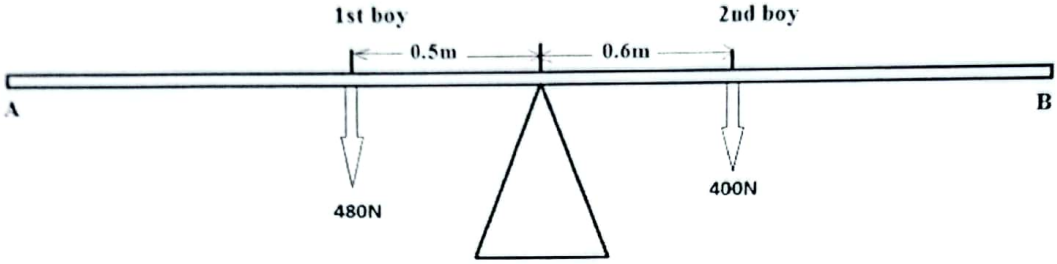
WAKISSHA JOINT EXAMINATIONS
SCORE GUIDE
End of year Assessment
Senior Three
November 2023
PHYSICS 1

1 = score

Item 1

The moment of a force = *Force* × *Perpendicular distance*



For equilibrium, sum of the clockwise moments is equal to the sum of anticlockwise moments

Sum of clockwise moments = $40 \times 10 \times 0.6 = 240Nm$
Sum of anticlockwise moments = $48 \times 10 \times 0.5 = 240Nm$
Equilibrium will be restored since the clockwise moment is equal to the anticlockwise moment.

Applications

i. Opening and closing a door
ii. Determining the weight of objects using a beam balance
iii. In cranes for lifting objects

With the boys off the beam, heating end B of the beam would cause the length of the beam to increase between the pivot and end B. However, the mass/weight of the beam will remain the same. Therefore, the beam will remain in the horizontal position implying that it is still under equilibrium.

12 scores

Item 2

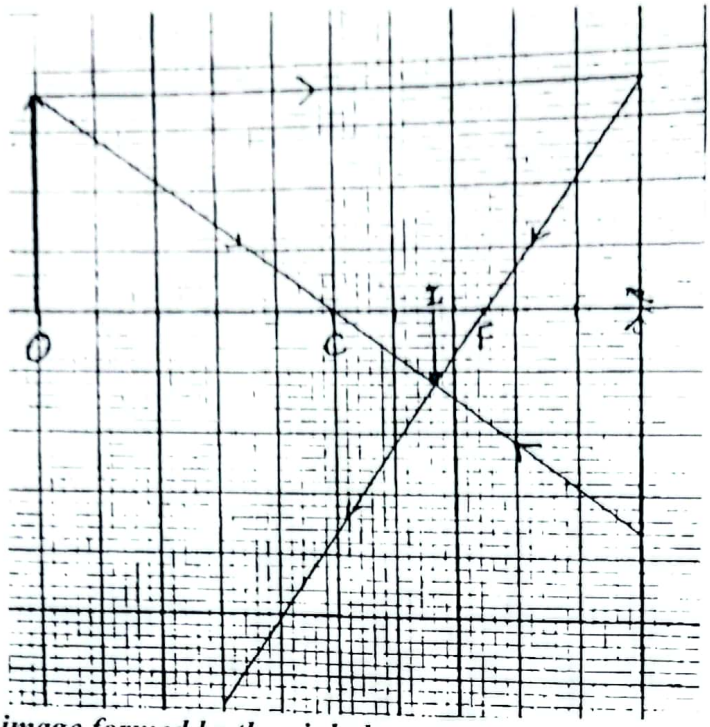
For the pinhole camera, $m = \frac{h_i}{h_o} = \frac{v}{u}$

$$m = \frac{0.5}{2} = 0.25$$

For the concave mirror, refer to the graph;

Scale: 1cm represents 20cm

$$m = \frac{v}{u} = \frac{66}{200} = 0.33$$



Nature of the image formed by the pinhole camera:
Real, inverted, diminished

Nature of the image formed by the pinhole camera:
Real, inverted, diminished

The effect of enlarging the pinhole
If the hole of the pinhole camera is made bigger, more light rays enter the camera forming overlapping images at the same point which makes it blurred. The brightness of the image increases but the image is not clear. This is because the bigger hole acts as a large number of pinholes each of which produces its own image.

12 scores

Item 3

For an echo, $speed\ of\ sound = \frac{2d}{t}$

For the woman; $d = \frac{s \times t}{2} = \frac{340 \times 4}{2} = 680m$

For the boy; $d = \frac{s \times t}{2} = \frac{340 \times 7.5}{2} = 1275m$

The distance between the boy and the woman = $1275m - 680m = 595m$

Alternatively :

$$d = \frac{s \times (t_1 - t_2)}{2} = \frac{340 \times (7.5 - 4)}{2} = \frac{340 \times 3.5}{2} = 595m$$

Sound travels faster in air if;
i. Temperature of the air increases
ii. Density of the air increases
iii. There is a wind blowing in the same direction as the sound.

Why it is easier for sound to travel at night than during the day.
During the day, the layers of air close to the ground are warmer than those above. So sound is refracted away from the ground. At night, the layers of air close to the ground are cooler than those above. So sound is refracted towards the ground. This makes the sound produced to travel a longer distance at night than during the day.

