



**CHEMISTRY 101**  
**SECOND EXAM**

**Name:** \_\_\_\_\_

**Date: 29/04/2012**

Student no.

Section:

**Useful Information:** Gas Constant  $R = 0.08206 \text{ L.atm/K.mol}$

<b>H</b> <sup>1</sup> 1.000																		<b>He</b> <sup>2</sup> 4			
<b>Li</b> <sup>3</sup> 6.941	<b>Be</b> <sup>4</sup> 9.012															<b>B</b> <sup>5</sup> 10.81	<b>C</b> <sup>6</sup> 12.01	<b>N</b> <sup>7</sup> 14.01	<b>O</b> <sup>8</sup> 16	<b>F</b> <sup>9</sup> 19	<b>Ne</b> <sup>10</sup> 20.18
<b>Na</b> <sup>11</sup> 22.99	<b>Mg</b> <sup>12</sup> 24.31															<b>Al</b> <sup>13</sup> 26.98	<b>Si</b> <sup>14</sup> 28.09	<b>P</b> <sup>15</sup> 30.97	<b>S</b> <sup>16</sup> 32.06	<b>Cl</b> <sup>17</sup> 35.45	<b>Ar</b> <sup>18</sup> 39.95
<b>K</b> <sup>19</sup> 39.10	<b>Ca</b> <sup>20</sup> 40.08	<b>Sc</b> <sup>21</sup> 44.96	<b>Ti</b> <sup>22</sup> 47.9	<b>V</b> <sup>23</sup> 50.94	<b>Cr</b> <sup>24</sup> 51.99	<b>Mn</b> <sup>25</sup> 54.94	<b>Fe</b> <sup>26</sup> 55.85	<b>Co</b> <sup>27</sup> 58.93	<b>Ni</b> <sup>28</sup> 58.71	<b>Cu</b> <sup>29</sup> 63.54	<b>Zn</b> <sup>30</sup> 65.37	<b>Ga</b> <sup>31</sup> 69.72	<b>Ge</b> <sup>32</sup> 72.59	<b>As</b> <sup>33</sup> 74.92	<b>Se</b> <sup>34</sup> 78.96	<b>Br</b> <sup>35</sup> 79.9	<b>Kr</b> <sup>36</sup> 83.8				
<b>Rb</b> <sup>37</sup> 85.47	<b>Sr</b> <sup>38</sup> 87.62	<b>Y</b> <sup>39</sup> 88.91	<b>Zr</b> <sup>40</sup> 91.22	<b>Nb</b> <sup>41</sup> 92.91	<b>Mo</b> <sup>42</sup> 95.94	<b>Tc</b> <sup>43</sup> 99.91	<b>Ru</b> <sup>44</sup> 101.1	<b>Rh</b> <sup>45</sup> 102.91	<b>Pd</b> <sup>46</sup> 106.4	<b>Ag</b> <sup>47</sup> 107.87	<b>Cd</b> <sup>48</sup> 112.4	<b>In</b> <sup>49</sup> 114.8	<b>Sn</b> <sup>50</sup> 118.69	<b>Sb</b> <sup>51</sup> 121.75	<b>Te</b> <sup>52</sup> 127.6	<b>I</b> <sup>53</sup> 126.9	<b>Xe</b> <sup>54</sup> 131.3				
<b>Cs</b> <sup>55</sup> 132.9	<b>Ba</b> <sup>56</sup> 137.3	<b>57-71</b> *	<b>Hf</b> <sup>72</sup> 178.5	<b>Ta</b> <sup>73</sup> 180.9	<b>W</b> <sup>74</sup> 183.85	<b>Re</b> <sup>75</sup> 186.2	<b>Os</b> <sup>76</sup> 190.2	<b>Ir</b> <sup>77</sup> 192.2	<b>Pt</b> <sup>78</sup> 195.1	<b>Au</b> <sup>79</sup> 196.97	<b>Hg</b> <sup>80</sup> 200.6	<b>Tl</b> <sup>81</sup> 204.37	<b>Pb</b> <sup>82</sup> 207.2	<b>Bi</b> <sup>83</sup> 208.98	<b>Po</b> <sup>84</sup> 210	<b>At</b> <sup>85</sup> 210	<b>Rn</b> <sup>86</sup> 222				

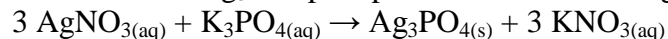
*Write the best fit answer of the following questions in this table:*

<b>Q1</b>	<b>Q2</b>	<b>Q3</b>	<b>Q4</b>	<b>Q5</b>	<b>Q6</b>	<b>Q7</b>	<b>Q8</b>
<b>Q9</b>	<b>Q10</b>	<b>Q11</b>	<b>Q12</b>	<b>Q13</b>	<b>Q14</b>	<b>Q15</b>	<b>Q16</b>

1. Calculate the volume of water that must be added to 500 mL of 0.125 M HCl solution in order to dilute it to exactly 0.100 M.

- a. 100 mL                      b. 125 mL                      c. 250 mL                      d. 625 mL

2. 25 mL of 0.10 M  $\text{AgNO}_3$  solution were mixed with 10 mL of 0.10 M  $\text{K}_3\text{PO}_4$  solution. Calculate the mass of  $\text{Ag}_3\text{PO}_4$  precipitate formed according to the following equation:



- a. 0.35 g                      b. 0.42 g                      c. 0.77 g                      d. 1.05

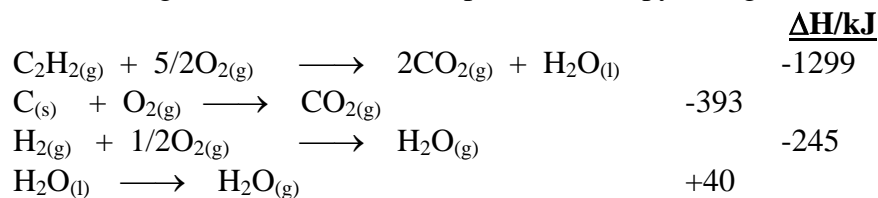
3. 45.0 mL of an aqueous solution of  $\text{HNO}_3$  were needed to neutralize 0.456 g of  $\text{Mg}(\text{OH})_2$ . Calculate the molarity of the  $\text{HNO}_3$  solution.

