

Thermochemistry Podcast #8: Phase Change Problems Mathematical; SC5 a,c

Substance	m.p. (°C)	ΔH_{fus} (kJ/g)	b.p. °C	ΔH_{vap} (kJ/g)	Specific Heat –C- (J/g °C)
H₂O	0.00	0.333	100.00	2.26	Ice: 2.09 Water: 4.18 Steam: 1.7
Grain Alcohol	-98	0.0987	64	1.10	Solid: 1.2 Liquid: 2.4 Gas: 1.9
Benzene	5.0	0.1265	80	0.394	Solid: 0.55 Liquid: 0.96 Gas: 1.09

1. If you must add 25 kJ to raise the temperature of an ice cube from -15°C to -10°C, is this an endothermic or an exothermic process.
2. How much heat is required to raise 40 grams of water from 30°C to 70°C?
3. How much water can be raised from 25°C (room temperature) to 37°C body temperature by adding the 2,000 kJ in a Snickers Bar?
4. How much heat does it take to melt 65 grams of ice at 0°C?

5. Calculate the amount of energy required to change 100 grams of solid ice at 0°C to gaseous steam at 100°C . (Be aware of units: kJ or J?) How many steps does this take?
6. Calculate the amount of energy released by cooling 59 grams of liquid water from $+25^{\circ}\text{C}$ to ice at -25°C . (Be aware of units: kJ or J?) How many steps does this take?
7. How much heat would it take to raise 5 grams of H_2O from -50°C to $+200^{\circ}\text{C}$? How many steps does this take?
8. How much energy is required to bring 45 g of benzene from -10°C to 70°C ?