

UBABIRI BENEDICT MESHAEU
15/ENGT/046
PETROLEUM ENGINEERING

CHE 574

QUESTION 3

Days	Average Ambient Temperature	
	Day	Night
1 Monday 17/02/20	35°C	25°C
2 Tuesday 18/02/20	36°C	25°C
3 Wednesday 19/02/20	35°C	25°C
4 Thursday 20/02/20	36°C	25°C
5 Friday 21/02/20	37°C	25°C

179°C [Total]

To Calculate Thermal Energy

$$Q = mC\bar{\Delta T} \quad \text{where } Q = \text{Thermal Energy in J}$$

$m = \text{Mass in kg}$

$C = \text{Specific Heat in J/kg}^\circ\text{C}$

$\bar{\Delta T} = \text{Change in temperature}$

— Calculate ΔT

$$\text{Monday } (\Delta T) = 35 - 25 = 10^\circ\text{C}$$

$$\text{Tuesday } (\Delta T) = 36 - 25 = 11^\circ\text{C}$$

$$\text{Wednesday } (\Delta T) = 35 - 25 = 10^\circ\text{C}$$

$$\text{Thursday } (\Delta T) = 36 - 25 = 11^\circ\text{C}$$

$$\text{Friday } (\Delta T) = 37 - 25 = 12^\circ\text{C}$$

→ Assuming

Area of Land in Ahead (A) = 1,300,000 m²

Recall the Formula $\rho_A = \frac{m}{A}$

where ρ_A = Average Area Density

m = Mass of Object

A = Area of Object = 1.67 kg/m²

$$\therefore \rho_A = \frac{m}{A}$$

$$m = \rho_A \times A = 1,300,000 \times 1.67 \\ = \underline{\underline{2,171,000 \text{ kg}}}$$

Recall that the Specific Heat Capacity for Air is 1020 J/kg°C

— Calculating the Thermal Energy

— For Monday

$$Q = Mc\Delta T$$

$$= 2,171,000 \times 1020 \times 10 = \underline{\underline{22,144,200,000 \text{ J}}}$$

Tuesday

$$Q = Mc\Delta T$$

$$= 2,171,000 \times 1020 \times 12 = \underline{\underline{26,358,620,000 \text{ J}}}$$

Wednesday
 $Q = Mc\Delta T$

$$= 2,171,000 \times 1020 \times 10 = \underline{\underline{22,144,200,000 \text{ J}}}$$

Thursday
 $Q = Mc\Delta T$

$$= 2,171,000 \times 1020 \times 11 = \underline{\underline{24,358,620,000 \text{ J}}}$$

Friday
 $Q = Mc\Delta T$

$$= 2,171,000 \times 1020 \times 12 = \underline{\underline{26,573,040,000 \text{ J}}}$$

∴ The average Thermal energy of Ahmed is

$$\frac{22,144,200,000 + 24,358,620,000 + 26,573,040,000}{5}$$

$$= \underline{\underline{23,915,786,000 \text{ J}}}$$