- a. 0.17 M                      b. 0.35 M                      c. 0.70 M                      d. 0.91 M

4. Calculate  $\Delta H$  for the reaction:



Given the following reactions and their respective enthalpy changes:



- a. 228 kJ                      b. 268 kJ                      c. 621 kJ                      d. 661 kJ

5. If 6.5 g of  $\text{NaOH}_{(\text{s})}$  dissolves in 100 g  $\text{H}_2\text{O}$  in a coffee-cup calorimeter, the temperature rises from 21.6°C to 37.8°C.  $\Delta H$  (in **kJ/mol** NaOH) for this process is:  
(Assume specific heat of solution is equal to the specific heat of water = 4.18 J/g°C, and that the coffee-cup doesn't gain heat)

- a. 7.2                      b. 44.4                      c. 4.2                      d. 16.2

6. A gas expands from 152 L to 189 L at a constant external pressure of 2 atm. It absorbs thereby 5000 J of heat. Calculate the change in the internal energy of the gas.

- a. -2498 J                      b. +4926 J                      c. -4926 J                      d. +2498 J

7. The density of  $\text{CH}_4$  (g) at 20°C and 2 atm is:

- a. 0.67 g/L                      b. 1.0 g/L                      c. 1.34 g/L                      d. 16 g/L

8. A vessel with a volume of 10.0 L contains 2.80 g of N<sub>2</sub> gas, 0.403 g of H<sub>2</sub> gas and 79.9 g of Ar gas. What is the pressure in the vessel at 25°C?

- a. 0.471 atm                      b. 6.43 atm                      c. 3.20 atm.                      d. 5.62 atm

9. Given the equation:  $S_{(s)} + O_{2(g)} \rightarrow SO_{2(g)} \quad \Delta H = -296 \text{ kJ}$ ;  
Which of the following statement(s) is (are) true?

**I.** The reaction is exothermic.

**II.** When 0.50 mol S<sub>(s)</sub> is reacted, 148 kJ of energy is released.

**III.** When 32.0 g of S<sub>(s)</sub> are burned,  $2.96 \times 10^5$  J of energy is released.

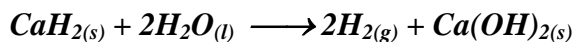
**a.** All are true.

**b.** None is true.

**c.** I and II are true.

**d.** Only I is true.

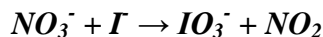
10. Calcium hydride (CaH<sub>2</sub>) combines with water according to the following equation:



Beginning with 84 g of CaH<sub>2(s)</sub> and enough water, what volume of H<sub>2</sub> will be produced at 273 K and a pressure of 1520 torr?

- a. 22.4 L                      b. 44.8 L                      c. 89.6 L                      d. 179 L

11. The oxidizing agent in the reaction:



a. NO<sub>3</sub><sup>-</sup>

b. I<sup>-</sup>

c. IO<sub>3</sub><sup>-</sup>

d. NO<sub>2</sub>

12. Given that the density of 10.0% aqueous NaCl is 1.071 g/cm<sup>3</sup>, what is the molar concentrations of Na<sup>+</sup> and Cl<sup>-</sup>?

- a. 1.83 mol/L                      b. 18.3 mol/L                      c. 0.0183 mol/L                      d. 62.7 mol/L

13. What volume of 2.00 M Pb(NO<sub>3</sub>)<sub>2</sub> contains 600 mg of lead?

- a. 145 ml                      b. 2.9 ml                      c. 1.45 ml                      d. 2900 ml

14. Chlorine gas is evolved at the anode of a commercial electrolysis cell at the rate of 3.65 L/min, at a temperature of 647°C. On its way to the intake pump it is cooled to 63°C. Calculate the rate of intake to the pump assuming the pressure has remained constant.

- a. 355 L/min                      b. 0.355 L/min                      c. 1.33 L/min                      d. 1330 L/min

15. The enthalpy of combustion of acetylene gas,  $\text{C}_2\text{H}_2(\text{g})$ , at  $25^\circ\text{C}$  is  $-1299.58 \text{ kJ/mol}$ . Determine the enthalpy of formation of acetylene. Given that  $\Delta H_f$  of  $\text{CO}_2$  is  $-393.51 \text{ kJ/mol}$  and for  $\text{H}_2\text{O}$  is  $-285.83 \text{ kJ/mol}$ .

- a.  $-226.73 \text{ kJ/mol}$       b.  $2371 \text{ kJ/mol}$       c.  $226.73 \text{ kJ/mol}$       d.  $-2371 \text{ kJ/mol}$

16. A certain hydrate has a formula of  $\text{MgSO}_4 \cdot x\text{H}_2\text{O}$ . A sample of  $54.2 \text{ g}$  of the compound is heated to drive the water off. If the steam generated exerts a pressure of  $24.8 \text{ atm}$  in  $2.00 \text{ L}$  container at  $120^\circ\text{C}$ , calculate  $x$ .

- a. 4      b. 5      c. 6      d. 7

**-GOOD LUCK-**