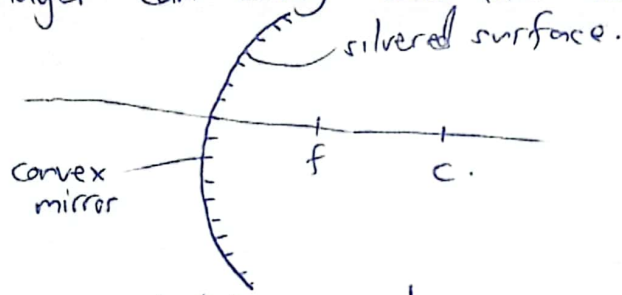


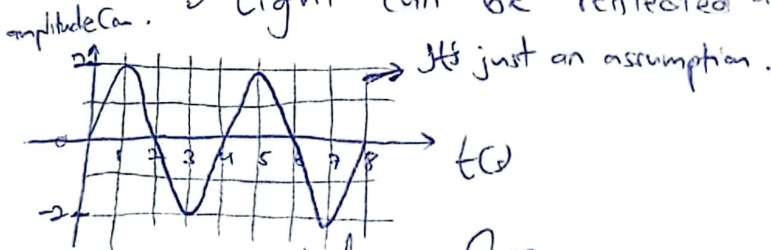
QUESTION

(a) A spherical glass material is cut

- (a) - A spherical glass material is got and it is cut into parts desired size and shape using a machine.
- The cut glass is then coated with a thin layer of pure silver using a process called electroplating.
- A layer of copper is then applied over the silver layer to protect it from tarnishing.
- The glass is then heated, molded into a convex shape using a machine and polished to remove any imperfections.
- The convex mirror made is then framed with a metal or plastic rim to give it a finished look.
- It is then fixed at a position near the fridge and the manager can easily view the activities of the customers.



- (b) Properties are;
- ✓ Light is a transverse wave
 - ✓ It travels in a straight line
 - ✓ Light travels through a vacuum.
 - ✓ Light can be reflected and refracted. ∴



Amplitude = 2m.

frequency, $f = \frac{1}{T}$ OR $f = \frac{1}{T}$ But $T = 4s$
 $f = \frac{1}{4} = \frac{1}{4} \text{ Hz}$ $f = \frac{1}{4} \text{ Hz}$

from $v = f\lambda$

$\lambda = \frac{v}{f}$

$\lambda = \frac{3 \times 10^8}{\frac{1}{4}}$

$\lambda = 1.2 \times 10^9 \text{ m}$

(a) Medical uses:

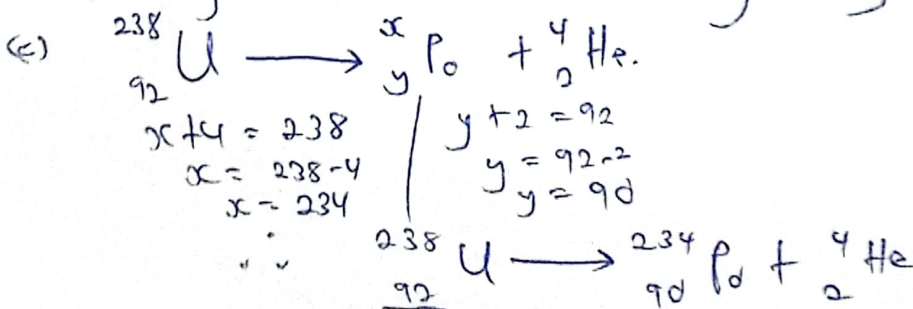
- ✓ Used to sterilize medical surgical equipments. Here, the equipments are cleaned and washed, disassembled (if possible), wrapped in sterilization containers and gamma radiation is applied on the equipments killing the germs.
- ✓ Used in radiotherapy for example in detection of fractures in bones. The part with the broken bone is put in an X-ray scanner, the X-rays are absorbed by the flesh and on reaching the bone, they are absorbed and an image of the fractured bone is formed on a photographic plate.

Industrial uses:

- ✓ Used in industrial tracers for fluid flow and leakage detection in pipes. Here gamma rays can be used to detect the leakages.
- ✓ Used in generation of energy used for commercial use. Here, radioactive substances such as uranium disintegrate by a process known as nuclear fission releasing large amounts of energy.
- ✓ Used to detect faults in thickness of metal sheets in welded joints. In this case, gamma rays are used since they have a high penetrating power.

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- (b) ✓ To prevent death of people because some waste materials release poisonous gases which cause suffocation.
- ✓ To prevent low body resistance to normal diseases since the radiations they emit damage blood corpuscles (blood cells).
- ✓ To prevent genetic mutation caused by DNA replication and protein synthesis.
- ✓ To prevent skin burns because some radiations damage skin tissues and destroy body cells.



ITEM 3

(a) The difference in time by the time she called home was due to the revolution of the earth around the sun along its axis. A point directly facing the sun will experience day while the one on the other side of the earth will be experiencing night.

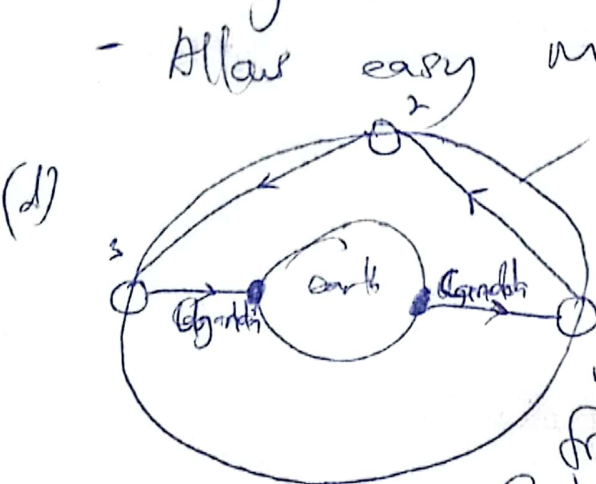
As the earth rotates, the point ceases to be directly under the sun hence becoming dark. At this time the other side of the earth will be experiencing day time.

