KAPROSS

S.3 MID TERM 2
PHYSICS (Theory)
Paper 2
2 hours

Instructions
Attempt all Items

ITEM 1

A group of eager high school students set off on an exciting study tour to explore the science and geography of their region. Their first stop was a massive dam in Jinja, a landmark they'd read about in class. As they approached, they marveled at its design. The dam's base was significantly larger than the top which was mind-blowing.

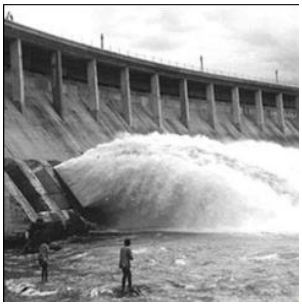


Fig 1. Dam

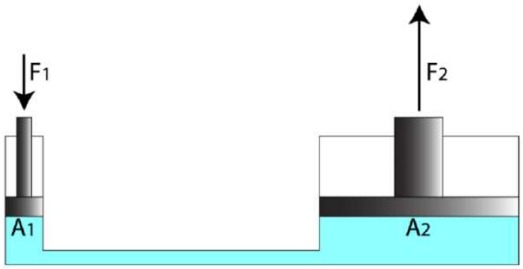


Fig 2. Hydraulic Press



Fig 3. Mt. Rwenzori

They headed to a cooking oil company in Kampala and noticed that hydraulic press was used in the process. They were told that they apply a force of 200N on a small piston of area $2m^2$ to light sucks of coconuts weighing 3tonnes. This was amazing!

The next day, the group geared up to climb the legendary Rwenzori Mountains found in the west. Two students, Alex and Ben, brought along a device they'd crafted just the day before in the school lab. Using the device, at the base of the mountain, they noted a reading of 73 cm Hg. As they climbed higher and higher, the number slowly dropped until it read 62 cm Hg. Both boys were amazed.

As they reached higher altitudes, A few students felt hungry and decided to make some instant noodles. However, much to their frustration, the water took long to boil, and the food took long to get ready. This was an unexpected and memorable lesson for the hungry students!

Meanwhile, Ben suddenly felt a light trickle from his nose—a nosebleed! And with this, they decided it was time to start heading back down.

However, at the icy top, a few students struggled to keep their balance on the slippery, frozen ground of ice. One of them, Lucy, was startled as her shoes started sinking slightly into the soft, icy surface. She laughed as she shouted, "My shoes are sinking!" as her friends helped her regain her balance.

Finally, back at their camp near the dam, some students took a dip in the chilly water to refresh after the long day. Emerging from the water, they wrapped themselves in shiny, silver thermal blankets provided by their teacher.

Exhausted yet exhilarated, the students gathered around the campfire to share what they'd learned.

TASK.

As a learner of physics,

a) Explain why the dam is made with such a unique design of a wide base at the bottom.
b) Determine the area of the larger piston that was used in lifting the sacks of coconut seeds.
c) Explain clearly how Ben and Alex made the device that was used to give different reading at different heights of the mountain.

d) If the density of air is 1.25 kgm^{-3} and that of mercury is 13600 kgm^{-3}, how far had they climbed the mountain?

e) Explain in detail the cause to the following occurrences.

