

Name _____ Pd _____ SN _____ Date _____

Chemistry Review Packet- Spring 2014

1.1.1 Draw pictures to illustrate the differing isotopes and ions of a given element.

1.1.1 Which atomic symbol represents an isotope of sulfur with 17 neutrons?

- a. ${}_{16}^{17}X$ b. ${}_{16}^{33}X$ c. ${}_{17}^{32}X$ d. ${}_{32}^{49}X$

1.1.2 Predict the electron configuration for the following elements:

- a. Argon _____
b. Nitrogen _____
c. Iron _____
d. Bromine _____

1.1.2 Which is the electronic configuration of calcium?

- a. $1s^22s^22p^63s^23p^8$
b. $1s^22s^22p^63s^23p^64s^2$
c. $1s^22s^22p^63s^23p^63d^2$
d. $1s^22s^22p^83s^23p^6$

1.1.3 Use the Bohr model to explain the release of energy in the return of electrons to a ground state.

1.1.3 An electron in an atom of hydrogen goes from energy level 6 to energy level 2. What is the wavelength of the electromagnetic radiation emitted?

- a. 410 nm b. 434 nm c. 486 nm d. 656 nm

1.1.4 The half-life of a radioactive isotope is 20 minutes. What is the total amount of 1.00 g of sample of this isotope remaining after 1 hour?

- a. 0.500 g
b. 0.333 g
c. 0.250 g
d. 0.125 g

1.2.1 Which of the following place bond types in the correct order of highest energy bonds to lowest energy.

- a. covalent > ionic > h-bonds > dipole-dipole > dispersion
- b. h-bonds > dipole-dipole > dispersion > covalent > ionic
- c. ionic > covalent > h-bonds > dipole-dipole > dispersion
- d. dispersion > dipole-dipole > h-bonds > covalent > ionic

1.2.1 Which statement compares the amount of energy needed to break the bonds in CaCl_2 (E1) and $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ (E2)?

- a. $E1 > E2$, as CaCl_2 is a covalent compound.
- b. $E1 < E2$, as CaCl_2 is a covalent compound.
- c. $E1 > E2$, as CaCl_2 is an ionic compound.
- d. $E1 < E2$, as CaCl_2 is an ionic compound.

1.2.2 Predict whether the bond formed between the atoms is either ionic or covalent, and write the formula for the predicted compound.

- a. Na and Cl
- b. C and O
- c. Sr and N
- d. Cl and S

1.2.2 Which statement describes the compound formed between sodium and oxygen?

- a. It is NaO_2 , which is ionic.
- b. It is NaO_2 , which is covalent.
- c. It is Na_2O , which is ionic.
- d. It is Na_2O , which is covalent.

1.2.3 At STP, fluorine is a gas and iodine is a solid. Why?

- a. Fluorine has lower average kinetic energy than iodine.
- b. Fluorine has higher average kinetic energy than iodine.
- c. Fluorine has weaker intermolecular forces of attraction than iodine.
- d. Fluorine has stronger intermolecular forces of attraction than iodine

1.2.4 A) Given the IUPAC name of a compound, infer its formula. B) Given a formula, write the IUPAC name, recognizing the differing nomenclature systems for ionic and covalent compounds.

Complete the table.

IUPAC name	Formula	Formula	Name
dinitrogen trioxide		NH_4Cl	
lithium acetate		GaAs	
silicon tetrafluoride		$\text{Mn}_2(\text{SO}_3)_3$	
cobalt (III) oxide		SiO_2	
lithium iodide		$\text{Mn}_2(\text{SO}_3)_3$	
silver phosphate		P_2O_5	
chromium (III) hydroxide		Cu_3P	

1.2.4 What is the IUPAC name for the compound represented by the formula $\text{Mg}(\text{OH})_2$?

- a. Magnesium hydroxide.
- b. Magnesium dihydroxide.
- c. Magnesium (II) hydroxide.
- d. Magnesium (II) dihydroxide.

1.2.5 Choose the correct word to make each statement correct.

There are many types of chemical bonds that force atoms to bind together. Two of the most common are covalent and ionic bonds.

- Ionic compounds are formed from **(strong or weak)** electrostatic interactions between **(ions or atoms.)**
- These electrostatic attractions result in distinguishing physical properties such as **(low or high)** melting points and **(low or high)** electrical conductivity.
- Covalent compounds **(donate or share electrons)** between atoms. Due to their **(donate or share electrons)** of electrons, they exhibit characteristic physical properties that include **(low or high)** melting points and **(low or high)** electrical conductivity.

