideal cookware and how heat transfer plays a vital role in achieving delicious dishes.

As you demonstrate grilling techniques, a participant inquires about the factors influencing the cooking time for different dishes. Explain how conduction, convection, and radiation interact during the cooking of the dishes.

5. As you carry out your research using a convex lens of focal length 10 cm, the lens accidentally drops on the floor and gets broken. When you go to collect another convex lens, you realise that Mr. Ocen, the lab technician is not around. However, there is a box containing several convex and concave lenses of different focal lengths from which you have to pick a similar convex lens of focal length 10 cm.

(a) How would you differentiate between a convex and concave lenses from the box.

(b) Briefly describe a quick method of how you would determine the focal length of the lens that you want.

6. While walking around during in the Optics show room at Entebbe, Safina of height 2 metres was amused as she saw her images change in a big convex lens attached to a wall as she walked closer. She told her friend that she had seen a magic glass lens. One of the images that made her think of magic was the one where she saw an upside down magnified image of herself in the lens.

(a) If the focal length of the lens was 150 cm and Safina was at a distance of 200 cm in front of the lens, use a graphical method to draw a ray diagram showing Safina's image through the convex lens.

(b) Use your graph to describe the nature and position of Safina's image.

7. While travelling with her dad to the village on a hot day, Ritah noticed that there was a pool of water ahead of them. She advised her dad to change route but the dad didn't take up her advise because he was sure it was not a pool of water though didn't know how to explain to her. If you're travelling with them, help Ritah's dad to explain to Ritah what the seemingly pool of water was and how it is formed.

8. As its threatening to rain, your friend notices a beautiful pattern of colours in the sky. She shouts that she has seen a rainbow. However, she does not know how its formed. As a physics student, help explain to your friend how a rainbow is formed.

9. In a theater production, the lighting designer needs to create a specific mood on stage using light colors. How would they strategically mix different colored lights to achieve the desired atmosphere of secondary colours, white and black shades.

10. A traffic investigator is analyzing a car crash scene that involved collision of a heavy trailer moving at 30 km/hr with a stationary passenger van. After her investigations, she reported to the media journalists her findings as follows;

- (i) the trailer and its contents had a mass 3000kg and was travelling at a velocity of 50 km/hr just before it collided.
- (ii) The passenger van had a mass of 1000 kg
- (iii) The truck driver was not putting on the seat belts
- (iv) The driver of the trailer applied the brakes late, so he failed to stop the truck
- (v) The two travelled together after collision for a distance of 20 meters before they stopped.

As a physic student, help the traffic offoicer answer the following questions arising from the journalists.

- (a) Was the collision elastic or inelastic?
- (b) Calculate the velocity of the two vehicles after collision
- (c) What was the danger of not putting on seat belts
- (d) Why was it difficult to stop the heavy truck after applying the brakes
- (e) Calculte the deceleration of the two vehicles after they had collided.

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