i. The food students were cooking took a long time to get ready,

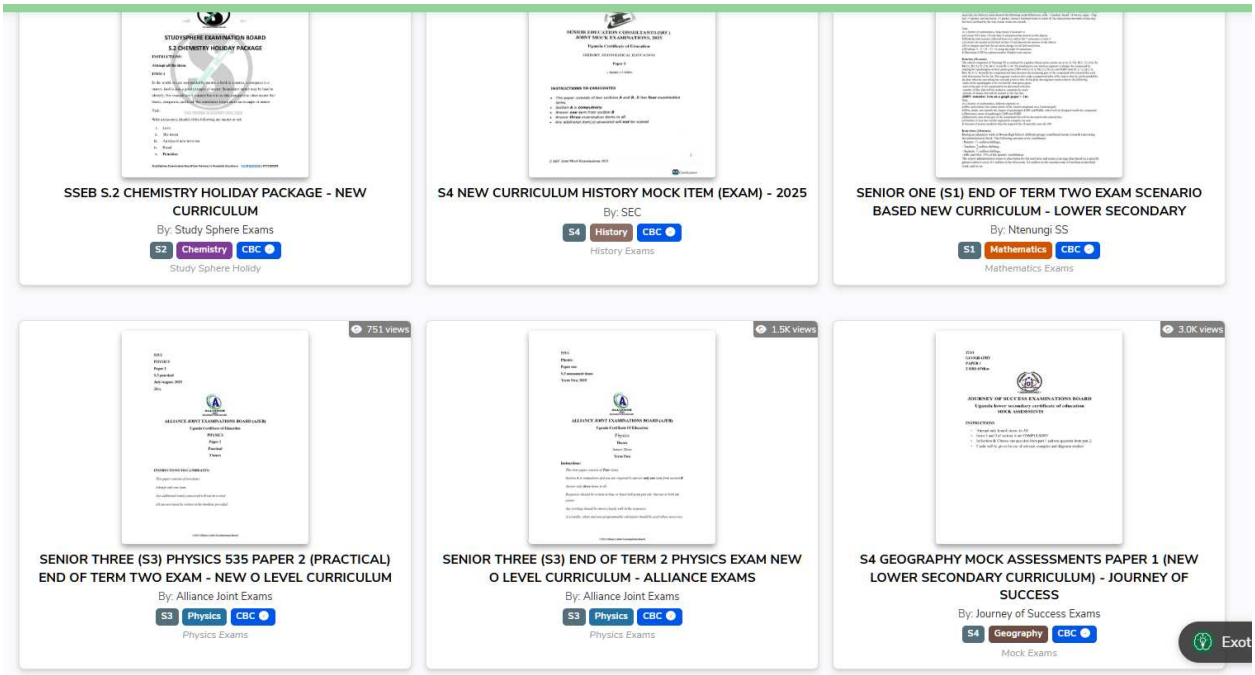
ii. Ben suddenly felt a light trickle from his nose, a nosebleed,

iii. Students wrapped themselves in shiny, silver thermal blankets after a dip bath.

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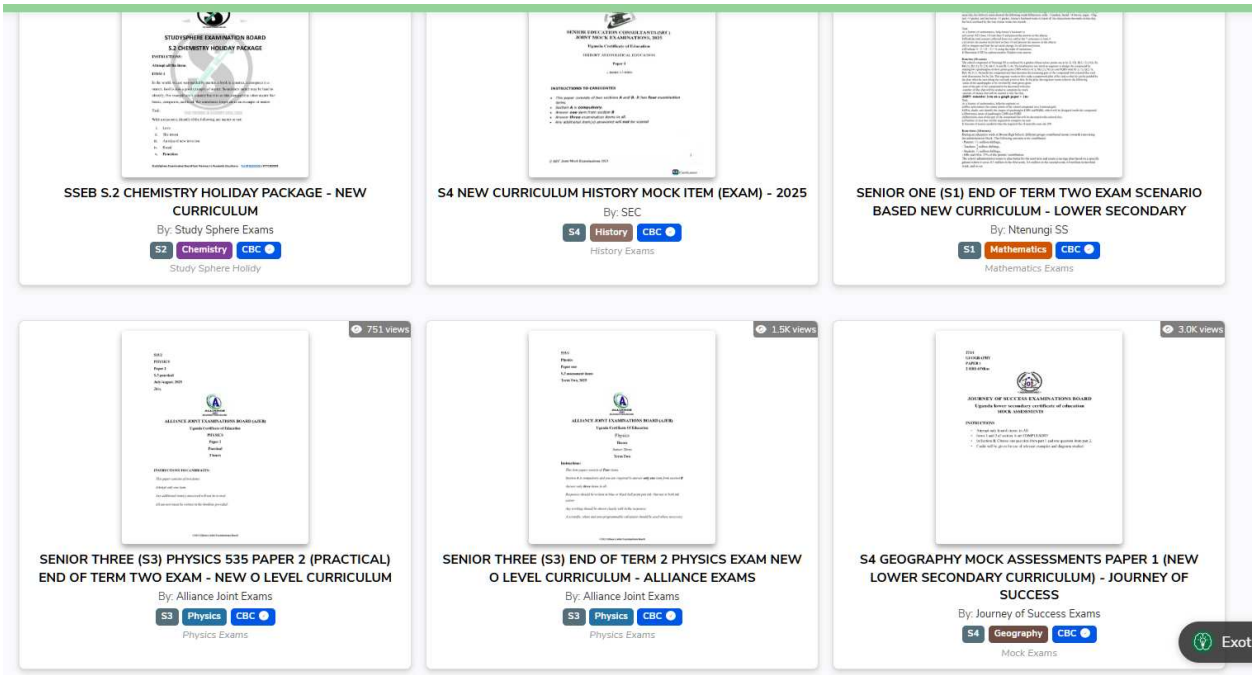
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