TROPICAL HIGH SCHOOL-IDUDI

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20 25

O'LEVEL PHYSICS SEMINAR ITEMS ON 14TH JUNE 2025

LIGHT AND WAVES

ITEM 1

An old man and his granddaughter were walking along a flat road on a hot day when going to hospital; they saw a sheet of water a short distance ahead of them which disappeared as they moved closer to it. The old man told his granddaughter that he has grown up seeing such and many other occurrences whose cause is unknown and no explanation can be given. On reaching the hospital, they saw a woman seated on the veranda of one building with a sick baby crying loudly but it was surprising to them to hear as if there was another baby crying from a nearby locked building. On close observation, sound of from the next could be received after 0.75s. The granddaughter wanted the old to estimate the distance between the buildings which he couldn't. You heard this old man and granddaughter conversing

Task : Use the physics knowledge to

(a) (i) Explain to them to understand the cause of the water seen.
(ii) Explain to them any **applications** of the cause of the above occurrence?
(b) (i) Explain to them the cause of the sound from the locked building.
(ii) Estimate the distance between the buildings in the hospital.

ELECTRICITY AND MAGNETISM

Item 2.

Moses has a radio that uses six dry cells. When his radio cannot produce good sound after using the cells for some time, he removes cells and puts them in the sunshine for some time. On fixing the cells back in the radio, it produces better sound for a while but Moses does not know why this happens. One day, while he had put the dry cells under sunshine, his children removed one of the cells and dismantled it. The children were surprised by the different parts they saw and were left wondering about the structure of the cell. When they shifted to a house with electricity, the radio was connected and it worked normally which left them wondering how possible this can be. There are 4 bulbs each of 25W in the house working for 10 hours a day and an electric kettle of 800W used for two hours a day and a unit of costs shs.900. But Moses wonders what cost of electricity will be each week.

Tasks:

(a) (i) Why would the radio produce a better sound whenever Moses fixed
(b) back the cells and can such defects be minimized at the time of manufacture?
(ii) Describe the structure of the cell and the functions of the different parts the children saw.
(c) (i) With aid of an illustration, explain to the family to understand how the radio was able to work when connected to electricity.

(ii) Help the family to understand the cost of electricity per week.

d) Explain how the loudspeaker in the radio works

HEAT AND MECHANICS

Item 3

Joseph, whose mass is 50kg, was driving on a flat road to his place of work and his car of mass 1870kg suddenly stopped because it had run out of fuel. He requested the men who were nearby to help him push the car up to the fuel station that was 100m ahead. As the men started while Joseph was in the driver's seat holding the steering wheel to control the car, the car could not easily move yet Joseph had not applied the brakes. This puzzled the men. When the men persisted with the pushing with increased force, the car eventually moved and the men pushed non-stop until it reached the fuel station in 4 minutes. On reaching the fuel station, Joseph had to apply brakes for the car to stop. After fueling the car, he realized that he was late and he started his vehicle accelerating at a rate of $5ms^{-2}$However, the men did not understand why Joseph had to first apply brakes for the car to stop.

Task:

(a) (i) Explain the men's puzzle.
(ii)Explain why the car stopped after applying the brakes.
(iii)Explain to Joseph to understand the force the engine of his car exerted while accelerating.
(b) Determine the power dissipated by the men.

Item 4

A minister had a flight to catch before 9:00a.m. She informed the head of security that they had to set off at 7:00a.m. and instructed him to design a travel plan so that she does not miss her flight. The head of security instructed the driver using the technical terms that, when they set off from the minister's home, the driver should **uniformly accelerate** the car and cover 10km in 15 minutes. After that time, the driver should maintain the **velocity** attained by the car for the next two-thirds of the total distance they have to cover and then **retard uniformly** up to the airport in half an hour. He shared the plan with minister and assured her that with that plan, they would take $1\frac{1}{2}$ hours to reach the airport. However, the driver did not tell the distance they were supposed to cover by maintaining the velocity attained by the car. The driver also wondered what the total distance was. The driver also has attendance of checking on the condition of the vehicle at the end of every journey but he has always wondered why rims always get warm.

Tasks :

a. (i) Determine the distance they were to cover by maintaining the velocity attained by the car.

(ii) If each liter of fuel covers 8km, explain to head of security to understand the quantity of fuel he needs for journey going and coming back home.

b. Explain the possible causes of the warmth of the rims

MORDERN PHYSICS

Item 5

A Local government decided to contract a company to construct a road through newly acquired land. During the excavation, a tractor removed a hard bone that appeared to be an animal but everyone wondered for how long it had stayed in the soil. The bone was later taken Laboratory for close analysis. Another section of the road has unusual soil particles. Some of these particles were picked and wrapped in a piece of paper and then placed in an aluminum container and then kept in a thin-walled Lead box. After 20 days, it was discovered that its mass had reduced by 3/4 of its original mass and all fluorescent materials kept in the same store were found glowing. This surprised everyone.

Hint

- The mass of carbon-14 in the bone is 5g
- Mass of carbon 14 in the bone of living animal =20g
- Half-life of carbon-14 is 5600years

Task

As a learner of physics

a) Explain to the people to understand the age of the bone

b) Explain to the people what these soil particles are likely to be

c) With reasons, advise the people in that place

Item 6.

It is established that a dairy company produces pasteurized milk that contains harmful bacteria. To ensure the effectiveness of the pasteurization process and monitor bacterial growth, the company adds a radioactive isotope tracer, Phosphorus-32 (P-32) to the milk. The tracer helps in tracking and ensuring that the bacteria are destroyed during the pasteurization process. However, P-32 is harmful for human consumption until its activity is reduced to a safe level. To monitor the activity of P-32 in the milk to safe levels, the company uses a Geiger Muller (GM) tube to measure the activity over time. The results obtained from the GM tube measurements are given in Table 1. Table 1: GM tube measurements.

Activity/counts per minute	22000	16000	11400	8200	5800	4000	3000	2400
Time (days)	0	2	4	6	8	10	12	14

Hint:

(i) Phosphorus becomes inactive after its activity goes below ***6000*** counts per minute

Task:
As a learner of physics,

a) Help the company to understand when the milk will be safe for human consumption.

b) Advise the company to understand the dangers that may be involved and how safe to guard themselves.

c) without the presence of the pasteurized milk, the GM-tube could still indicate some reading. Help the company owners to understand this.

d) The GM tube has failed to detect X-rays which has puzzled everyone. Help the company owners to understand this.

SATTELLITES AND COMMUNICATION

Item 7

Recently, your female friend enrolled in an Astrophysics course in one of the outside countries. After a few days of settling in, she called her parents in Uganda by 9 am local time in that country. However, in Uganda, it was 8 pm. Her parents had just received the news that the full moon had been sighted using satellite communication, indicating the start of fasting for the holy month. During the phone conversation, she mentioned that her first lecture was about the life cycle of a star. This interested the parents who wondered how a star could have a life cycle and they were also curious about the significant time difference between the two countries.

Task:
As a physics learner, help the parents to understand;

(a) What causes the differences in time between the two countries.

(b) The different phases of the moon.

(c) The life cycle of a star.

(d) How it is possible to talk to her parents

535/2 PHYSICS PRACTICAL PAPER

ITEM 8

In one of the schools, during project work, the S.4learners opted to make a reflecting telescope. All the other materials were available except the concave mirror of radius of curvature in the range of 18.0cm and 22.0cm inclusive. One of the learners bought a concave mirror but there was no label on it.

Task: you are provided with one concave mirror from the laboratory with similar properties like the one the learner bought, sensitize the S.4 learners whether to use it or not.

END