CM4L9 Assessment

1) The specific heat of aluminum is 0.900 J/g ^{o}C. How much heat is required to raise the temperature of a 30.0g block of aluminum from 25.0^{o}C to 75.0^{o}C?
   a. 0.540 J (Incorrect)
   b. 1.50 J (Incorrect)
   c. 1350 J (Correct)
   d. 1670 J (Incorrect)

Show work regardless if student got answer correct or incorrect
$q = mC\Delta T$
$q = (30.0g)(0.900J/g^{o}C)(50^{o}C)$
$q = 1350\ J$

2) Given the balanced equation representing a reaction at 101.3 kPa and 298K:
   $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g) + 91.8kJ$
   a. It is exothermic and ΔH equals -91.8 kJ (Correct; exothermic reactions have energy as a product and a negative ΔH)
   b. It is exothermic and ΔH equals +91.8 kJ (Incorrect; exothermic reactions have a negative ΔH)
   c. It is endothermic and ΔH equals -91.8 kJ (Incorrect; endothermic reactions have a positive ΔH and have energy as a reactant)
   d. It is endothermic and ΔH equals +91.8 kJ (Incorrect; endothermic reactions have energy as a reactant)

3) The table below shows the specific heat capacity of four substances.

Substance	Specific Heat J / g ^{o}C
Water	4.18
Copper	0.39
Gold	0.13
Silver	0.24

For an equal mass of each substance, which one will require the *least* amount of heat to raise its temperature from 40^{o}C to 50^{o}C?
   a. water (Incorrect; water would require the *most* amount of heat (energy) to raise it's temperature)
   b. copper (Incorrect; it would take 0.39 J for each degree change in copper. There is a substance that requires less heat (energy) than copper)
   c. gold (Correct; the smaller the specific heat the less heat (energy) that is needed to raise the temperature)
   d. silver (Incorrect; it would take 0.24 J for each degree change in silver. There is a substance that requires less heat (energy) than silver)

ΔH_f^o kJ/mol	
CuO	-156.1
Cu_2O	-170.7

4) What is the value of ΔH^o (in kJ) for this reaction?

$2CuO(s) \rightarrow Cu_2O(s) + \frac{1}{2} O_2(g)$

a. 141.5 Correct
b. 14.6 Incorrect
c. -14.6 Incorrect
d. -141.5 Incorrect

Show correct work regardless of answer choice.

$\Delta Hrxn = [H_{Cu2O} + \frac{1}{2}(H_{O2})] - 2(H_{CuO})$

$= [-170.7 + \frac{1}{2}(0)] - 2(-156.1)$

$= 141.5$ kJ

5) Consider the following reaction:

$2Al(s) + 3Cl_2(g) \rightarrow 2AlCl_3(s)$ $\Delta H = -1391$ kJ

When a 20.0g sample of chlorine reacts with excess aluminum, how much energy will be released as heat?

a. 1739 kJ Incorrect
b. 869 kJ Incorrect
c. 580 kJ Incorrect
d. 290 kJ Correct

Show correct work regardless of answer choice.

$$\frac{20\text{g } Cl_2}{} \times \frac{1 \text{ mole } Cl_2}{32 \text{ g } Cl_2} \times \frac{1391 \text{ kJ}}{3 \text{ moles } Cl_2} = 289.8 \text{ g}$$