Name KEY Per ___

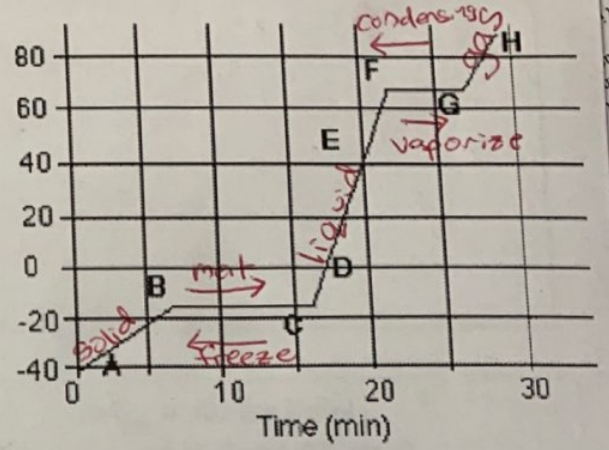
Unit 8 Study Guide: Thermochemistry

Write whether each of the following words corresponds with Endothermic or Exothermic reactions:

exo Releases energy/heat
endo Absorbs energy/heat
endo +ΔH
exo -ΔH

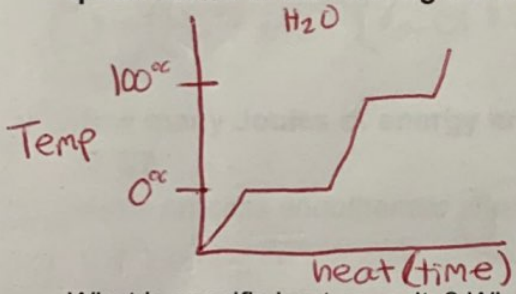
endo Melting
exo Condensating
endo Vaporizing
exo Freezing

On the heating curve to the right, label: solid, liquid gas, melting, freezing, vaporizing, condensing



What is the melting point of this substance? -18°C
What is the boiling point of this substance? 68°C
What is the condensation point of this substance? 68°C
What phase(s) are at point E? liquid
What phase(s) are at point A? solid
What is occurring between B and C? melt/freeze
Is the temperature changing between B and C? no
What phase(s) are between points B and C? solid AND liquid
What is occurring between F and G? vap/cond
Is the temperature changing between F and G? no
What phase(s) are between points F and G? liquid AND gas
What is occurring at D? liquid warming

Explain how the Heating Curve for water would look different than the heating curve shown above. Draw a quick sketch of the Heating Curve for water with the important temperatures labeled.



The temps for phase changes would be different (0°C for melting & 100°C for boiling).

What is specific heat capacity? What are the units? What does it depend on?
J/g°C The amount of heat needed to raise 1 gram of a substance by 1°C. Depends on mass & composition of the object.

What does it mean for a substance to have a high specific heat capacity?
It takes a lot of heat to raise its temperature.

Rank the following items from lowest to highest specific heat: water, sand, air, metal
metal, sand, air, water

Describe how you identified your evidence in the Forensic Chemistry Lab.

What does the Innocence Project work to do?
Exonerate wrongfully convicted people by use of forensics.

How does a calorimeter work?

It measures heat changes in a closed system. The coffee cup full of water helped us record temp change & calculate heat change due to our metal.

Define each of the variables in the equations, their units, and when you would use each equation:

Q=mΔH problems	q=mcΔT problems
Q: heat or energy (J) m: mass (moles) ΔH: enthalpy change (J/mol) -flat parts -phase changes	q= heat or energy (J) m= mass (grams) c= specific heat (J/g°C) ΔT= temp change (°C) -slanted parts -temp changes

Given Information for H_2O:	ΔH_{fus} = 6.01 kJ/mol	ΔH_{vap} = 40.8 kJ/mol
$c_{(solid)}$ of H_2O = 2.06 J/g°C	$c_{(liquid)}$ of H_2O = 4.18 J/g°C	$c_{(gas)}$ of H_2O = 1.87 J/g°C

How many Joules of energy are required to melt 85 grams of water?

$85g \times \frac{1\,mol}{18g} = 4.7\,mol$

Is this process endothermic or exothermic?

$Q = m\Delta H_{fus}$

$Q = (4.7\,mol)(6.01\,kJ/mol) = \boxed{28.2\,kJ}$

How many Joules of energy are required to decrease the temperature of water from 75°C to 30°C?

85g

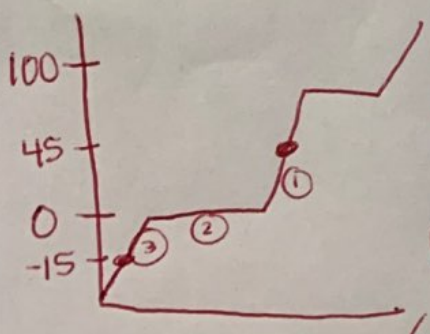
Is this process endothermic or exothermic?

$q = mc\Delta T$

$q = (85g)(4.18\,J/g°C)(-45°C) = \boxed{-15,989\,J}$

How many kJ of energy are given off when 170 grams of water are cooled from 45 °C to -15°C?

Is this process endothermic or exothermic?



① $q = mc\Delta T = (170g)(4.18\,J/g°C)(-45°C) = \boxed{-31,977\,J}$

② $Q = m\Delta H = (9.4\,mol)(-6.01\,kJ/mol) = \boxed{-56.5\,kJ}$

$170g \times \frac{1\,mol}{18g} = 9.4\,mol$

③ $q = mc\Delta T = (170g)(2.06\,J/g°C)(-15°C) = \boxed{-5,253\,J}$

$(-31.977\,kJ) + (-56.5\,kJ) + (-5.253) = \boxed{-93.7\,kJ}$