Chapter 6

- A system that does no work but which transfers heat to the surroundings has
  A) $q < 0, \Delta E > 0$ D) $q > 0, \Delta E < 0$
  B) $q < 0, \Delta E < 0$ E) $q < 0, \Delta E = 0$
  C) $q > 0, \Delta E > 0$
  Ans: B
- A system receives 575 J of heat and delivers 425 J of work. Calculate the change in the internal energy, ΔE, of the system.
  A) -150 J B) 150 J C) -l000 J D) 1000 J E) 575 J
  Ans: B

- A Snickers® candy bar contains 280 Calories, of which the fat content accounts for 120 Calories. What is the energy of the fat content, in kJ?
  A) 5.0×10^{-1} kJ D) 1.2×10^{3} kJ
  B) 29 kJ E) 5.0×10^{5} kJ
  C) 5.0×10^{2} kJ
  Ans: C

- A 275-g sample of nickel at l00.0°C is placed in 100.0 mL of water at 22.0°C. What is the final temperature of the water? Assume that no heat is lost to or gained from the surroundings. Specific heat capacity of nickel = 0.444 J/(g·K)

275 x 0.444 (T - 100) + 100 x 4.18 (T - 22)=0

122.1 T - 12210 + 418 T - 9196 =0

540.1 T = 21406

T = 39.6 °C

- A piece of copper metal is initially at 100º C. It is dropped into a coffee cup calorimeter containing 50.0 g of water at a temperature of 20.0º C. After stirring, the final temperature of both copper and water is 25.0º C. Assuming no heat losses, and that the specific heat (capacity) of water is 4.184 J(g•K), what is the heat capacity of the copper in J/K?

Heat gained by water = heat lost by copper

heat gained by water = q = mCΔT = (50 g)(4.18 J/g/deg)(5 deg) = 1045 J

heat lost by copper = 1045 J = C x ΔT

C = 1045 J/75 = 13.9 J/deg

- Use Hess's Law to calculate the enthalpy change for the reaction
- $WO_3(s) + 3H_2(g) \rightarrow W(s) + 3H_2O(g)$
- from the following data:
- $2W(s) + 3O_2(g) \rightarrow 2WO_3(s)$ $\Delta H = -1685.4$ kJ
- $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$ $\Delta H = -477.84$ kJ

- A) 125.9 kJ D) 1207.6 kJ
- B) 252.9 kJ E) None of these choices is correct.
- C) 364.9 kJ
- Ans: A

- Which one of the following equations represents the formation reaction of $CH_3OH(l)$?

A) $C(g) + 2H_2(g) + O_2(g) \rightarrow CH_3OH(l)$

B) $C(g) + 4H(g) + O(g) \rightarrow CH_3OH(l)$

C) $C(graphite) + 4H(g) + O(g) \rightarrow CH_3OH(l)$

D) $C(diamond) + 4H(g) + O(g) \rightarrow CH_3OH(l)$

E) $C(graphite) + 2H_2(g) + O_2(g) \rightarrow CH_3OH(l)$

Ans: E

- Which of these processes is *endothermic*?

A. $O_2(g) + 2H_2(g) \rightarrow 2H_2O(g)$
B. $H_2O(g) \rightarrow H_2O(l)$
C. $3O_2(g) + 2CH_3OH(g) \rightarrow 2CO_2(g) + 2H_2O(g)$
D. $H_2O(s) \rightarrow H_2O(l)$

To which one of these reactions occurring at 25□C does the symbol [H2SO4(l)] refer?

A. 2H(g) + S(g) + 4O(g) → H2SO4(l)
B. H2(g) + S(g) + 2O2(g) → H2SO4(l)
C. H2SO4(l) → H2(g) + S(s) + 2O2(g)
D. H2SO4(l) → 2H(g) + S(s) + 4O(g)
E. H2(g) + S(s) + 2O2(g) → H2SO4(l)

- Calculate ΔH^{o}_{rxn} for the following reaction

$$2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g)$$

- given that ΔH^{o}_{f} [$H_2O(l)$] = -285.8 kJ/mol and ΔH^{o}_{f} [$H_2O_2(l)$] = -187.6 kJ/mol.

A. -196.4 kJ/mol

B. 98.2 kJ/mol

C. -98.2 kJ /mol

D. 196.4 kJ/mol

E. -396.4 kJ/mol

- How many degrees of temperature rise will occur when a 25.0 g block of aluminum absorbs 10.0 kJ of heat? The specific heat of Al is 0.900 J/g·°C.

  A. 0.44°C
  B. 22.5°C
  C. 225°C
  D. 360°C
  E. 444°C

- The shape of an atomic orbital is associated with

A) the principal quantum number (n).

B) the angular momentum quantum number (l).

C) the magnetic quantum number (ml).

D) the spin quantum number (ms).

E) the magnetic and spin quantum numbers, together.

- Which of the following is a correct set of quantum numbers for an electron in a 3d orbital?

A) n = 3, l = 0, ml = -1

B) n = 3, l = 1, ml = +3

C) n = 3, l = 2, ml = 3

D) n = 3, l = 3, ml = +2

E) n = 3, l = 2, ml = -2

Each electron in an atom must have its own unique set of quantum numbers" is a statement of

A) the aufbau principle.

B) the Pauli exclusion principle.

C) Hund's rule.

D) the periodic law.

E) Heisenberg's principle.

- Electrons added to atomic orbitals of the same energy will remain unpaired with parallel spins until the subshell is more than half-filled" is a statement of

A) the aufbau principle.
B) Hund's rule.
C) the Pauli exclusion principle.
D) the periodic law.
E) the singularity rule.

In a single atom, what is the maximum number of electrons which can have quantum number n = 4?

A) 16 B) 18 C) 32 D) 36 E) None of these choices is correct.

- Select the correct electron configuration for Cu (Z = 29).

A) [Ar]4s23d9

B) [Ar]4s13d10

C) [Ar]4s24p63d3

D) [Ar]4s24d9

E) [Ar]5s24d9

- An element with the electron configuration [noble gas]$ns^2(n - 1)d^8$ has _____ valence electrons.

A) 2 B) 6 C) 8 D) 10 E) None of these choices is correct.

Chapter 8

- The effective nuclear charge for an atom is less than the actual nuclear charge due to

A) shielding.
B) penetration.
C) paramagnetism.
D) electron-pair repulsion.
E) relativity.

An element with the electron configuration [noble gas]ns2(n - 1)d8 has _____ valence electrons.

A) 2 B) 6 C) 8 **D)** 10 E) None of these choices is correct.

- Which of the following elements has the largest atomic size?

A) S B) Ca **C)** Ba D) Po E) Rn

Which of the following elements has the greatest atomic radius?

A) Li B) Ne **C)** Rb D) Sr E) Xe

Which one of the following equations correctly represents the process relating to the ionization energy of X?

A) $X(s) \rightarrow X^+(g) + e^-$

B) $X_2(g) \rightarrow X^+(g) + X^-(g)$

C) $X(g) + e^- \rightarrow X^-(g)$

D) $X^-(g) \rightarrow X(g) + e^-$

E) $X(g) \rightarrow X^+(g) + e^-$

- **Which of the following elements has the largest second ionization energy (IE_2)?**

  A) Li B) B C) O D) F E) Na

- **Select the most basic compound from the following**.

  A) Bi_2O_3 B) SiO_2 **C**) Cs_2O D) Na_2O E) H_2O

- **Select the paramagnetic ion.**

  A) Cu^+ B) Ag^+ **C**) Fe^{3+} D) Cd^{2+} E) Ca^{2+}