Quiz VII (Take Home) Gen Chem II Lecture Dr. Hahn 20 pts 4/19/13 F form 9:30 am quiz # _____

Name Key (print) Name _____ (sign)
Please show all work for full credit & to get partial credit. (suggestion: A guess is better than no answer.)

turn in deadline in classroom: **Please return the completed take home quiz by 4/22 M by 9:45 am**. You will receive the answer key as you turn in the take home quiz in class. After this deadline the quiz will **be worth zero points** because I will hand out the key and will discuss the answers.

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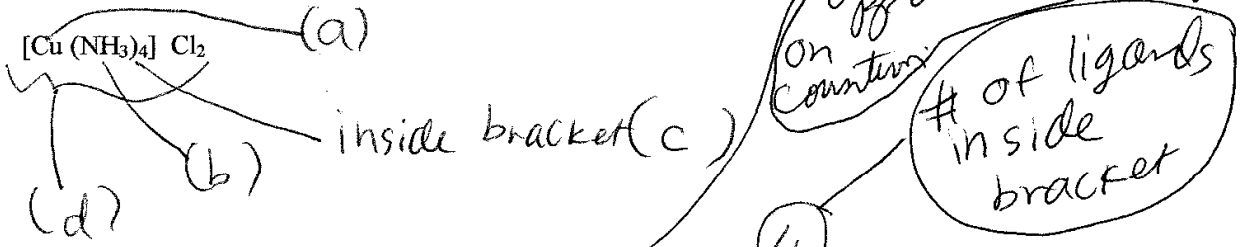
in this case −1 x2

1. For the coordination compound given, label each parenthesis with the correct letter. You may use each letter one time, many times or not at all. (a) metal (b) ligand (c) coordination complex (d) coordination compound (4 pts, 1 pt per blank)



For the coordination compound shown, the coordination number is 4 (2 pts)
The charge on the coordination complex is +2 (2 pts)

2 For the reaction $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ if $\Delta H^\circ_{RXN} = 178.3$ kJ and $\Delta S^\circ_{RXN} = 159.0$ J/K at 25°C (298 K) what is the ΔG°_{RXN} (12 pts)

3 pts
NW −1

$\Delta G^\circ_{RXN} = \Delta H^\circ - T\Delta S^\circ$

$159.0\ J/K \times \frac{1\ kJ}{1000\ J} = 0.159\ kJ/K$

math & algebra −2

$\Delta G^\circ_{RXN} = 178.3\ kJ - (298\ K)(0.159\ \frac{kJ}{K})$

$\Delta G^\circ_{RXN} = 178.3\ kJ - 47.4\ kJ = 130.9\ kJ$

math only −1

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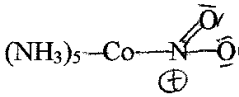
1. Given the isomer pairs shown, match the kind of isomer by using the letters given. Each blank may have one to as many as four of the possible isomer names. (a) cis/trans isomer type of geometric isomer (b) fac- mer isomer type of geometric isomer (c) coordination isomer type of structural isomer (d) linkage isomer type of structural isomer (8 pts, 2 pts per blank)

$[Co(NH_3)_5Br]Cl$ & $[Co(NH_3)_5Cl]Br$ C



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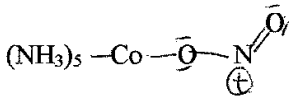
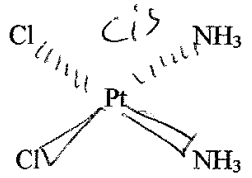


d



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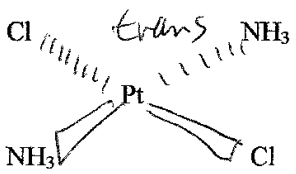
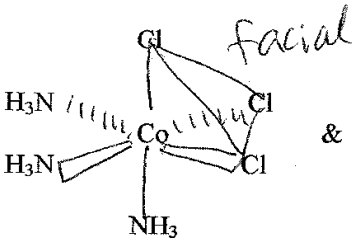


a



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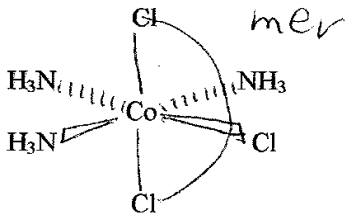