(b) The rise and fall in water levels she observed was due to the occurrence of ocean tides.

High tides are caused by the moon's gravitational pull. This force causes the earth and its water to bulge out on the side closest to the moon and the side further from the moon making water levels to rise.

Low tides are caused by the sun's gravitational pull with the earth, and since the sun is stationary, the force is weak and hence water levels are fall.

- (c) - Generation of tidal energy for home consumption.
- fishing activities can take place.
- Allow easy movement of ships on oceans.



Phone signals are transmitted by the help of satellites. Satellites 1, 2 and 3 or more are put in parking orbit. Signals are to be transmitted from Canada to Uganda they are first transmitted from Canada to satellite 1 then from 1 to 2, from 2 to 3 and finally from 3 to Uganda.

TEXT 4

(i) total distance = 230 km.

ST = 4:00 am.

$v = 80 \text{ km hr}^{-1}$ rest = 30 minutes.

$u = 0 \text{ ms}^{-1}$

$$\begin{aligned} \text{total time} &= 8:30 \text{ am} - 4:00 \text{ am} \\ &= 4:30 \\ &= \underline{\underline{4.5 \text{ hours}}} \end{aligned}$$

$$\begin{aligned} \text{(ii) Average speed} &= \frac{\text{total distance covered}}{\text{total time taken.}} \\ &= \frac{230 \text{ km}}{4.5 \text{ hr.}} \\ &= \underline{\underline{51\frac{1}{3} \text{ km hr}^{-1}}} \end{aligned}$$

(iii) The brake pads felt hot due to because of the heat produced due to friction force between the pads and the tyre.

$$\text{(iv) } m_p c_p \Delta\theta = \frac{1}{2} m v^2$$

$$2.5 \times 4000 \times \Delta\theta = \frac{1}{2} \times 2 \times 1000 \times 80^2$$

$$10,000 \Delta\theta = 6,400,000.$$

$$\Delta\theta = \underline{\underline{640^\circ\text{C}}}$$

Assumption:

All the kinetic energy of the car is converted to heat energy.

(b) - The truck driver should avoid overloading his truck to increase on the stability of the truck on the road.
The truck driver should avoid driving the truck at high speeds on such slippery roads.

QUESTION 5

(a) (i) Heat lost by hot water = Heat gained by cold water
 $m_h c_w (\theta_1 - \theta_f) = m_c c_w (\theta_f - \theta_2)$

But $m_h = ?$

~~By conservation of energy~~ $m_c = 2L$ But $1L = 1kg = 2kg$

$$\theta_2 = 20^\circ C$$

$$\theta_1 = 90^\circ C$$

$$\theta_f = 30^\circ C$$

$$m_h \times 4200 \times (90 - 30) = 2 \times 4200 \times (30 - 20)$$

$$m_h = \frac{2 \times 4200 \times 10}{4200 \times 60}$$

$$m_h = 0.3333 kg$$

(ii) I will mix the cold water with 0.3333 kg of hot water.

Assumption: ✓ Heat lost by hot water is equal to heat gained by cold water.

✓ Heat gained by basin and that lost to the surrounding is negligible.

(ii) The flask was covered with a flask cover or cork to minimise heat loss by convection and conduction.

✓ The flask was also filled up with the hot water to minimise heat loss by convection.

✓ The flask's inner walls are silvered to minimise heat loss by radiation since silvered surfaces are bad emitters of heat.

✓ The flask also has a vacuum which minimises heat loss by convection and conduction.

- (b) The baby has a large surface area to volume ratio and therefore it can easily lose heat from its body. So covering the baby helps it to be warm since the lost heat is trapped in the cloth in which it is covered.
Also the baby has less body fats to insulate them and keep them warm.

ITEM 7.

- (a)(i) The fuse is connected in series to ensure that the entire circuit including the load (bulbs) and other appliances are protected from excessive currents and in this case, it just breaks the circuit.
Also connected in series so that it is easy replaced when it blows.

- (ii) Sockets are connected in parallel to ensure a constant voltage supply through each socket.
Also connected in parallel because if any socket is faulty it won't affect the other sockets reducing risk of electrical shock or fire.

(b) total amount of electricity used in a day

$$= \text{Amount used by a radio} + \text{Amount used by a TV set.}$$

$$= \left(\frac{500}{1000} \times 2 \right) + \left(\frac{80}{1000} \times 3 \right)$$

$$= 1.24 \text{ kWh.}$$

But 1 day uses 1.24 kWh.

$$30 \text{ days use } 30 \times 1.24 \\ = 37.2 \text{ kWh.}$$

Then after you multiply the 37.2 kWh with the cost of each unit.

3) He can use a step down transformer. It consists of two coils (a primary coil and a secondary coil).

The high voltage from the factory line is received by the primary coil and as a result, a magnetic field is created around it.

This created field keeps on changing and it is induced in the secondary coil. In this case, the number of primary coils is greater than the number of secondary coils.

As a result, the voltage from the factory line is reduced and it is efficient for home use.

AC 220V