Hello everyone! Good job, y’all made it through another week!! This is the last resource I’ll be posting this semester. All the resources can be found here: https://www.baylor.edu/support_programs/index.php?id=967950#science

Reach out to me if you need help with anything. Don’t forget that the last Group Tutoring session will be this Monday (12/06/21) from 5:15 pm to 6:15 pm via Microsoft Teams. We will go over common topics that you may need help with before the final and we’ll also do a bunch of practice problems. You can reserve a spot at www.baylor.edu/tutoring :) 

**Topics I'll be covering in this resource:** Phase Change, Intermolecular forces, Importance concepts from past material, practice questions for the final

**Keywords:** Final Review

**Let’s start with going over a generalized concept that y’all are going to discuss in class before the final.**

**Phase Change:**

![Diagram of phase change](https://www.shmoop.com/study-guides/chemistry/matter-properties/phase-change)

- Change of state from solid to liquid to gas does not involve change in molecules, but change in forces among molecules
- **Solid to liquid**
  - By adding energy, the motion of molecules increase
  - Molecules eventually have greater movement and the disorder characteristics of a liquid
- **Liquid to gas**- By adding more energy, individual molecules move far apart, reducing interaction

In the above diagram, solid state can undergo **melting** to change to the liquid phase. Furthermore, the liquid phase can undergo **vaporization** to change to the gaseous state. From gas to liquid, the process of **condensation** takes place and from liquid to solid, the process of...
freezing takes place. The direct change of solid to gas without any intermediate step is called sublimation and the direct change of gaseous state to solid state is called deposition.

**Intermolecular forces:**
They are forces that occur between molecules and include:
• Dipole–dipole forces
• Hydrogen bonding
• London dispersion forces

**Dipole–dipole forces:**
(a) The electrostatic interaction of two polar molecules
(b) The interaction of many dipoles in a condensed state

**Hydrogen Bonding:**
Strong dipole–dipole forces can be noticed when H is bound to highly electronegative atoms like N, O, and F

In this diagram, the bond between oxygen and hydrogen is called hydrogen bonding.

**London dispersion forces:**
They exist among noble gas atoms and nonpolar molecules

This section of the resource includes all the key concepts covered throughout the semester. Make sure you give this section a good look to review past materials. I have only included material that I think is high-yield. If y’all want to check out other concepts, make sure to click on the link mentioned in the introduction to go over previous resources.

**Highlight #1: Quantum numbers (Week 3)**

<table>
<thead>
<tr>
<th>Number</th>
<th>Symbol</th>
<th>Possible Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Quantum Number</td>
<td>n</td>
<td>1, 2, 3, 4, ...</td>
</tr>
<tr>
<td>Angular Momentum Quantum Number</td>
<td>ℓ</td>
<td>0, 1, 2, 3, ..., (n – 1)</td>
</tr>
<tr>
<td>Magnetic Quantum Number</td>
<td>m_1</td>
<td>ℓ, ... , -1, 0, 1, ... , ℓ</td>
</tr>
<tr>
<td>Spin Quantum Number</td>
<td>m_s</td>
<td>+1/2, -1/2</td>
</tr>
</tbody>
</table>

This table explains how to calculate quantum numbers.
Angular momentum quantum number: n-1
Magnetic quantum number: -1 to +1
Spin quantum number: +½, -½
Highlight #2: Electronic configuration (Week 4)

This diagram will help you determine the electronic configuration of an element. Follow the arrow to write out the electronic configuration. For example, 1s comes first followed by 2s, 2p, 3s, 3p, 4s, 3d, so on and so forth. Remember that s holds a maximum of 2 electrons, p holds a maximum of 6 electrons, d holds a maximum of 10 electrons, and f holds a maximum of 14 electrons.

Highlight #3: Different types of bonding (Week 5)

