

Chemistry IH/I Midterm (Semester 1) Exam Review – Mrs. Bauck
Optional assignment due _____

The chemistry exam will consist of two parts. The district EOC has 41 multiple choice questions (50% of total score), and Bauck's exam has 73 multiple choice questions. This review will help you with both portions. The exam is divided into sections by topics. You will need #2 pencils and erasers, a calculator, as well as something to do (book, other classes' work, etc.) if you finish early. No electronic devices are allowed as long as exams are being taken in the classroom.

The midterm exam is weighted 25% of the semester grade. Reread the notes and book, redo practice problems, watch tutorial videos, complete this review. This exam review was written directly from the exam. The exam review will count as an optional assignment grade if it is completed correctly and turned in by due date.

Help card: You may use ONE 3"x5" or 4"x6" index card (or piece of paper cut to size) with information written or typed on both sides. The actual card must be submitted for approval the day the exam review is due. It will be checked for size and content. Electronic copies of cards will not be accepted. No sharing of cards during the exam is permitted. You may write any information you want on the card EXCEPT THE POLYATOMIC IONS. You will have a laminated periodic table, but I will not furnish any equations or constants for you, so doing a help card is important.

Here is the minimum information recommended to be on the card: density equation, Kelvin equation, wave equations, Planck's constant, speed of light constant, VSEPR table of shapes.

Sections on Bauck's exam:

Introduction to chemistry; general topics
Scientific measurement, sig. figs., metrics, and dimensional analysis
Atomic structure
Chemical names and formulas
Electrons in atoms
Periodic table; periodicity
Ionic bonds
Covalent bonds

INTRO TO CHEM; GENERAL TOPICS

- 1) **Chemical change:** What is it? List three examples.
- 2) **Chemical property:** What is it? List three examples.
- 3) **Chemical reaction:** What is it? How do you tell one has taken place?
- 4) **Compound:** What is it? Contrast with **element**.
- 5) **Control / control group:** What is it? How does it fit into an experiment? How does it related to variables?
- 6) **Element:** What is it? Contrast with **compound**.
- 7) **Energy:** What is it? Define these types: kinetic, radiant, potential, nuclear.
- 8) **Experiment:** What is it? How it is designed?
- 9) **Heterogeneous mixture:** What is it? Identify examples. Contrast with **homogeneous mixture**.
- 10) **Homogeneous mixture (solution):** What is it? Identify examples. Contrast with **heterogeneous mixture**.
- 11) **Hypothesis:** What is it? Give an example.
- 12) **Physical change:** What is it? List three examples.
- 13) **Physical property:** What is it? List three examples.
- 14) **Reaction:** What is it? (Be able to identify **reactants** and **products** in a sample reaction).

- 15) **Scientific law**: What is it? Identify characteristics; contrast with **theory**.
- 16) **Theory**: What is it? Identify characteristics; contrast with **scientific law**.
- 17) **Variable**: What is it? Contrast **independent variables** and **dependent variables**. Identify **independent variables** and **dependent variables** in an example.

SCIENTIFIC MEASUREMENT, SIG. FIGS., METRICS, AND DIMENSIONAL ANALYSIS

- 18) **Absolute zero**: What is it?
- 19) **Accuracy**: What is it? Contrast with **precision**.
- 20) **Density**: What does this measure? Identify proper units. Solve problems for D, M, or V, using the equation $D = M / V$. Give an example of each.
- 21) **Dimensional analysis**: How does it work? What is the function of **conversion factors**? (Be able to do simple math dimensional analysis problems). Give one example each of **mole math** problems using g, L, and atoms.
- 22) **Kelvin**: What does this measure? Convert from **Kelvin** to **Celsius**, and **Celsius** to **Kelvin** using the equation $K = C + 273$. Give an example of each.
- 23) **Mass**: What does this measure? Identify proper mass units, and list three of them here.
- 24) **Metric system**: List the **prefixes** in order, from kilo down to milli. What do they mean numerically?
- 25) **Precision**: What is it? Contrast with **accuracy**.
- 26) **SI**: What is this? Identify the common **base units** of mass, temperature, length.
- 27) **Scientific notation**: Know how to put a number from standard notation into scientific notation and vice versa. Give an example of each.
- 28) **Significant figures** (“**sig.figs**”): What are they? How are they used? [Know *how* to apply the sig.fig rules: “How many sig.figs are in the number --”?]]
- 29) **Volume**: What is it? List three possible units of volume.

