

Submet

Item 7.

a) The electrician recommended against connecting the sockets in series because;

- If one appliance malfunctions or draws more current, it would affect the operation of the rest connected in series.
- A series arrangement (connection) would make it impossible to independently switch appliances on or off.
- A series connection would make it impossible for the appliances to operate at the same voltage.

Earthing the sockets is crucial for safety;

Earthing provides a low resistance path for fault currents to flow to the ground, preventing electric shock and protecting against damage to appliances in the event of a short circuit.

- In case of a fault, the current would flow through the earth wire instead of a person touching the appliance thus preventing injuries.

b)

Appliance	Power (kW)	Time (hr)	Units (kWh)
Cooker	2.9	(180 minutes) 3 hrs	8.7
10 bulbs	$\left(\frac{10 \times 40}{1000}\right)$ = 0.4	8	3.2
Heater	2.9	120 minutes (2 hr)	5.8

$$\begin{aligned}\text{Total units} &= 8.7 + 3.2 + 5.8 \\ &= 17.7 \text{ kWh daily.}\end{aligned}$$

For a week.

$$\begin{aligned}17.7 \times 7 \\ = 123.9 \text{ kWh.}\end{aligned}$$

Total cost of electricity every week.

$$\begin{aligned}123.9 \times 1000 \\ = \text{sh. } 123,900\end{aligned}$$

. The budgeted money of sh. 80,000 is insufficient since the the cost of electricity is sh. 123,900 every week.

c) Ways to reduce the electricity bill.

- Replace incandescent bulbs with LEDs.
- Reduce usage time.

- Use energy-efficient appliances.

- Regular maintenance to ensure appliances ~~xxx~~ operate at peak efficiency.

Item 3.

a)

i) cross-sectional area = 18380 cm^2 ,
height = 5.5 m .

Converting area to m^2 .

$$1 \text{ cm}^2 = \frac{1}{10000} \text{ m}^2$$

$$18380 \text{ cm}^2 = \frac{18380}{10000} = 1.838 \text{ m}^2$$

$$\begin{aligned}\text{Capacity of the tank} &= \text{C.S. area} \times \text{height} \\ &= 1.838 \times 5.5 \\ &= 10.109 \text{ m}^3.\end{aligned}$$

Either tank can store the required 10 m^3 of water as both have a capacity of 10.109 m^3 , which is greater than the required 10 m^3 .

ii) The ~~white~~^{black} tank would be better at keeping the water at the required temperature because it ~~reflects~~^{absorbs more} heat from sunlight which can then be transferred to the water inside unlike the white tank which will instead reflect the solar energy hence allowing cooling down of water as quickly as possible.

Item 2.

a) - I choose a glass prism over a plane mirror.

- Glass prisms use total internal reflection within them which results into;

✓ brighter and clearer images - than - those of plane mirrors.

✓ Glass prisms are durable compared to plane mirrors.

c) Differences between regular light bulb and laser.

Regular light bulb

laser bulb

- Emits light in all directions

- Emits light in one direction.

- Emits light of different wavelengths

- Emits light of a specific wave length

- Light from the bulb is incoherent.

- Laser light is coherent.

d)

$$\lambda = 5.32 \times 10^{-11} \text{ m}, \quad v = 3 \times 10^8 \text{ ms}^{-1}.$$

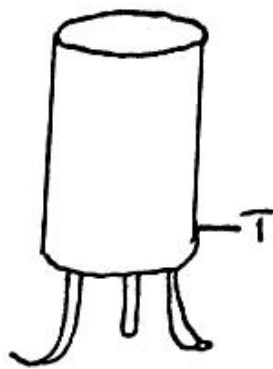
$$v = f \lambda.$$

$$f = \frac{3 \times 10^8}{5.32 \times 10^{-11}}$$

$$f = 5.64 \times 10^{18} \text{ Hz}.$$

The laser is not suitable for their needs since its frequency is greater than $6 \times 10^{14} \text{ Hz}$

b.)



ii) The tap, T should be placed near the bottom or slightly above the bottom to allow consistent flow of water without the need of excessive pressure.

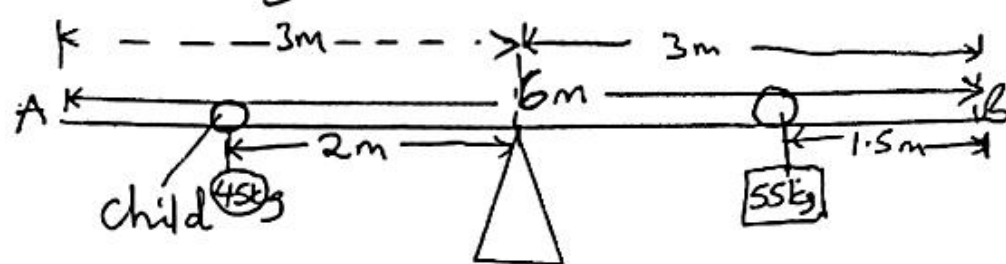
- This position also ensures consistent flow of water due to gravity since water flows downwards due to gravity.

- This position also allows the weight of the water above the tap to create pressure, pushing water out when the tap is opened.

c)

- To use a strong durable material for the stand e.g reinforced plastic or metal
- To ensure a wide, stable base to distribute the weight regularly.
- To add diagonals in the stands to ensure strength of the stands.

Hom 4. a)



A see-saw will balance when clockwise moment is equal to anticlockwise moment about the pivot.

$$\begin{aligned} & \text{Clockwise moment (for the worker)} \\ & F \times d \\ & = (55 \times 10) \times 1.5 \\ & = 825 \text{ Nm.} \end{aligned}$$

$$\begin{aligned} & \text{Anticlockwise moment (for the child)} \\ & F \times d \\ & = (45 \times 10) \times 2 \\ & = 900 \text{ Nm.} \end{aligned}$$

No, the see-saw ~~will~~^{would} not balance since clockwise moment is not equal to anticlockwise moment.

- b) — The worker to extend away from the pivot (towards end B).
— The children to move close to the pivot.
- c) Since the see-saw was black and a metal, and black (dark colours) absorb more solar radiation than lighter ones, the black paint on the see-saw absorbed a significant amount of heat causing it to heat up especially in the hot afternoon sun.

d) Measures of preventing overheating.

- Provide shade, to reduce the amount of direct sunlight the seesaw receives.
- Water the ground around the seesaw since evaporation of water can help cool the surrounding area.
- The manager could repaint the seesaw with a lighter colour which would then absorb less heat.