<table>
<thead>
<tr>
<th>Metallic Bonding</th>
<th>Ionic Bonding</th>
<th>Covalent Bonding</th>
</tr>
</thead>
<tbody>
<tr>
<td>metal + metal</td>
<td>metal + non-metal</td>
<td>non-metal + non-metal</td>
</tr>
<tr>
<td>atoms seek stability</td>
<td>atoms seek stability</td>
<td>atoms seek stability</td>
</tr>
<tr>
<td>atoms release their electrons to</td>
<td>atoms give off or accept</td>
<td>atoms share electrons with</td>
</tr>
<tr>
<td>become cations</td>
<td>electrons</td>
<td>other atoms</td>
</tr>
<tr>
<td>happens between atoms of</td>
<td>happens between atoms of</td>
<td>happens between atoms of</td>
</tr>
<tr>
<td>great difference in</td>
<td>little difference in</td>
<td>little difference in</td>
</tr>
<tr>
<td>electronegativity</td>
<td>electronegativity</td>
<td>electronegativity</td>
</tr>
<tr>
<td>can be bent without breaking</td>
<td>easily breaks</td>
<td>fragility depends on state</td>
</tr>
<tr>
<td>can conduct electricity and heat</td>
<td>ability to conduct may depend</td>
<td>ability to conduct may depend</td>
</tr>
<tr>
<td>on state</td>
<td>on state</td>
<td>on the atoms</td>
</tr>
<tr>
<td>high melting and boiling point</td>
<td>high melting and boiling point</td>
<td>low melting and boiling point</td>
</tr>
</tbody>
</table>
Highlight #4: Lewis Structures (Week 6)

Lewis Dot Structures are extremely important and are the foundation of many additional concepts. This diagram is a step by step process of drawing the lewis structure of NO₃⁻.

Highlight #5: Naming Inorganic compounds (Week 7)

This diagram is a flowchart that will assist you in naming inorganic compounds. Initially, practice questions using this flow chart, once you get a hang of it, you won’t need this flowchart anymore.
Highlight #6: Dimensional Analysis (Week 9)

Grams to Mole conversion is not an essential part of Chem 2 but Chem 2. This flowchart will help you convert from grams to moles to particles/molecules/atoms.

Highlight #7: Ideal Gas Law (Week 12)

You can derive Boyle’s Law and Charles's Law from the Ideal Gas Law equation.

Note that:

- Pressure (P) and Volume (V) are inversely proportional
- Volume (V) and Temperature (T) are directly proportional

Now, the next section of this resource consists of some important questions that will help y’all with the cumulative final. These questions cover concepts we went over throughout the semester.

1. Order the intermolecular forces from weakest to strongest. (dipole-dipole, London dispersion, ionic, and hydrogen-bonding)
   
   **Ans. London dispersion < dipole-dipole < Hydrogen bonding < Ionic**

2. It takes 11.2 kJ of energy to raise the temperature of 145 g of benzene from 23.0 deg C to 68.0 deg C. What is the specific heat of benzene?
   
   **Ans. 1.72 J/ g deg C**

3. A flask with a volume of 3.16 L contains 9.33 grams of an unknown gas at 32 deg C and 1.00 atm. What is the molar mass of the gas?
   
   **Ans. 74 g/mol**
4. How many grams of uranium hexafluoride (UF₆, 352.02 g/mol) gas are contained in a 50.0 mL flask at 567 torr and 18.00 deg C?

Ans. 0.5496 g

5. Which of the species below would you expect to show the least hydrogen bonding?
   a. NH₃
   b. H₂O
   c. HF
   d. CH₄
   e. All show equal hydrogen bonding

6. Given the standard enthalpies of formation for the following substances, determine the change in enthalpy for the combustion of 1.0 mol propane, C₃H₈?

<table>
<thead>
<tr>
<th>Substance</th>
<th>ΔHᶠ in kJ/mol</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₃H₈ (g)</td>
<td>-103.8</td>
</tr>
<tr>
<td>CO₂ (g)</td>
<td>-393.5</td>
</tr>
<tr>
<td>H₂O (l)</td>
<td>-285.8</td>
</tr>
</tbody>
</table>

Ans. -2219.9 kJ/mol C₃H₈

7. Calculate the mass percent composition of oxygen in Al₂(SO₄)₃

Ans. 56.11 %

8. How many core electrons does Cd have?

Ans. 46 core electrons

9. Place the following in order of increasing electronegativity?
   As    O    Br

As ≤ Br ≤ O

10. What is the frequency of the radiation with a wavelength of 440 nm?

Ans. 6.81 * 10¹⁴ s⁻¹

11. What is the correct electronic configuration of Te?

Ans. [Kr] 5s² 4d¹⁰ 5p⁴

12. Give the numbers for ml for a d orbital

Ans. -2, -1, 0, +1, +2

13. Place the following types of electromagnetic radiation in order of increasing wavelength

Visible light    gamma rays    microwaves

Ans. Gammas rays < visible light < microwaves

Remember the mnemonic: “Red Monkeys Invade Venus Using X-ray Guns” to remember the order of decreasing wavelength of electromagnetic radiation

Thank you so much and I hope y’all enjoyed learning Chemistry! :)