

## CHEM 1101 – SAMPLE MIDTERM FOR WINTER 2017

- Print your name and student number on your test booklet. **UNDERLINE YOUR FAMILY NAME**
- SPACE OUT YOUR ANSWERS – we will mark answers on the lined side of the page only – you can use the other side for rough work if you wish
- **KEEP YOUR TEST PAPER - HAND IN ONLY THE BOOKLET**
- **TURN OFF YOUR CELL PHONES AND ANY ALARMS YOU MAY HAVE**

1. Tellurium has an ionization energy of 856 kJ/mol. Determine the maximum wavelength of the electromagnetic radiation that will trigger the photoelectric effect in Te, in nanometers:

2. For tin  ${}_{50}\text{Sn}$ :

- Give the electron configuration
- Identify the valence subshell(s). Give the orbital diagram and the quantum numbers for all electrons in the valence subshell(s)
- Identify the highest energy subshell. Give the orbital diagram and the quantum numbers for all electrons in the highest energy subshell, if different from b).
- Give the electron configuration for the tin ion,  $\text{Sn}^{4+}$ .

3. For the following elements: Ar, K, Mg, Ne, P, S, Si

- Rank in order of **increasing** size
- Rank in order of **increasing** ionization energy

4. Give the IUPAC (systematic) name for the following:

- a)  $\text{Bi}_2\text{O}_3$                       b)  $\text{Tl}_2\text{O}_3$                       c)  $\text{MoPO}_4$                       d)  $\text{N}_2\text{O}_4$

Give the chemical formula for the following:

- e) Tin sulfate                      f) indium (I) sulfide                      g) ammonium nitrate

5. For iodine tribromide,  $\text{IBr}_3$

- Show the Lewis diagram
- Give the bond order for each bond
- Draw and name the VSEPR geometry

6. a) Draw and label a molecular orbital diagram for the ion  $O_2^+$   
b) Determine the bond order  
c) Give the magnetism

**Data and Equations**

$$E = hc/\lambda$$

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

$$E = hv$$

$$c = 3.00 \times 10^8 \text{ m/s}$$

$$1 \text{ mol: } 6.02 \times 10^{23}$$

$$E = R_H \left( \frac{1}{n_i^2} - \frac{1}{n_f^2} \right)$$

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