

MAZADITA PTH 1 UCE: 2024
PROPOSED RESPONSES BY GRANT-K.

ITEM 1

0702741835.

a)

- Stars have different colours due to their temperatures and different brightness due to their size, temperature and distance from Earth.

b) The shape of the moon varies due to its phases, which result from the changing positions of the Earth, moon and sun.

- As the moon orbits the Earth, different portions of its surface are illuminated by the sun leading to the appearance of various shapes, known as phases.

- The complete cycle of these phases takes approximately 29.5 days, which is why the shape of the moon keeps varying over a 28-day cycle.

c) Satellites equipped with ~~the~~ ~~stars~~ telescopes can observe stars from above the Earth's atmosphere which allows for clearer images without atmospheric distortion.

These, collect data across various wave lengths and analyse light for detailed information.

ITEM 3.

a)

Using $v = f\lambda$.

$$\lambda = 5.5 \text{ cm}$$

$$= 0.055 \text{ m.}$$

$$v = 330 \text{ m/s.}$$

$$\Rightarrow 330 = 0.055 f$$

$$f = 6000 \text{ Hz.}$$

Since 6000 Hz is within the range of audible sound but not excessively high, it is safe for short exposure. However continuous exposure at high volumes can still be harmful.

b) A convex mirror can be used and always mounted on castor wheels.

c) ^{Darker} ~~light~~ colours should be considered such as deep blue, dark gray or black to absorb more light and can create a darker atmosphere.

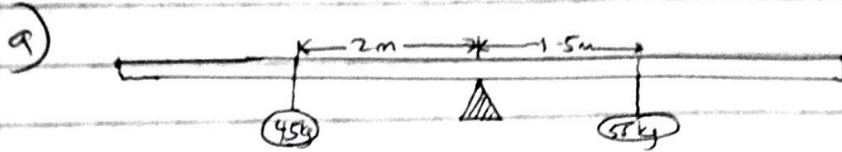
d) Causes of distortion

- echoes

- poor acoustics

To reduce distortion, the town council can implement sound-absorbing materials such as acoustic panels, carpets, curtains to minimize reflections and improve sound quality.

ITEM 4.



Calculating the moment of a child from the pivot

$$\text{Moment} = 450 \times 2 \\ = 900 \text{ Nm.}$$

calculating the moment of a ^{worker} ~~man~~ from the pivot

$$\text{moment} = 550 \times 1.5 \\ = 825 \text{ Nm.}$$

The see-saw will not balance, since their moments ^{from the pivot} are not equal.

b) The worker should move further away from the pivot to increase his moment.

c) The see-saw is made of metal and painted black. Black surfaces absorb more heat from the sun causing the see-saw to heat up.

d) - The manager can paint the see-saw with a lighter colour.

- The manager can use a different material that does not absorb as much heat.

- The manager can provide a shade over the see-saw.

ITEM 5.

- a) from 0°C to -10°C .
 -10°C to 0°C

$$Q_1 = mc\Delta\theta \rightarrow \text{Heat gained by ice}$$

$$= 0.05 \times 2100 \times (10)$$

$$= 10500 \text{ J.}$$

$$Q_2 = mL_f \rightarrow \text{Heat to melt ice.}$$

$$= 0.05 \times 340000$$

$$= 17000 \text{ J.}$$

Heat gained by ice + heat to melt ice = heat lost by water.

$$10500 + 17000 = 2 \times 4200 \times (24 - T)$$

$$27500 = 8400(24 - T)$$

$$27500 = 201600 - 8400T.$$

$$8400T = 174100$$

$$T = 20.7^{\circ}\text{C}.$$

Yes, the water cooled when mixed with ice, since the final temperature $T = 20.7^{\circ}\text{C}$ which is less than the initial temperature of the water of 24°C .

[Note that $2000\text{cm}^3 = 2\text{litres} = 2\text{kg}$].

- b) The ice cubes absorb heat from the water causing them to melt.

- c) Metal conducts heat better than plastic, causing the water in the metallic container to lose heat ~~transfer~~ faster.

4)

calculating the pressure exerted by each person.

$$A_{\text{man}} = 50\text{cm}^2 \\ = 0.005\text{m}^2$$

$$A_{\text{lady}} = 15\text{cm}^2 \\ = 0.0015\text{m}^2$$

If they have the same mass, they have the ~~R~~ same weight (force)

$$\text{from } P = \frac{F}{A}$$

P_{man} is less than that of the lady since the area of contact of the man's shoes is bigger than that of the lady's shoes. This will make the lady's shoes to sink in the mud since they exert higher pressure than those of the man.

ITEM 6.

- a) The electric bell operates on the principle of electromagnetism.
- When the switch is pressed, an electric current flows through the circuit.
 - This current passes thru a coil of wire wrapped around a piece of iron, creating a magnetic field.
 - The magnetic field attracts a metal armature that is connected to a bell.
 - As the armature moves, it strikes the bell, producing sound.
 - When the armature moves away from the coil, the circuit is broken, stopping the current and the sound.
 - The spring then returns the armature to its original position, allowing the process to repeat as long as the switch is pressed (on).

b)

- The piece of iron serves as a core of the electromagnet.
- When the electric current flows through the coil, the iron core becomes magnetised, enhancing the magnetic field produced by the coil.
- Iron also magnetises easily and demagnetises easily.
- The increased magnetic strength allows for a stronger attraction of the armature.

c)

- The electric bell is designed to operate at 240V.
- If connected to a 120V supply, the current flowing through the bell would be reduced. ~~and~~
- A reduction in voltage leads to a decrease in the power output of the bell resulting into insufficient magnetic force to effectively operate the bell.
- Consequently the bell may not ring at all or produce a very weak sound.

d)

- Increase the voltage supply to the rated voltage of 240V.
- Use a larger bell or a bell made of a material that resonates better to amplify the sound.
- Adjust the distance between the armature and the bell to optimize the striking force.
- Ensure that the bell is securely mounted to minimize vibrations that could absorb sound energy.

ITEM 7

a) The voltage is changed using a transformer.

A transformer can either step up or step down voltage levels while maintaining power.

b) - Thick aluminium wires are used because they have a lower resistance than the thinner ones.

A lower resistance reduces the amount of heat generated during transmission which minimises energy losses due to the heating effect.

- Aluminium is also cost-effective making it a suitable choice for long distance power transmission.

c) Power ^(from) at the power station.

$$P = VI$$

$$P = (13 \times 1000) \times 0.05$$

$$P = 650 \text{ W.}$$

Calculating the current that reaches the appliance.

A house has 240V.

Using $P = VI$

$$650 = 240I$$

$$I = 2.7 \text{ A.}$$

The appliance will not work since 2.7A is less than the required current of 15A of the appliance.

d)

- Use thicker wires to reduce resistance.
- Increase transmission voltage further to reduce current.
- Improve transformer efficiency to reduce energy lost during voltage conversion.