KAMSSA EOT 1 2024 S.4 PHYSICS PAPER 1 SCORING GUIDE

ITEM 1(a)

- By investing in backup power system
- Suggest using energy efficient equipment and appliances
- Advised them to adopt energy conservation practices as turning off unnecessary light and equipments.
- Collaboration among the business men to buy a shared generator
- Stay informed about local energy policies and initiatives
- Encourage them to use solar energy especially during power cuts.

(b)

- By encouraging the business men to switch off non critical electricity usage
- The government should advocate for infrastructural development
- Expand the grid to reach newly developed areas
- Deploy energy storage system such as batteries to store excess electricity
- Implement microgrids in specific areas to decentralize power generation and distribution
- Incorporate renewable energy sources like wind, solar etc
- Upgrade the existing infrastructure by increasing the capacity of powerlines, transformers. Etc

ITEM 2

- Obtain uranium or plutonium, which are the primary fuel used in nuclear reactors
- Place the fuel rods within the reactor core, where controlled nuclear fission reactions occur
- The energy released during nuclear is used to generate steam
- The heat is transferred to water turning it into steam
- The steam is then pressurized to high temperatures
- This pressurized steam is directed to turbine blades causing them spin
- The spinning turbine is connected to a generator which converts the mechanical energy into electrical energy
- The generated is then distributed through the grid system to home, business and industries

(b) Arguments for nuclear power

- Low greenhouse gas emission
- High energy density
- Reliable
- Cost competitive with other forms of energy
- Arguments against nuclear power.
- Risk of proliferation (making of nuclear weapons)
- High initial costs
- It generates radioactive wastes that are dangerous four years

ITEM 3(a) Materials

- A transparent container filled with water
- A source of light (white light source)
- A glass prism
- A dark room

Experimental set-up

- Fill the transparent container with water
- Put the white light source on side of the container
- Place the prism or glass of water in the path of light
- Make sure the room is dark so that the rainbow colors are seen
- Adjust the angle of the prism or glass until you see a rain bow spectrum projected on the screen

(b) To relate the observation to the concept of color, the student could explain;

- Dispersion of light
- How the arrangement of colors in the rain bow is due to the specific angles of refraction.
- The role of rain drops in rain bow formation
- How white light is composed of different colors
- The phenomenon of refraction

ITEM 4. Heat absorbed during freezing

$Q_{freeze} = M_w C_w (0 - {}^{-}26)$
$= 2.5 \times 4200 \times 26$
$= 273000J$

Heat absorbed during temperature drop when frozen

$Q_{drop} = M_w C_W ({}^{-}26 - 96)$
$= 2.5 \text{ X } 4200 \text{ X } -122$
$= -1{,}287{,}000J$

Total heat absorbed during transportation

$Q_{total} = Q_{freez} + Q_{drop}$
$= 273{,}000J - 1{,}287{,}000J$
$= -1{,}014{,}000J$

But heat lost by water and vaccine is 2000000J and the heat absorbed during transportation is -1014000J

Calculating heat capacity from the formula.

$Q_{total} = MC\theta$
$-1{,}014{,}000 = MC\ (96 — 26)$
$C = -\frac{-1{,}014{,}000}{2.5 \times 122}$
$= -3{,}321.31 Jkg^{-1}\,{}^{o}c^{-1}$

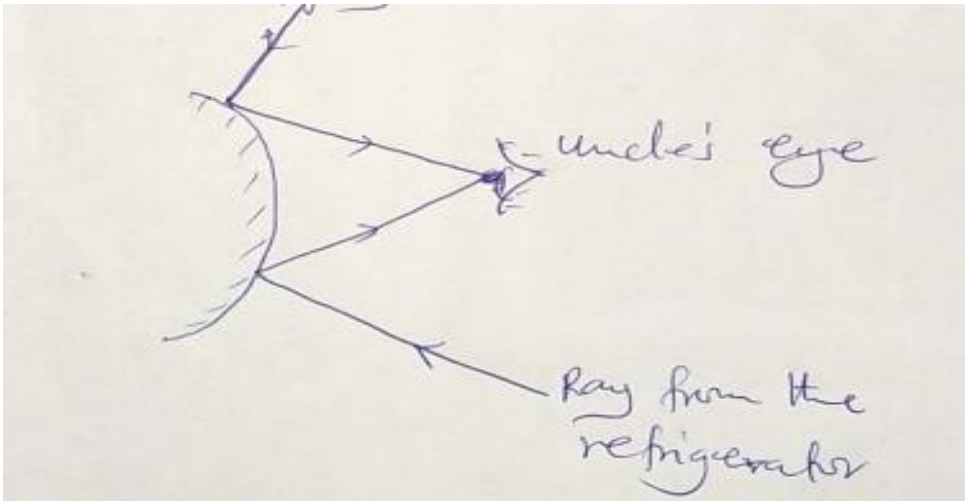
The negative shows heat loss

Let's determine whether the vaccine will reach it's effective
Time taken to reach Kigumba
Distance=speed x Time
200km= 80kn/hr x time
Time =2.5 hours

The temperature drop during this time
The temperature drops at 1^0C/min during transportation
Temperature drop =Rate x time
$=1^0$C/min x (2.5 x 60) min
$=150^0$C

Since the vaccines effective temperature range is from 96^0C to -26^0C and temperature drop during transportation is 150^0C, the vaccine will unfortunately not remain effective upon arrival at the health center.

ITEM 5
One could install a simple convex mirror strategically placed inside the shop near entrance. This mirror will provide your uncle with a wide-angle view of the area where the refrigerator is located outside the shop.
By glancing at the mirror, your uncle could easily monitor customers approaching the refrigerator and help deter theft or remind customers to pay their items before leaving.



Posting a small sign near the refrigerator reminding customers to pay for items

ITEM 6
a) The business man likely used a spring balance to measure the weight of the log. This device measures weight or force in Newtons.

b)
- Objects float or sink in water based on their density relative to the density of water.
- The log despite being heavy, is less dense than water.
- On the other hand, the stone despite being smaller and lighter than the log, is denser than water, so it displaces less water than its own weight. Its density is greater than that of the stone.
- This difference is density between the log and the stone is why one sinks while the other floats.

c)

- This was due sea breeze or lake breeze or river breeze. This occurs when there is a temperature difference between the land and the water surface.
- During the day, the land gets heated up more quickly than the water, causing warm air to rise over the land. As a result, cooler air from water rushes in to replace it, creating a cool breeze along the shore.

d) From Archimedes' principle

Upthrust force = Weight of displaced water

Assuming the volume of displaced water is V and density of water is $1000kg^{-1}$

$$900 = \text{Weight}$$

$$900 = \text{Mass x gravity}$$

$$900 = v \times 1000 \times 10$$

$$900 = 10000v$$

$$v = \frac{900}{10000}$$

$$v = 0.09m^3$$

The volume of displaced water is $0.09m^3$