1.2.5 An unknown substance is tested in the laboratory. The physical test results are listed below.

- Nonconductor of electricity
- Insoluble in water
- Soluble in oil
- Low melting point

Based on these results, what is the unknown substance?

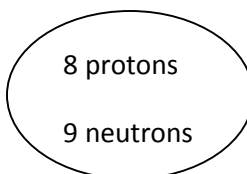
a. ionic and polar. b. ionic and nonpolar. c. covalent and polar. d. covalent and nonpolar

1.3.1 Classify whether the following elements are metals/nonmetals/metalloids. If it is a metal, identify transition metals. Identify each element's group and period.

<u>Name</u>	<u>Type</u>	<u>Transition metal?</u>	<u>Group #</u>	<u>Period #</u>
Lead				
Rubidium				
Radon				
Sulfur				
Iron				
Neon				
Carbon				

1.3.1 The nucleus of an atom is shown. Which statement describes the element??

- a. It is a nonmetal in group 2.
- b. It is a nonmetal in group 16.
- c. It is a metal in group 2.
- d. It is a nonmetal in group 17.



1.3.2 Which atom has the largest radius? Justify your answer.

- a. Bromine
- b. Chlorine
- c. Selenium
- d. Sulfur

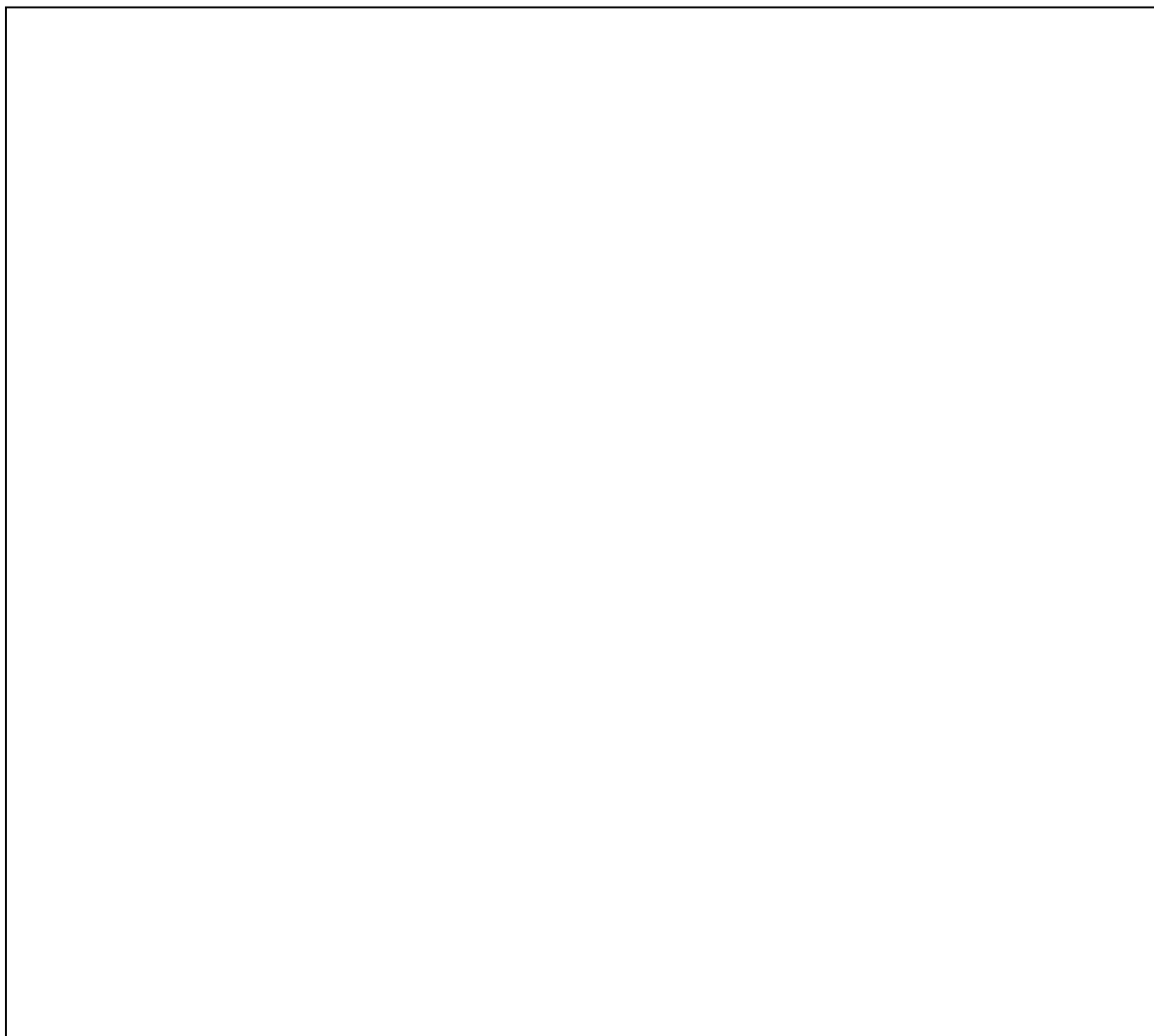
Why?

