

A few equations

$$c = \square\square$$

$$E_{\text{photon}} = h\square$$

$$KE = h\square\square\square$$

$$\square E = -R_H(1/n_f^2 - 1/n_i^2)$$

$$\square = h/(mv)$$

A few constants

$$R_H = 2.18 \times 10^{-18} \text{ J}$$

$$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$c = 2.9979 \times 10^8 \text{ m/s}$$

$$m_e = 9.11 \times 10^{-31} \text{ kg}$$

$$m_p = 1.6 \times 10^{-27} \text{ kg}$$

$n$  has integral values 1,2,3...

$l$  has integral values from 0 to  $n-1$

$m_l$  has integral values between (and including)  $l$   
to  $-l$

$m_s$  can be  $+1/2$  or  $-1/2$

$$0 \text{ }^\circ\text{C} = 273.15 \text{ K}$$

1. The Bohr model of the hydrogen atom (mark each statement true or false)

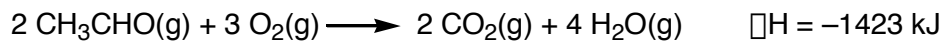
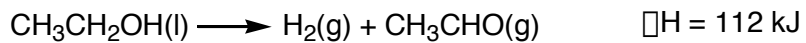
- \_\_\_\_\_ was the first model based on physical relationships that successfully accounted for the line spectrum of the hydrogen atom.
- \_\_\_\_\_ explains why the energy of an electron is quantized.
- \_\_\_\_\_ successfully accounted for the line spectrum of multielectron atoms like helium.

2. Using the noble gas shorthand write the ground state electron configuration for Sb.

3. Determine the number of unpaired electrons in the following unexcited atoms or ions.

- a. Br \_\_\_\_\_      b.  $\text{F}^-$  \_\_\_\_\_      c. S \_\_\_\_\_      d. Al \_\_\_\_\_      f. P \_\_\_\_\_

4. Use the following information to determine the heat of formation,  $\Delta H_f^\circ$ , for  $\text{CH}_3\text{CH}_2\text{OH}$ .



For  $\text{CO}_2\text{(g)}$   $\Delta H_f^\circ = -393.5 \text{ kJ/mol}$ , and for  $\text{H}_2\text{O(g)}$   $\Delta H_f^\circ = -242 \text{ kJ/mol}$ .

5. Quantum mechanics (mark each statement true or false)

- \_\_\_\_\_ treats electrons as particles that orbit a nucleus in a wavelike pattern.
- \_\_\_\_\_ quantizes the energy of an electron by treating the electron as a standing wave.

6. In a hydrogen atom, a photon with wavelength equal to 1874.5 nm is emitted as an electron moves from the  $n=4$  level to which level?

7. Draw an energy level diagram for the electrons of a C atom. Remember to label all the energy levels.

8. To release 520 kJ of energy how many grams of propane,  $\text{CH}_3\text{CH}_2\text{CH}_3$ , must be burned?  
 $\Delta H_{\text{combustion}} = -2044 \text{ kJ/mol}$ .