

## The Periodic Table

<i>IA</i> <b>H</b> 1 1.01																	<i>VIIA</i> <b>He</b> 2 4.00
<i>IA</i> <b>Li</b> 3 6.94	<i>IIA</i> <b>Be</b> 4 9.01											<i>IIIA</i> <b>B</b> 5 10.81	<i>IVA</i> <b>C</b> 6 12.01	<i>VA</i> <b>N</b> 7 14.01	<i>VIA</i> <b>O</b> 8 16.00	<i>VIIA</i> <b>F</b> 9 19.00	<b>Ne</b> 10 20.18
<b>Na</b> 11 22.99	<b>Mg</b> 12 24.31			<i>IIIB</i> <b>Al</b> 13 26.98	<i>IVB</i> <b>Si</b> 14 28.09	<i>VB</i> <b>P</b> 15 30.97	<i>VIB</i> <b>S</b> 16 32.07	<i>VIB</i> <b>Cl</b> 17 35.45	<i>VIB</i> <b>Ar</b> 18 39.95								
<b>K</b> 19 39.10	<b>Ca</b> 20 40.08	<b>Sc</b> 21 44.96	<b>Ti</b> 22 47.88	<b>V</b> 23 50.94	<b>Cr</b> 24 52.00	<b>Mn</b> 25 54.94	<b>Fe</b> 26 55.85	<b>Co</b> 27 58.93	<b>Ni</b> 28 58.69	<b>Cu</b> 29 63.55	<b>Zn</b> 30 65.39	<b>Ga</b> 31 69.72	<b>Ge</b> 32 72.61	<b>As</b> 33 74.92	<b>Se</b> 34 78.96	<b>Br</b> 35 79.90	<b>Kr</b> 36 83.80
<b>Rb</b> 37 85.47	<b>Sr</b> 38 87.62	<b>Y</b> 39 88.91	<b>Zr</b> 40 91.22	<b>Nb</b> 41 92.91	<b>Mo</b> 42 95.94	<b>Tc</b> 43 (97.9)	<b>Ru</b> 44 101.07	<b>Rh</b> 45 102.91	<b>Pd</b> 46 106.42	<b>Ag</b> 47 107.87	<b>Cd</b> 48 112.41	<b>In</b> 49 114.82	<b>Sn</b> 50 118.71	<b>Sb</b> 51 121.76	<b>Te</b> 52 127.60	<b>I</b> 53 126.90	<b>Xe</b> 54 131.29
<b>Cs</b> 55 132.91	<b>Ba</b> 56 137.33	<b>La</b> 57 138.91	<b>Hf</b> 72 178.49	<b>Ta</b> 73 180.95	<b>W</b> 74 183.85	<b>Re</b> 75 186.21	<b>Os</b> 76 190.2	<b>Ir</b> 77 192.22	<b>Pt</b> 78 195.08	<b>Au</b> 79 197.97	<b>Hg</b> 80 200.59	<b>Tl</b> 81 204.38	<b>Pb</b> 82 207.2	<b>Bi</b> 83 208.98	<b>Po</b> 84 (209)	<b>At</b> 85 (210)	<b>Rn</b> 86 (222)
<b>Fr</b> 87 223.02	<b>Ra</b> 88 226.03	<b>Ac</b> 89 227.03	<b>Rf</b> 104 (261)	<b>Db</b> 105 (262)	<b>Sg</b> 106 (263)	<b>Bh</b> 107 (262)	<b>Hs</b> 108 (265)	<b>Mt</b> 109 (266)									
<b>Ce</b> 58 140.12	<b>Pr</b> 59 140.91	<b>Nd</b> 60 144.24	<b>Pm</b> 61 (145)	<b>Sm</b> 62 150.36	<b>Eu</b> 63 152.97	<b>Gd</b> 64 157.25	<b>Tb</b> 65 158.93	<b>Dy</b> 66 162.50	<b>Ho</b> 67 164.93	<b>Er</b> 68 167.26	<b>Tm</b> 69 168.93	<b>Yb</b> 70 173.04	<b>Lu</b> 71 174.97				
<b>Th</b> 90 232.04	<b>Pa</b> 91 231.04	<b>U</b> 92 238.03	<b>Np</b> 93 237.05	<b>Pu</b> 94 (240)	<b>Am</b> 95 243.06	<b>Cm</b> 96 (247)	<b>Bk</b> 97 (248)	<b>Cf</b> 98 (251)	<b>Es</b> 99 252.08	<b>Fm</b> 100 257.10	<b>Md</b> 101 (257)	<b>No</b> 102 259.10	<b>Lr</b> 103 262.11				