ATOMIC STRUCTURE

- 30) **Atomic mass**: What is it? Contrast with **atomic number** and **mass number**.
- 31) **Atomic number**: What is it? What types of information does the atomic number give?
- 32) **Electron**: What is it? Where is it located? What is its symbol? What is its relative mass? What is its charge?
- 33) **Isotopes**: What are they? How are isotopes of an element the same? How are they different?
- 34) **Mass number**: What is it? Why is it NOT the number on the periodic table?
- 35) **Nucleus**: What is it? Is it the heaviest part of the atom?
- 36) **Neutron**: What is it? Where is it located? What is its symbol? What is its relative mass? What is its charge?
- 37) **Proton**: What is it? Where is it located? What is its symbol? What is its relative mass? What is its charge?
- 38) **Rutherford’s gold foil experiment**: How was it set up? What did the results show?
- 39) **Subatomic particles**: What are the three main ones? How many do scientists think there are in total? (Be able to find the numbers of protons, neutrons, and electrons of an atom. A mass number will be given when needed).

COMPOUNDS; WRITING AND NAMING CHEMICAL FORMULAS

- 40) **Anion**: What is it? What is a **monatomic anion**? How does it form?
- 41) **BI**: What does this stand for?
- 42) **BM**: What does this stand for?
- 43) **Cation**: What is it? What is a **monatomic cation**? How does it form?
- 44) “Charge Chant”: list the common **ionic charges (oxidation numbers)** of the representative elements
- 45) **Compound**: What is it? Be able to identify **BI**, **BM**, and **TI** compounds.

- 46) Formulas of compounds: Be able to write the formula of a compound, given its name. (Crisscross of BI and TI; using prefixes for BM). Give an example of each here.
- 47) **Groups**: Where are they in the periodic table? Why is the group arrangement important?
- 48) **Metals**: Where are they in the periodic table? What are some characteristics?
- 49) **“Middle metals”**: How do these work when they form cations? Explain how Roman numerals are used in naming them. What three elements are the exceptions to this?
- 50) **Metalloids**: What are two other names for the metalloids? Where are they in the periodic table?
- 51) **Molecular compound**: What types of elements make up a “BM” compound? Identify characteristics of molecular compounds.
- 52) **Naming compounds**: Given a chemical formula, be able to name the compound correctly. Give an example here.
- 53) **Nonmetals**: Where are they in the periodic table? What are some characteristics?
- 54) **Periods**: Where are they in the periodic table?
- 55) **Polyatomic ion**: What is it made of? Know the common polyatomic ions. List them here.
- 56) **Prefixes**: Know the ten prefixes used for naming BM compounds. List them here.
- 57) **Subscripts and superscripts**: How can you identify them in a formula?
- 58) **TI**: What does this stand for?