12 scores

Item 4

Heat supplied by hot water = Heat gained by sauce pan + Cold water

$$m_w c_w(100-\theta) = m_p c_p(\theta-20) + m_c c_c(\theta-20)$$
$$2\times 4200(100-\theta) = 3.5\times 650(\theta-20) + 6\times 4200(\theta-20)$$
$$8400(100-\theta) = 2275(\theta-20) + 25200(\theta-20)$$
$$840000 - 8400\theta = 27475(\theta-20)$$
$$840000 - 8400\theta = 27475\theta - 549500$$
$$1389500 = 35875\theta$$
$$\theta = 38.7^oC$$

The water was not warm enough for Alex to bathe.

To decrease the rate of cooling of water;

i. Lag the container with cotton wool/ felt jacket
ii. Cover the container with a plastic lid
iii. Use plastic containers to hold the liquid

Why water is used as a coolant

Water is used as a coolant in an engine because it has a high heat capacity and therefore draws a lot of heat from an engine hence cooling the engine.

12 scores

Item 5

Various places were having different seasons. As a learner of Physics explain; why some places had day time while it was night time at other places, why different places had different weather patterns and how world-wide communication is made possible through satellites.

The cause of day and night

Day and night are due to the rotation of the earth on its axis. This rotation takes 24 hours. As the earth rotates different parts of the earth face the sun at different times. Those parts of the earth facing the sun experience day time while those parts facing away from the sun experience night time.

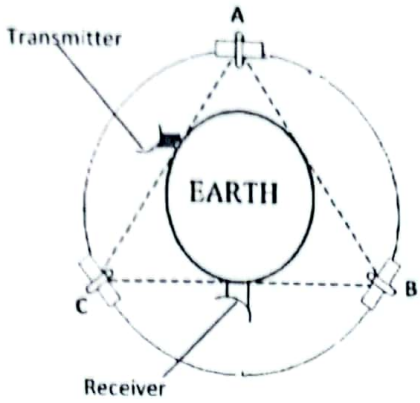
Variation in weather patterns

i. The earth is tilted about its axis. This causes different parts of the earth to receive different amounts of sunshine at different times of the year.
ii. Wind patterns; wind is a major factor in determining weather and climate patterns. As the wind moves, it carries with it heat, moisture, pollutants and pollens to places where it passes.
iii. Global warming as a result of increasing levels of carbon dioxide in the atmosphere.

How world-wide communication is made possible by the use of satellites

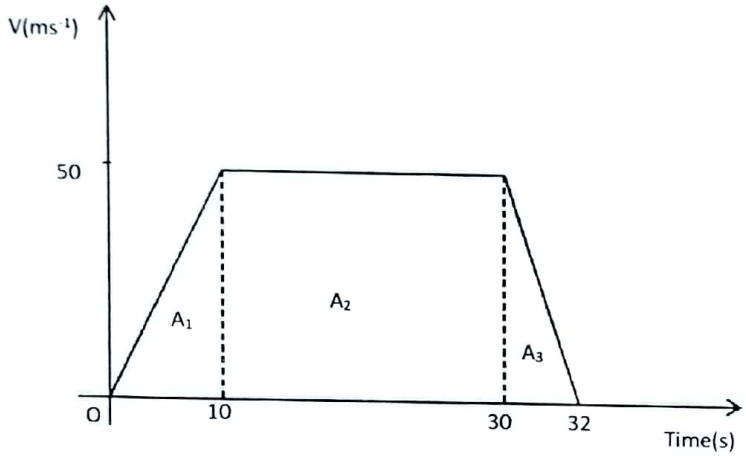
Communication is made possible through a network of satellites. At least 3 satellites are required to achieve world- wide communication between any two locations on earth. The satellites are placed in such a way that each pair subtends an angle of 120° at the centre of the earth.

12 scores



First, the transmitting station sends signals to satellite A which sends to satellite B and satellite B sends to satellite C. From satellite C, the signals are sent to the receiving station stations at different locations on the earth's surface.

Item 6



$$Average\ velocity = \frac{Total\ displacement}{Total\ time\ taken}$$

$$A_1 = \frac{1}{2}bh = \frac{1}{2} \times 10 \times 50 = 250m$$

$$A_2 = L \times w = 20 \times 50 = 1000m$$

$$A_3 = \frac{1}{2}bh = \frac{1}{2} \times 2 \times 50 = 50m$$

Total displacement = 250+1000+50 = 1300m

Alternative:

$$Total\ displacement = \frac{1}{2}h(a+b) = \frac{1}{2} \times 50 \times (20+32) = 1300m$$

$$Average\ velocity = \frac{1300m}{32} = 40.63ms^{-1}$$

- Yes, the average speed exceeds the town's speed limit.
- The deceleration: $\boldsymbol{a = \frac{v-u}{t} = \frac{0-50}{2} = -25ms^{-2}}$
- Initially, both the driver and the car are moving at the same velocity. When the car is suddenly brought to rest, the driver continues to move due to inertia. This is because the stopping force acts on the car but not the driver. This makes the driver to crash into the windscreen.
- The forward movement can be reduced by fastening seat belts.

END