

## INFORMATION, SCRAP, AND COVER PAGE

**\*\*\* KEEP YOUR WORK AND YOUR ANSWERS COVERED \*\*\***

This page contains information which may or may not be needed. This page can also be used for scrap paper or for cover paper. THIS PAGE WILL NOT BE COLLECTED. TEAR THIS PAGE OFF THE EXAM.

Avogadro's Number  $6.022 \times 10^{23}$

Electromagnetic Radiation  $c = \lambda\nu = 3.00 \times 10^8 \text{ m/s}$

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

$$E = h\nu = hc/\lambda$$

Electron Energy  $E = -2.18 \times 10^{-18} \text{ J} \left( \frac{Z^2}{n^2} \right)$

Transition Energy  $\Delta E = -2.18 \times 10^{-18} \text{ J} \left( \frac{1}{n_{\text{final}}^2} - \frac{1}{n_{\text{initial}}^2} \right)$

PRINT NAME \_\_\_\_\_

SIGN NAME \_\_\_\_\_

CIRCLE your recitation section in the list below.

5: W	12:00	LF 102	6: Th	8:00	HM 209
7: F	10:00	HM 108	8: W	2:00	HM 106
9: Th	9:00	HM 215	10: F	1:00	HM 209
11: M	1:00	HM 101			

SCORED GRADE: \_\_\_\_\_

All answers should be with the correct significant figures.

The Periodic Table and Information Page will not be collected. They may be used as scratch paper or as cover paper. Do not turn them in. If you wish to check your answers against the key, you can copy your answers to those pages.

Be certain your answers are clear. If an answer is not clear, it can be considered wrong.

Problems marked with \*\* in the margin are from the assigned homework. These total 23 points.

Place your name in the space provided at the top of each question page. This helps to identify the pages if they are accidentally separated during grading and processing.

Work promptly. Use your time effectively.

last name: \_\_\_\_\_

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1. (24 pts) Indicate whether each statement is true (T) or false (F). Be certain T or F is clearly indicated.

\_\_\_\_\_ IR radiation has a shorter wavelength than visible radiation.  
\_\_\_\_\_ An excitation always increases the energy of the electron in an atom.  
\_\_\_\_\_ Phosphorescence is characterized by delayed relaxation.  
\_\_\_\_\_ Spin exclusion limits every orbital to two electrons maximum.  
\_\_\_\_\_ Aluminum is a *d*-block metal.  
\_\_\_\_\_ Neutral atoms of all elements in Group 13 have one unpaired electron.  
\_\_\_\_\_ A tin atom has five valence electrons in  $n = 4$ .  
\_\_\_\_\_  $\text{Ti}^{2+}$  has a full subshell configuration.

2. (6 pts) Give the number of unpaired electrons in each of the following.

C \_\_\_\_\_ Ni \_\_\_\_\_  $\text{Sn}^{2+}$  \_\_\_\_\_

- \*\* 3. (6 pts) Write the full electron configuration for Si.

- \*\* 4. (4 pts) Circle the entry below which has the greatest desire to gain an electron.

Br Cl  $\text{Cl}^-$  S  $\text{S}^{2-}$  P

5. (2 pts) How many elements in Period 3 are paramagnetic (as neutral atoms)? \_\_\_\_\_

(2 pts) How many core electrons are in an atom of Se? \_\_\_\_\_

(2 pts) Which element in the *p*-block has the highest  $\text{IE}_2$ ? \_\_\_\_\_

last name: \_\_\_\_\_

- \*\* 6. (4 pts) The solar wind contains many unusual and very high energy ions flying through space. One such ion is  $O^{7+}$ . Circle the energy (in J) of the electron in the  $n = 3$  level of  $O^{7+}$ .

$-2.06 \times 10^{-18}$      $-4.37 \times 10^{-18}$      $-5.82 \times 10^{-18}$      $-7.66 \times 10^{-18}$      $-8.23 \times 10^{-18}$   
 $-1.55 \times 10^{-17}$      $-3.41 \times 10^{-17}$      $-6.37 \times 10^{-17}$      $-8.84 \times 10^{-17}$      $-9.06 \times 10^{-17}$

7. (12 pts) Using noble gas abbreviation, give the configuration of each of the following.

$V^{3+}$     [    ]

Hf    [    ]

$Sb^{3+}$     [    ]

8. (2 pts) What is the value of  $l$  for a  $d$  subshell? \_\_\_\_\_

(2 pts) What is the maximum number of electrons in any  $f$  subshell? \_\_\_\_\_

- \*\* 9. (3 pts) What element forms a  $2+$  cation which is isoelectronic to  $Al^{3+}$ ? \_\_\_\_\_

(3 pts) How many subshells are in the  $n = 4$  shell? \_\_\_\_\_

(3 pts) What element in Group 16 has the highest ionization energy? \_\_\_\_\_