PS.121 – 2021 Spring Foltz Quiz 2 name FOLTZ (KEY)

mass density $\rho_m = \frac{m}{Vol}$; specific $y = {}^{y}/_{m}$; 0°C = 32°F = 273 K ; 1 C°=1.8 F° ; ΔE : $\mathcal{P}\cdot\Delta t$, $mc\Delta T$, mL

water: c (solid) = .50 $\frac{cal}{gC°}$; L(melt) = 80 $\frac{cal}{g}$; c (liq) = 1.0 $\frac{cal}{gC°}$; L(vap) = 540 $\frac{cal}{g}$; c (gas) = .47 $\frac{cal}{gC°}$

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1. Those snowflakes drifting down from the dark clouds were formed there by

{ condensation | (deposition) | evaporation | freezing | melting | none of these } . (1/2) (1/2)

Once they hit the sidewalk, (about 34 °F now), they will melt .

4 Explain briefly what happens to Thermal Energy down here at the sidewalk:

TE from sidewalk enters snowflake, molecules there start rotating to melt then warm to sidewalk temp. leaves, so sidewalk cools

2. A thermometer displays the temperature of its { surroundings | (self) | observer | holder } ;

4 b) plunged into hot water, the display changes { immediately | (slowly) } because the

{ water | glass tube | (bulb liquid) } must first { (absorb) | release } Thermal Energy . (1/2)

3. Add 50 ml water at 20°C into 150 ml water at 80°C, and the final temperature becomes about

2 { –60°C | 0°C | 20°C | 35°C | 50°C | 60°C | (65°C) | 75°C | 80°C | 100°C | 260°C } . (1/2) (1) (2) (1)

$\frac{(50\times20^{*1}+150\times80^{*1})}{200\cdot1}$ =

4. What happens when 60 grams ice at –20°C is added to 120 grams tea-water at 75°C ?

4 a) the ice { gives energy to the tea | (receives energy) from the tea } .

b) That tea-water used to be what temperature , in °F ? 167°F $75°C \times \frac{1.8F°}{1C°} = 135F° + 32°F$

c) That tea-water used to be what temperature , in K ? 348 K $75°C + 273K$

d) show how much energy would melt all the ice:

2 $\Delta E_{melt} = mL_{melt} = 60_g(80\frac{cal}{g}) = 4800\,cal$ + $\Delta E_{warm} = mc_{solid}\Delta T = 60_g(.5\frac{cal}{gC°})(+20C°) = 600\,cal$ } 5400 cal

e) show how much energy would change the tea-water to 0°C:

$\Delta E_{cool} = mc_{tea\,liq}\Delta T = 120_g(1\frac{cal}{gC°})(-75C°) = -9000\,cal$

5 f) Does all the ice melt? { (Y) | N } Does some of the tea-water freeze? { Y | (N) }

{not asked: final Temp = $\frac{\Delta E_{remaining}}{m_{total}\,c_{liq}} = \frac{(9000-5400)\,cal}{(60g+120g)(1\frac{cal}{gC°})} = 20.0°C$}

avg $\frac{11\pm3.2}{21}$ $\xrightarrow[8\times.8]{5\times.2}$ $\frac{8\times.4}{8\times.8}$ $\frac{7.5\pm1.33}{10}$