CHEM111 Name _____
College of Charleston
Spring 2002
Exam III Score _____ /100

1(21). Circle the letter that represents the best response to each item.

An atom of Mn ($Z = 25$) has two 4s and five 3d electrons. How many unpaired electrons would there be in the Mn^{2+} ion?
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

Which is an acceptable set of quantum numbers for a 3d electron?
(A) $n = 3, l = 2, m_l = 1, m_s = +1/2$ (B) $n = 3, l = 3, m_l = 1, m_s = +1/2$
(C) $n = 2, l = 2, m_l = -1, m_s = -1/2$ (D) $n = 2, l = 3, m_l = 2, m_s = -1/2$

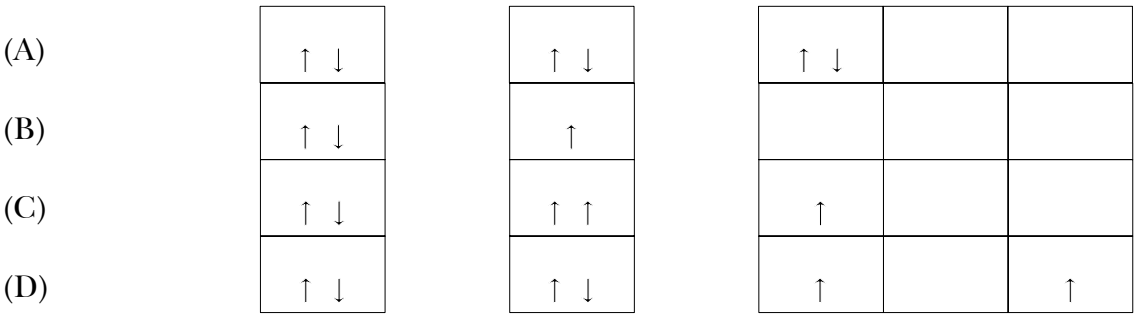
Which isoelectronic ion is the smallest in size?
(A) Al^{3+} (B) Na^{+} (C) F^{-} (D) O^{2-}

Which particle has the highest first ionization energy?
(A) K^{+} (B) K (C) Cl^{-} (D) Cl

Which has the least tendency to gain electrons?
(A) N (B) P (C) As (D) Sb (E) Bi

Which set of mass-velocity values would generate the longest deBroglie wavelength?
(A) high v, high m (B) high v, low m (C) low v, high m (D) low v, low m

Which electron configuration is an exception to the Pauli exclusion principle?



2(10). You are given the task of preparing 250.00 mL of 0.265 M NaCl solution. What mass of solid NaCl is required? (Watch sig figs.) What is the name of the type of flask that should be used?_____

3(15). A 10.00 mL sample of phosphoric acid was titrated with 0.101 M NaOH

$$H_3PO_4(aq) + NaOH(aq) \rightarrow Na_2HPO_4(aq) + H_2O(l)$$

If 13.26 mL of NaOH were required, what is the concentration of the acid?

4(10). Use the following thermochemical equations

$$\begin{aligned} H_2(g) &\rightarrow 2\ H(g) & \Delta H &= 436\ kJ \\ D_2(g) &\rightarrow 2\ D(g) & \Delta H &= 444\ kJ \\ H_2(g) + D_2(g) &\rightarrow 2\ HD(g) & \Delta H &= 0.6\ kJ \\ O_2(g) + D_2(g) &\rightarrow 2\ OD(g) & \Delta H &= 74\ kJ \end{aligned}$$

to determine the heat of reaction for

$$HD(g) \rightarrow H(g) + D(g)$$

5(10). The enthalpy of formation of FO(g) is 109 kJ mol^{-1}, of $F_2O(g)$ is 24.7 kJ mol^{-1}, of $F_2O_2(g)$ is 18.0 kJ mol^{-1}, and of $F_2O_3(g)$ is 15.9 kJ mol^{-1}. Determine the heat of reaction for

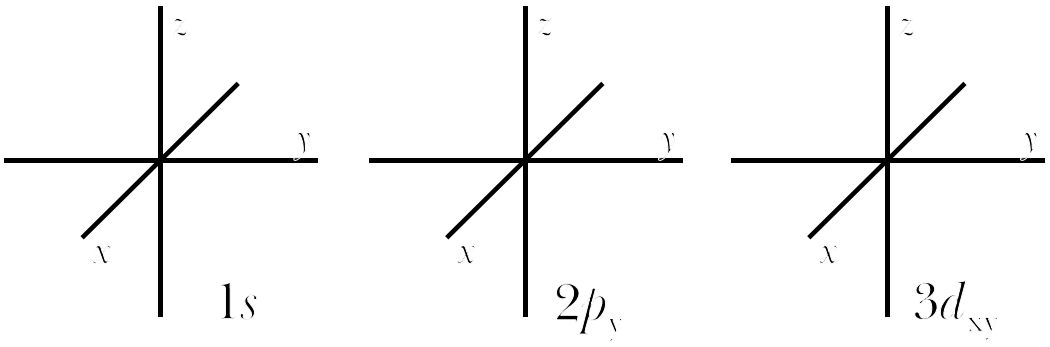
$$2\ F_2O_2(g) \rightarrow F_2O_3(g) + F_2O(g)$$

6(10). The heat capacity of water is 34 J K^{-1} mol^{-1} for steam, 75 J K^{-1} mol^{-1} for liquid, and 38 J K^{-1} mol^{-1} for ice and the enthalpy of fusion is 6.009 kJ mol^{-1} and the enthalpy of vaporization is 40.656 kJ mol^{-1}. Calculate q for heating 10.0 g of water from 25 °C to 115 °C at one atmosphere pressure.

7(9). Complete the table describing the atomic quantum numbers.

Symbol	Name	Permitted Values	Interpretation
			spin angular momentum
		1,2,3,...	
	Magnetic		
l			

8(5). Sketch the orbitals.



9(10). Write the electron configuration for P

What ion(s) will P form?_____ Is P paramagnetic?_____

Write the electron configuration for In

What ion(s) will In form?_____ Is In paramagnetic?_____