Chem1405 **Sample Quiz 1** **Last update: 26/3/13**

1. Which one of the following statements is false?

a) Electrons have a much greater mass than neutrons.

b) If an atom loses electrons it becomes positively charged and is called a cation.

c) All calcium cations (Ca^{2+}) contain 20 protons.

d) The neon atom has 10 electrons.

e) Different isotopes of the same element contain different numbers of neutrons.

2. Which one of the following sets of quantum numbers is valid?

	n	l	m_l	m_s
a)	3	1	0	0
b)	1	1	0	–½
c)	3	3	–2	+½
d)	1	1	1	0
e)	5	4	3	+½

Questions 3 and 4 refer to the following experiment. 0.060 M aluminium nitrate solution (100 mL) is added to 0.080 M potassium phosphate solution (50 mL). Assume quantitative (*i.e.* complete) precipitation of $AlPO_4(s)$ occurs.

3. What amount (in mol) of $AlPO_4(s)$ precipitates?

a) 0.0060 b) 0.0060 c) 0.0040 d) 0.0020 e) 0.040

4. What is the final concentration of $Al^{3+}(aq)$ ions remaining in solution after the reaction?

a) 0.020 M b) 0.013 M c) 0.040 M d) 0.060 M e) 0.010 M

5. In which of the following are the atoms arranged in order of INCREASING first ionisation energy?

a) Ne, F, O, C

b) Te, Se, S, O

c) Ca, K, Cl, Ar

d) He, Ne, Ar, Kr

e) N, P, K, Rb

6. What is the shape of the NO_3^- ion?

a) trigonal planar
b) tetrahedral
c) trigonal pyramidal
d) T-shaped
e) square planar

7. Which one of the following species has **two** lone-pairs of electrons in the valence shell of the underlined atom(s)?

a) $\underline{Cl}F_3$ b) $\underline{P}Cl_5$ c) $\underline{S}F_4$ d) $\underline{N}H_3$ e) $\underline{P}Cl_3$

8. Which of the following substances would you expect to form hydrogen bonds?

H_2O PH_3 CHF_3 Cl_2

a) PH_3 and CHF_3 only
b) H_2O and Cl_2 only
c) H_2O only
d) PH_3 only
e) F_2 only

9. A 1.0 L flask contains a mixture of hydrogen (8.0 atm), oxygen (4.0 atm) and neon (2.0 atm) at the stated partial pressures at a temperature of 40 °C. What is the total pressure inside the flask at 40 °C after the mixture is sparked. Ignore the vapour pressure of liquid water.

a) 14.0 atm b) 10.0 atm c) 6.0 atm d) 2.0 atm e) 0.0 atm

10. Given the following thermochemical data:

$$N_2(g) + O_2(g) \rightarrow 2NO(g) \qquad \Delta H° = +181 \text{ kJ mol}^{-1}$$

$$NO(g) + \tfrac{1}{2}O_2(g) \rightarrow NO_2(g) \qquad \Delta H° = -57.1 \text{ kJ mol}^{-1}$$

What is the enthalpy of formation $\Delta_f H°$ for 1.00 mol of $NO_2(g)$ at 298 K and 101.3 kPa?

a) +124 kJ mol^{-1}
b) +33.4 kJ mol^{-1}
c) –148 kJ mol^{-1}
d) –124 kJ mol^{-1}
e) –33.4 kJ mol^{-1}

Correct answers: 1A, 2E, 3C, 4B, 5B, 6A, 7A, 8C, 9D, 10B