### Some Useful And Not So Useful Information:

$$\lambda\nu = c$$

$$E = h\nu$$

$$E = mc^2$$

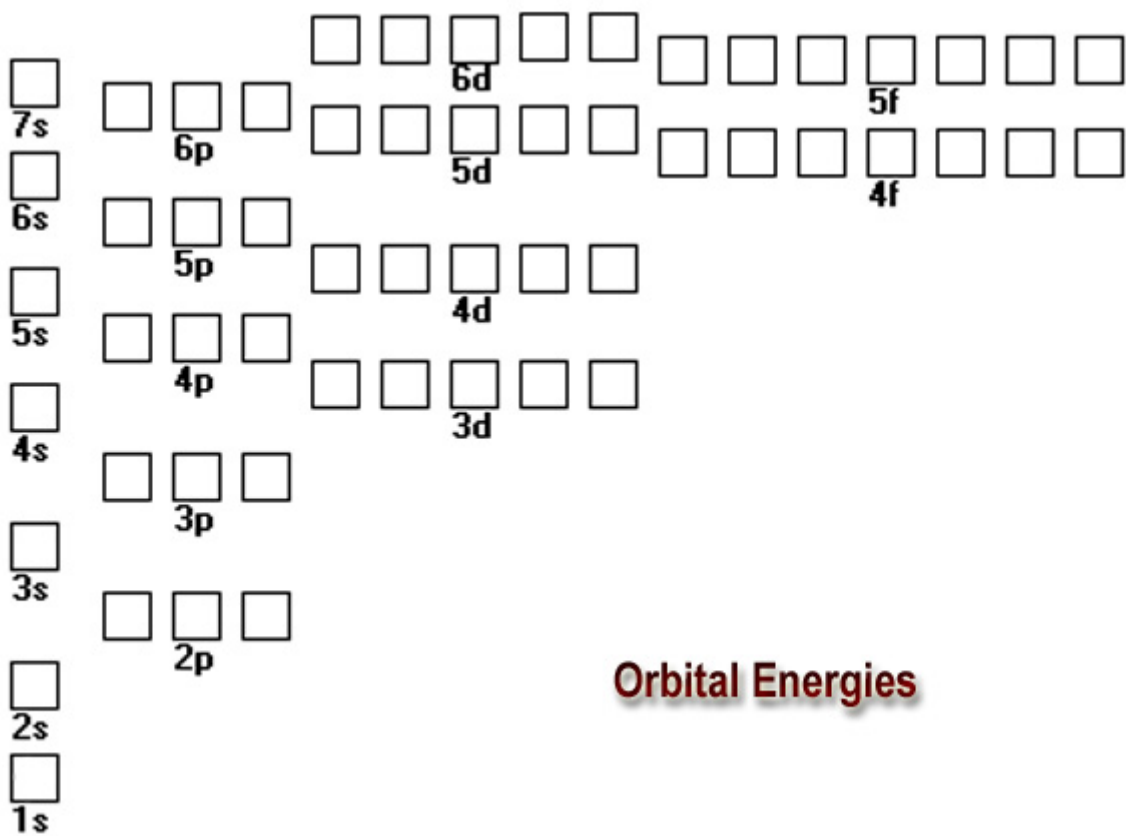
$$1 \text{ kJ} = 1000 \text{ J}$$

$$N = 6.023 \times 10^{23} \text{ mol}^{-1}$$

$$c = 2.998 \times 10^8 \text{ m.s}^{-1}$$

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

Energy



Orbital Energies

Question 1 A piece of copper has a mass of 640 kg. Using dimensional analysis and the conversion data given below, what is the volume of the sample, in units of liters?  
6 Points

$$1 \text{ cm}^3 \text{ Cu} = 8.8 \text{ g Cu}$$

$$1 \text{ kg} = 1000\text{g}$$

$$1\text{L} = 1000 \text{ cm}^3$$

$$9.5 \times 10^{21} \text{ atoms Cu} = 1 \text{ g Cu}$$

$$1 \text{ cm}^3 = 1 \text{ mL}$$

Question 2 What is the charge of the ions formed from: (Give both magnitude and sign.)  
4 Points

Ca \_\_\_\_\_ F \_\_\_\_\_  
S \_\_\_\_\_ K \_\_\_\_\_

Question 3 Fill in the blanks in the following table:  
4 Points

Protons	Neutrons	Electrons	Complete Atomic Symbol
			${}^{90}_{39}\text{Y}^+$
20	20	18	

Question 4 Classify each of the following elements as:  
8 Points  
Pick the most appropriate from the following:  
Metal, Non Metal, Halide, Noble Gas, Alkali Metal, Alkali Earth Metal, Transition Metal, Lanthanide or Actinide.

