

Chapter 6

- A system that does no work but which transfers heat to the surroundings has
 - A) $q < 0, \Delta E > 0$
 - B) $q < 0, \Delta E < 0$
 - C) $q > 0, \Delta E > 0$
 - D) $q > 0, \Delta E < 0$
 - E) $q < 0, \Delta E = 0$
 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) -1000 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
 - B) 29 kJ
 - C) 5.0×10^2 kJ
 - D) 1.2×10^3 kJ
 - E) 5.0×10^5 kJ
 Ans: C

- A 275-g sample of nickel at 100.0°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)

$$275 \times 0.444 (T - 100) + 100 \times 4.18 (T - 22) = 0$$

$$122.1 T - 12210 + 418 T - 9196 = 0$$

$$540.1 T = 21406$$

$$T = 39.6 \text{ } ^\circ\text{C}$$

- A piece of copper metal is initially at 100° C. It is dropped into a coffee cup calorimeter containing 50.0 g of water at a temperature of 20.0° C. After stirring, the final temperature of both copper and water is 25.0° 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?

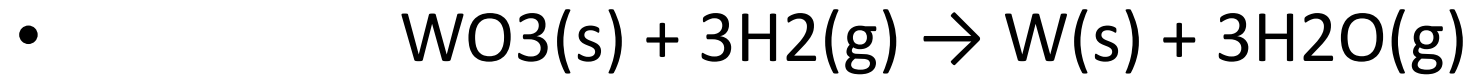
Heat gained by water = heat lost by copper

$$\text{heat gained by water} = q = mC\Delta T = (50 \text{ g})(4.18 \text{ J/g/deg})(5 \text{ deg}) = 1045 \text{ J}$$

$$\text{heat lost by copper} = 1045 \text{ J} = C \times \Delta T$$

$$C = 1045 \text{ J}/75 = 13.9 \text{ J/deg}$$

- Use Hess's Law to calculate the enthalpy change for the reaction

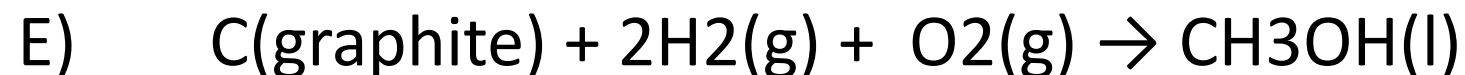
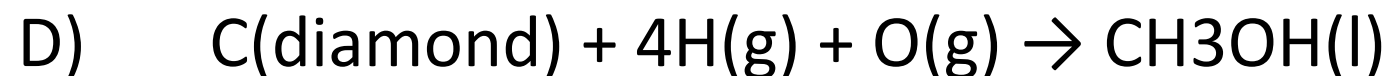
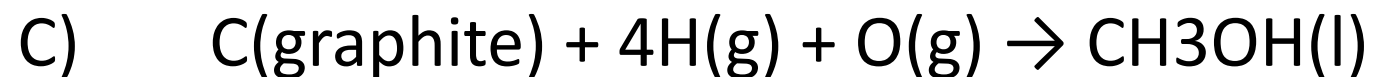
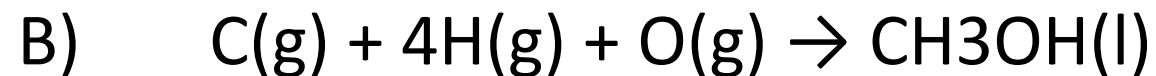
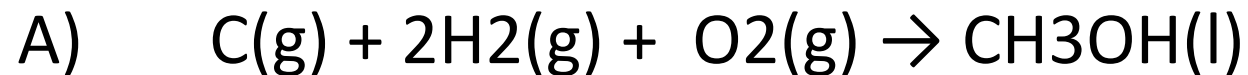


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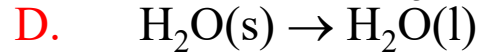
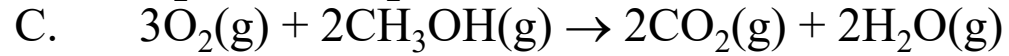
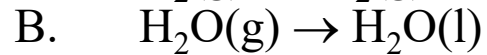
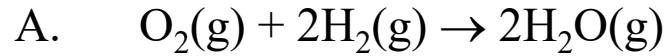
- A) 125.9 kJ D) 1207.6 kJ
- B) 252.9 kJ E) None of these choices is correct.
- C) 364.9 kJ
- Ans: A

- Which one of the following equations represents the formation reaction of CH₃OH(l)?

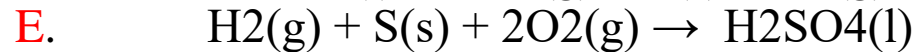
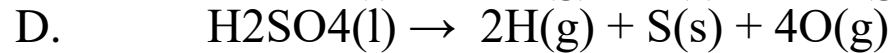
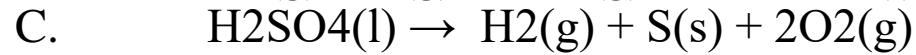
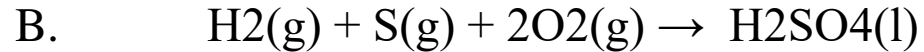
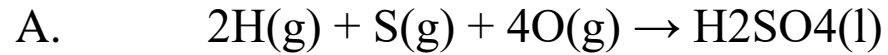


Ans: E

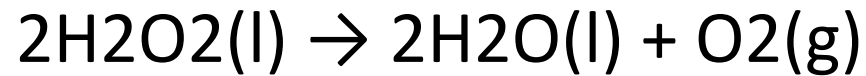
- Which of these processes is *endothermic*?



To which one of these reactions occurring at 25°C does the symbol $[\text{H}_2\text{SO}_4(\text{l})]$ refer?



- Calculate $\Delta H_{\text{rxn}}^{\circ}$ for the following reaction



- given that $\Delta H_{\text{f}}^{\circ} [\text{H}_2\text{O}(\text{l})] = -285.8 \text{ kJ/mol}$ and $\Delta H_{\text{f}}^{\circ} [\text{H}_2\text{O}_2(\text{l})] = -187.6 \text{ kJ/mol}$.

- 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 (m_l).
 - D) the spin quantum number (m_s).
 - 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) $n = 3, l = 0, m_l = -1$

D) $n = 3, l = 3, m_l = +2$

B) $n = 3, l = 1, m_l = +3$

E) $n = 3, l = 2, m_l = -2$

C) $n = 3, l = 2, m_l = 3$

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

A) the aufbau principle.

D) the periodic law.

B) the Pauli exclusion principle.

E) Heisenberg's principle.

C) Hund's rule.

- 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

D) [Ar]4s²4d⁹

B) [Ar]4s¹3d¹⁰

E) [Ar]5s²4d⁹

C) [Ar]4s²4p⁶3d³

• 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.

Chapter 8

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

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

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.

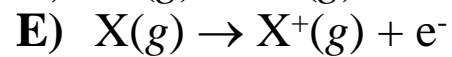
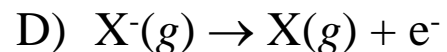
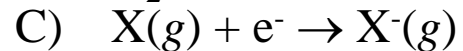
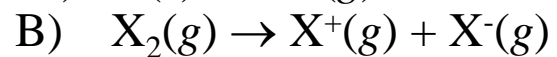
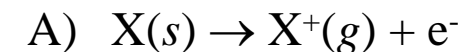
• Which of the following elements has the largest atomic size?

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?



- **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+}