Chem 115
Practice Exam 2
Answer Key

Part I. Multiple choice

page 2:
1. D
2. D
3. B
4. C
5. C

page 3:
6. A
7. D
8. D
9. C
10. D
11. B

page 4:
12. A
13. A
14. C
15. A
16. C

page 5:
17. C
18. B
19. E

Part II. Problems

1. worth 10 pts

Either use Hess's law in the form of

$$\Delta H^o_{rxn} = \sum_{products} (stoich\ coeff)\Delta H^o_f - \sum_{reactants} (stoich\ coeff)\Delta H^o_f$$

$$\Delta H^o_{rxn} = \left[\Delta H^o_f(O_3(g)) + 3\Delta H^o_f(H_2(g))\right] - \left[3\Delta H^o_f(H_2O(l))\right]$$

$$= \left[\left(\frac{+271\,kJ}{2}\right) + 3(0)\right] - \left[3(-286\,kJ)\right]$$

$$= +994\,kJ$$

or arrange the reactions so that they sum to the overall rxn

$(-3) \times \{H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)\}$ $\Delta H^o = (-3) \times \{-286\ kJ\}$

$(\frac{1}{2}) \times \{3\ O_2(g) \rightarrow 2\ O_3(g)\}$ $\Delta H^o = (\frac{1}{2}) \times \{+271\ kJ\}$

sums to:

$3\ H_2(g) + O_3(g) \rightarrow 3\ H_2O(l)$ with sum of $\Delta H^o = +994$ kJ

2. worth 20 pts, each part worth 5 pts

a) $AgNO_3$ available = (0.1300 L)(0.110 M) = 0.0143 mol
$CaCl_2$ available = (0.0900 L)(0.095 M) = 0.0086 mol
need 2:1 mole ratio, so $AgNO_3$ is limiting
moles of AgCl that form:

$$= 0.0143\,mol\ AgNO_3 \times \frac{2\,mol\ AgCl}{2\,mol\ AgNO_3} = 0.0143\,mol\ AgCl$$

b) temperature change ΔT = 27.00 – 25.00 = 2.00 ºC
mass of solution = 220.0 mL × 1.000 g/mL = 220.0 g
heat,

$$q = mC\Delta T = (220.0g)\left(4.184\frac{J}{g\cdot{}^oC}\right)(2.00^oC) = 1841J = 1.84kJ$$

c) reaction shown is exothermic because water temperature increased (indicating that reaction system gave off heat energy)

d) ΔH_{rxn} in $\frac{kJ}{mol\ AgCl} = \frac{1.84\,kJ}{0.0143\,mol\ AgCl} = 129\ kJ/mol$

so ΔH_{rxn} = –129 kJ/mol