



BLESSED VICTORS SS - BUWALULA

END OF YEAR ASSESSMENT 2025

S5 PHYSICS

Paper 2

Time: 2 hours

Attempt only (3) items

Item 1:

In a certain village, a mechanic aligns a convex and a plane mirror coaxially. He placed an illuminated bulb 30 cm from the convex mirror and 20 cm from the plane mirror, which blocks half the convex mirror aperture. The images coincide without parallax.

A barber uses a concave mirror, a driver checks his side mirror, and a teacher reflects a laser beam with his mirror.

A girl placed a pin 22cm from a concave mirror and it coincided with its image. She then poured kerosene into a concave mirror to a depth of 2cm and the image formed coincided with its object at 16 cm from the top surface of kerosene.

Her brother places a coin under three layers ie glass (3 cm thick), water (4 cm thick, $n=1.33$), and oil (2 cm thick, $n=1.4$). The coin appears shifted to 6.44cm from the top surface of oil. A monochromatic ray of light struck the glass from water at an angle of incidence 30° .

Task:

- Derive the relationship between the bulbs position, its image distance and focal length of the convex mirror assuming the bulb is point source of light. Hence calculate the focal length of the convex mirror.
- Explain how each mirror type helps the barber, driver, and teacher in their tasks.
- Determine the refractive index of kerosene and suggest possible errors in this experiment.
- Determine the lateral displacement of the ray in glass.

Item 2:

In Davula village, children play near the river early in the morning. Amina places two flat small shiny metal plates at an angle, X , to reflect sunlight onto a distant wall, noticing the beam turns twice before landing.

Nearby, Ssuna balances a pin on a stick and adjusts a small curved mirror until the pin's reflection seems to touch its tip, noting the distance carefully.

On a wooden table, a concave mirror of radius of curvature 48 cm enlarges a small pin three times the linear size of the object forming a virtual image at 30cm from the mirror. Curious, the children wonder how far to place this pin to get a magnified image.

Their grandmother sprinkled water into a shallow dish containing a small silver fish. As she moved her hand above and around the surface, the fish continued to track her movement, turning accordingly to follow her hand's position.

Task:

- a) Identify the reflection type with the metal plates.
- b) Relate the sunbeam's deviation to the plates' angle.
- c) Explain how Ssuna found the mirror's focal point.
- d) Calculate the object distance for the concave mirror.
- e) Explain why the fish can see her hand clearly.
- (f) Derive an expression for the deviation of a ray of light in a glass prism of small refracting angle, A and refractive index, n

Item 3:

In Katooke village, dark clouds gather and thunder shakes the sky. Three metallic spheres hang from a large tree, forming an equilateral triangle 5cm apart. As lightning flashes, the charged air around them induces charges on the spheres: $+2 \mu\text{C}$ on sphere A, $-3 \mu\text{C}$ on B, and $+4 \mu\text{C}$ on C. The villagers notice the spheres slightly attracting and repelling each other.

Nearby, Alinange combs his hair with a plastic comb; his hair stands up and bits of paper cling briefly after fell off.

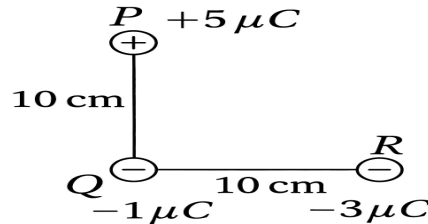
A metal rod at the top of a hut diverts lightning safely into the ground.

Task:

- (a) (i) State the law explaining force between charged spheres.
(ii) Calculate the net force on sphere A.
- (b) (i) Explain Alinange's hair and paper behavior.
(ii) How can the comb's sign of charge be detected using a Gold-Leaf Electroscope?
- (c) Describe how the metal rod protects the hut and suggest 3 dangers which may happen in absence of the metal rod. How can they be prevented?

Item 4:

In her school laboratory, Jovia sets up an experiment using two small metal spheres mounted on an insulated line. The sphere at point P carries a charge of $+5\mu\text{C}$, while the one at point R carries $-3\mu\text{C}$. Each sphere is 10 cm from a point Q, and the lines joining P and R to Q meet at a right angle (90°). A small charge of $-1\mu\text{C}$ is placed at Q, and later, the charge at P is moved to R. Afterwards, Jovia uses a gold-leaf electroscope to study how objects behave when they are balanced and carry no extra charge. She then attaches a sharp metal pin to the cap of a positively charged electroscope and observes the resulting changes. Through these experiments, Asha investigates how electric charges move, balance, and distribute.



Task:

- (a). Describe the law which affects the force between Jovia's charged spheres.
- (b). Explain how Jovia could show an object is neutral.
- (c). Calculate the energy change in moving the charge placed at P to R.
- (d). Predict what happens after adding the sharp metal pin.

S6 ENTRANCE EXAMS PHYSICS DEPARTMENT BVSS

Merry Christmas and a prosperous New Year 2026 @Alex BK

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