

# FUNDAMENTALS OF CHEMISTRY 1A (CHEM1001) - June 2007

2007-J-2

- $${}_{90}^{232}\text{Th} \rightarrow {}_{88}^{228}\text{Ra} + {}_2^4\text{He}$$

$${}_{54}^{133}\text{Xe} \rightarrow {}_{55}^{133}\text{Cs} + {}_{-1}^0\beta$$
- $2.5 \times 10^{10} \text{ s}^{-1}$
- $1.7 \times 10^{-23} \text{ J}$
- 2.8 g
- 0.006 mol

2007-J-3

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| SF <sub>6</sub>                                                                                                                                                                                                                   | ClF <sub>3</sub>                                                                                           |                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| sulfur hexafluoride                                                                                                                                                                                                               |                                                                                                            | ammonia                                                                                                                                                |
| $  \begin{array}{c}  \text{F} \quad \text{F} \quad \text{F} \\  \diagdown \quad   \quad \diagup \\  \text{F} - \text{S} - \text{F} \\  \diagup \quad   \quad \diagdown \\  \text{F} \quad \text{F} \quad \text{F}  \end{array}  $ | $  \begin{array}{c}  \text{F} \\    \\  \text{F} - \text{Cl} - \text{F} \\    \\  \text{F}  \end{array}  $ | $  \begin{array}{c}  \text{H} \quad \text{H} \\  \diagdown \quad   \quad \diagup \\  \text{H} - \text{N} - \text{H} \\    \\  \text{H}  \end{array}  $ |
| 6                                                                                                                                                                                                                                 | 3                                                                                                          | 3                                                                                                                                                      |
| 0                                                                                                                                                                                                                                 | 2                                                                                                          | 1                                                                                                                                                      |
| octahedral                                                                                                                                                                                                                        | T-shaped                                                                                                   | trigonal pyramidal                                                                                                                                     |

- 28.09

2007-J-4

- $$\text{C}_4\text{H}_{10}(\text{g}) + {}^{13}/_2\text{O}_2(\text{g}) \rightarrow 4\text{CO}_2(\text{g}) + 5\text{H}_2\text{O}(\text{g})$$

1.62 kg O<sub>2</sub> required; 1.38 kg CO<sub>2</sub> produced; 704 g H<sub>2</sub>O produced
- CH<sub>2</sub>O
- C<sub>3</sub>H<sub>6</sub>O<sub>3</sub>
- 0.050 mol
- 0.0750 M

2007-J-5

- 0.69 g  
0.18 M
- $2\text{Na(s)} + 2\text{H}_2\text{O(l)} \rightarrow 2\text{Na}^+(\text{aq}) + 2\text{OH}^-(\text{aq}) + \text{H}_2(\text{g})$   
 $3\text{Co}^{2+}(\text{aq}) + 2\text{PO}_4^{3-}(\text{aq}) \rightarrow \text{Co}_3(\text{PO}_4)_2(\text{s})$   
 $\text{CaCO}_3(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{Ca}^{2+}(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O(l)}$

2007-J-6

- $0.22 \text{ J g}^{-1} \text{ K}^{-1}$
- $4 \times 10^3$

2007-J-7

- $3\text{Ag}^+(\text{aq}) + \text{Cr(s)} \rightarrow 3\text{Ag(s)} + \text{Cr}^{3+}(\text{aq})$   
1.54 V
- $-256.2 \text{ kJ mol}^{-1}$

2007-J-8

- Cr
- $\text{NiO(OH)(s)/Ni(OH)}_2(\text{s})$   
 $\text{NiO(OH)(s)} + \text{H}_2\text{O(l)} + \text{e}^- \rightarrow \text{Ni(OH)}_2(\text{s}) + \text{OH}^-(\text{aq})$   
So that the battery maintains a constant voltage

2007-J-9

- $p(\text{Br}_2) = 0.13 \text{ atm}$        $p(\text{Cl}_2) = 0.13 \text{ atm}$        $p(\text{BrCl}) = 0.34 \text{ atm}$

2007-J-10

- 73 mmHg  
13.6 kg  
 $1.02 \times 10^4 \text{ L}$