ELECTRONS AND ELECTRON CONFIGURATIONS

- 59) Aufbau diagram: Know what the “**boxes**” and “**arrows**” mean. Why do the “arrows” point in opposite directions?
- 60) **Electron configuration**: What is it? How is it done? (Know how to write complete electron configurations as well as condensed and valence configurations. Be able to identify an element based on its electron configuration. Be able to identify how an ion changes its electron configuration).
- 61) **em**: What does this stand for?
- 62) **Energy**: What is it? List the common unit for energy in wave equations.
- 63) **Frequency**: What is it? List the common unit for energy in wave equations.
- 64) **Ground state and excited state**: What are these? How are they related?
- 65) **Orbital**: What is it? What are **s, p, d, f**? What are their shapes?
- 66) **Principal quantum number (n)**: What is a common name for this? How many are there, according to the periodic table?
- 67) **Quantum**: What is it?
- 68) **Valence**: What is it? Give an example of a valence electron configuration.
- 69) **Wave anatomy**: define **crest, trough, wavelength, frequency, amplitude**.
- 70) **Wave-particle duality of nature**: What is it?
- 71) Solve the **wave equation $c = \lambda\nu$** for frequency. Show an example problem here.
- 72) Solve the **wave equation $c = \lambda\nu$** for wavelength. Show an example problem here.
- 73) Solve the **wave equation $E = h\nu$** for energy. Show an example problem here.
- 74) Solve the **wave equation $E = h\nu$** for frequency. Show an example problem here.

PERIODIC TABLE; PERIODICITY

- 75) **Atomic size (atomic radius)**: What is the periodic trend for atomic radius from top to bottom down a group; from left to right across a period? Compare atomic size (of the neutral atom) to the **ionic size of cations and anions**.
- 76) **Electronegativity**: What is it? What is the periodic trend for electronegativity from top to bottom down a group; from left to right across a period? Which element is the “greediest”? Why?

- 77) **Group IA (1):** Where are they located? What is this group called? Identify elements from this group. What charge do these ions form? How is their valence configuration related to each other?
- 78) **Group IIA (2):** Where are they located? What is this group called? Identify elements from this group. What charge do these ions form? How is their valence configuration related to each other?
- 79) **Group VIIA (17):** Where are they located? What is this group called? Identify elements from this group. What charge do these ions form? How is their valence configuration related to each other?
- 80) **Group VIIIA (18):** Where are they located? What is this group called? Identify elements from this group. How is their valence configuration related to each other? Why are they **inert**?
- 81) **Inner transition metals:** What are two other names for this collection of elements? Where are they located? Which orbitals do they fill?
- 82) **Ionization energy:** What is it? What is the periodic trend for ionization energy from top to bottom down a group; from left to right across a period?
- 83) **Representative elements:** Where are they located in the periodic table? Which orbitals do they fill?
- 84) **Transition metals:** Where are they located in the periodic table? Which orbitals do they fill?
- 85) **Valence:** Why are only **s & p** orbitals included in normal valence configurations?

IONIC BONDS

- 86) **Electron dot diagrams (Lewis structures):** Be able to predict the number of electron dots for elements and ions.
- 87) **Formula unit:** What is this? Where is it found? Contrast with **molecule**.
- 88) **Delocalized electrons:** What are these? Where are they found? Relate to **metallic bonding**.
- 89) **Ionic bond, ionic compound:** Identify characteristics. Relate the term **salt** to ionic compounds.
- 90) **Metals:** What are they? Identify characteristics. Identify metallic elements.
- 91) **Noble Gas configuration:** What is this? How does this support the **octet rule**? What are the two element exceptions to the octet rule?
- 92) **Octet rule:** What is this? How does this relate to dot diagrams for atoms? How does this relate to ion formation?
- 93) **Valence:** Understand electron changes ion cations and anions. Be able to identify how an ion changed its electron configuration.

COVALENT BONDS

- 94) What is the symbol δ ? How does it relate to **polarity**?
- 95) **Bond strength:** Arrange the following from strongest to weakest: **polar covalent bond, nonpolar covalent bond, ionic bond**.
- 96) **Covalent bond:** What is it? Contrast to an **ionic bond**. Compare and contrast **polar** vs. **nonpolar covalent bonds**. When do these form?
- 97) **Electron dot diagrams (Lewis structures):** Be able to predict the number of **unshared pairs** in an element, and the **number of bonds** that can form as a result.
- 98) **Hydrogen bonding:** What is it? How does it occur? Recognize molecules that can undergo hydrogen bonding.
- 99) **Polarity:** What is this? How does it work? Define **polar** and **non-polar**.
- 100) **VSEPR:** What does this stand for? How does it work? Relate to **molecular geometry**. Given a chemical formula, predict the shape of the molecule.