Element Number	Element Number
68 _____	12 _____
86 _____	19 _____
27 _____	13 _____
53 _____	16 _____

\* Element number 13 when it reacts likes to loose electrons

Question 5 Eu has two naturally occurring isotopes:

6 Points

Isotope	Exact Mass	Natural Abundance
$^{151}\text{Eu}$	150.919860	47.80%
$^{153}\text{Eu}$	152.921243	52.20%

What is the average atomic mass of Eu? (Give your answer to 6 decimal places)

Question 6 A sample of cinnamaldehyde,  $\text{C}_9\text{H}_8\text{O}$ , has a mass of 23.53g. Who many moles of cinnamaldehyde does this represent?

6 Points

Question 7 Analysis of a compound found it to contain:

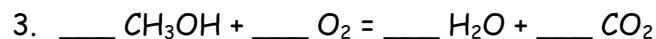
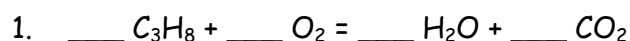
6 Points

K 49.413%                      S 20.259%                      O 30.330%

What is the empirical formula of this compound?

Question 8 Using the smallest whole number integers possible, balance the following chemical equations.

9 Points



Question 9 A chemical reaction can be initiated by light that carries energy of  $3.79 \times 10^5 \text{ J} \cdot \text{mol}^{-1}$ . Only light less than a certain wavelength will initiate the reaction.

7 Points

What is the longest wavelength, in meters, that can deliver the required energy?

Question 10 Give the correct name for each of the following ionic compounds.

4 Points

1.  $\text{MgO}$  \_\_\_\_\_
2.  $\text{Ca}(\text{NO}_2)_2$  \_\_\_\_\_
3.  $\text{FeP}$  \_\_\_\_\_
4.  $\text{CuCl}_2$  \_\_\_\_\_

Question 11 Give the correct formula for each of the following ionic compounds.

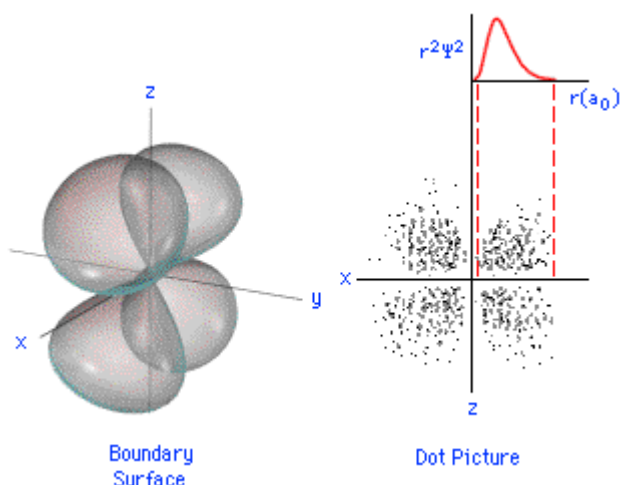
4 Points

1. Ammonium nitrate \_\_\_\_\_
2. Lithium hydrogen sulfate \_\_\_\_\_
3. Potassium chlorate \_\_\_\_\_
4. Aluminum phosphate \_\_\_\_\_

Question 12 a. What type of orbital is depicted on the right? (s, p, d, f, g)

6 Points

- \_\_\_\_\_
- b. What is the principal quantum number for this orbital?
- \_\_\_\_\_
- c. What is the specific designation for this orbital?
- \_\_\_\_\_



Question 13 Which of the following orbital designations are solutions to the Schrodinger Equation.  
[Check those that apply]

6 Points

8s \_\_\_      4p \_\_\_      2d \_\_\_      3f \_\_\_      2p \_\_\_

Question 14 Give the Complete Electronic Configuration (Spectroscopic Notation) for the following:

6 Points

1. C \_\_\_\_\_

2. Al \_\_\_\_\_

3. Br \_\_\_\_\_

Question 15 Give the Noble Gas Electronic Configuration for the following:

6 Points

1. Cl \_\_\_\_\_

2. Ca \_\_\_\_\_

3. Se \_\_\_\_\_

Question 16 Which of the following elements are paramagnetic?

6 Points

[Check those that are]

Li \_\_\_      Mg \_\_\_      C \_\_\_      Ar \_\_\_      O \_\_\_

Question 17 In the visible region of the electromagnetic spectrum, red and blue light lie at the extremes. Which of these has:

6 Points

1. The longest wavelength: \_\_\_\_\_

2. The highest frequency: \_\_\_\_\_

3. The smallest energy: \_\_\_\_\_