b

2. For the reaction $2\,NH_3(g) \rightarrow N_2H_4(g) + H_2(g)$ calculate ΔG°_{RXN} and ΔS°_{RXN} {Some useful data: $\Delta G_f^\circ [NH3(g)] = -16.4$ kJ / mol $\Delta G_f^\circ [N2H4(g)] = 159.4$ kJ/mol $S^\circ [NH_3(g)] = 192.8$ J/mol K $S^\circ [N_2H_4(g)] = 238.5$ J/mol K $S^\circ [H_2(g)] = 130.7$ J/mol K}(You may also find kilojoule = 1000 Joule useful) (12 pts)

reactant product reversed -2

$$\Delta G^\circ_{RXN} = \sum n \Delta G_f^\circ(\text{product}) - \sum n \Delta G_f^\circ(\text{reactant})$$

$$\Delta G^\circ_{RXN} = \{(1\,mol)\,\Delta G_f^\circ[N_2H_4(g)] + (1\,mol)\,\Delta G_f^\circ[H_2(g)]\} - \{(2\,mol)\,\Delta G_f^\circ[NH_3(g)]\}$$

6 pts NW -3

$$\Delta G^\circ_{RXN} = \{(1\,mol)(159.4\,kJ/mol) + (1\,mol)(0)\} - \{(2\,mol)(-16.4\,kJ/mol)\} = 159.4\,kJ + 32.8\,kJ$$

(1 pt each)

$$\Delta G^\circ_{RXN} = 192.2\,kJ$$

$$\Delta S^\circ_{RXN} = \sum n S^\circ(\text{product}) - \sum n S^\circ(\text{reactant})$$

NW -3 (6 pts)

$$\Delta S^\circ_{RXN} = \{(1\,mol)\,S^\circ[N_2H_4(g)] + (1\,mol)\,S^\circ[H_2(g)]\} - \{(2\,mol)\,S^\circ[NH_3(g)]\}$$

(1 pt each)

product: $\{(1\,mol)(238.5\,J/mol\,K) + (1\,mol)(130.7\,J/mol\,K)\}$

reactant: $\{(2\,mol)(192.8\,J/mol\,K)\}$

$$\Delta S^\circ_{RXN} = \{238.5\,J/K + 130.7\,J/K\} - \{385.6\,J/K\}$$

$$\Delta S^\circ_{RXN} = 369.2 - 385.6 = -16.4\,J/K$$

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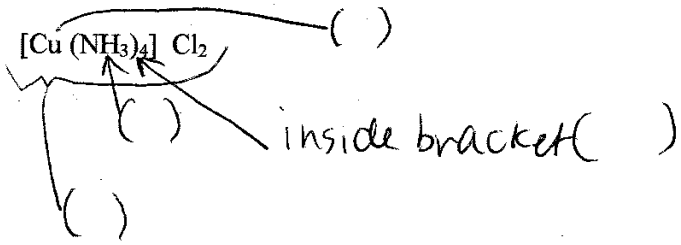

For the coordination compound shown, the coordination number is _____ (2 pts)
The charge on the coordination complex is _____ (2 pts)

2 For the reaction $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ if $\Delta H^\circ_{RXN} = 178.3$ kJ and $\Delta S^\circ_{RXN} = 159.0$ J/K at 25°C (298 K) what is the ΔG°_{RXN} (12 pts) $[\Delta G^\circ_{RXN} = \Delta H^\circ_{RXN} - T\Delta S^\circ_{RXN}]$

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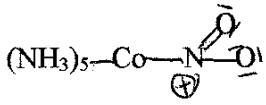

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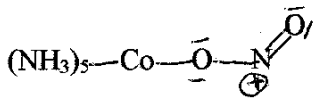

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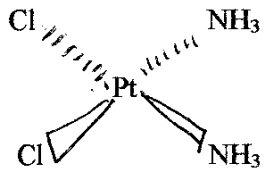

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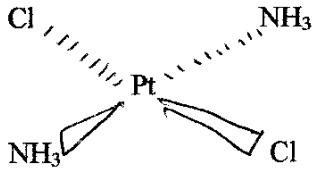

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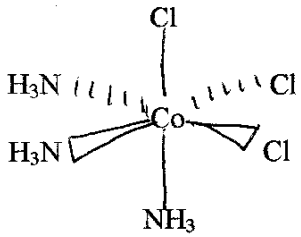

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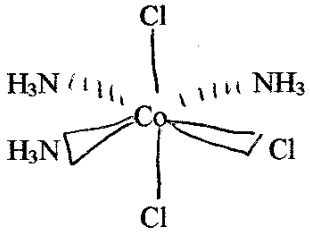

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$$\Delta S^\circ_{RXN} = \Sigma n S^\circ (product) - \Sigma n S^\circ (reactant)$$