1.3.3 Arrange the following elements in order of increasing electronegativity, from lowest to highest:

F, K, Si, and S.

- a. $F < K < S < Si$ b. $K < Si < S < F$ c. $Si < F < K < S$ d. $S < Si < F < K$

1.3.3 Draw a periodic table. Label the various areas (alkali metals, alkaline-Earth metals, transition metals, halogens, noble gases, lanthanides, actinides, s, p, d, and f blocks). Also label the trends for atomic sizes, reactivity, electronegativity, and ionization energies.

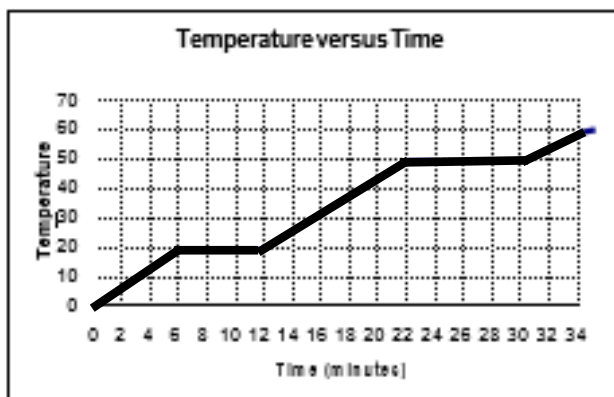


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2.1.1 What causes the process of perspiration to be cooling for human skin?

- a. It involves condensation and is exothermic.
- b. It involves evaporation and is exothermic.
- c. It involves condensation and is endothermic.
- d. It involves evaporation and is endothermic.

2.1.1 What is occurring between t= 6 min and t = 12 min?

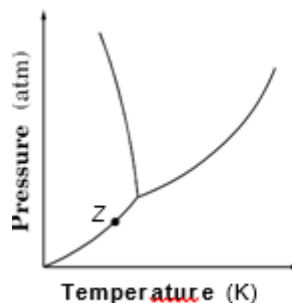


- a. There is an increase in kinetic energy and vaporization is occurring.
- b. There is an increase in kinetic energy and condensation is occurring.
- c. There is an increase in potential energy and freezing is occurring.
- d. There is an increase in potential energy and melting is occurring.

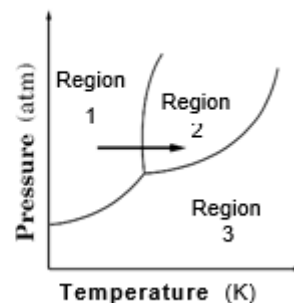
2.1.3 Label “solid,” “liquid,” and “gas” in the first phase diagram. Also label the triple point. In the second diagram, what phase change is occurring?



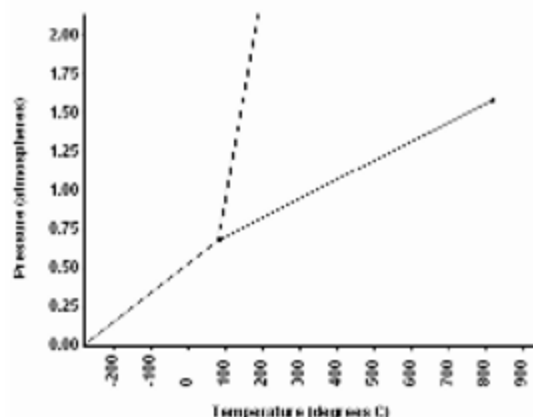
Phase Diagram of Water



Phase Diagram of a Substance



2.1.3 According to the phase diagram to the right, what is the boiling point of this substance at a pressure of 1.25 atmospheres? _____



2.1.4 An 8.80 g sample of metal is heated to 92.0 °C and then added to 15.0 g of water at 20.0 °C in an insulated calorimeter. At thermal equilibrium the temperature of the system was measured as 25.0 °C. What is the identity of the metal? (Use Ref table.)

2.1.4 1000 J of heat is added to 2 g of the following substances. Which one will experience the biggest change in temperature?

- a) aluminum
- b) copper
- c) iron
- d) lead

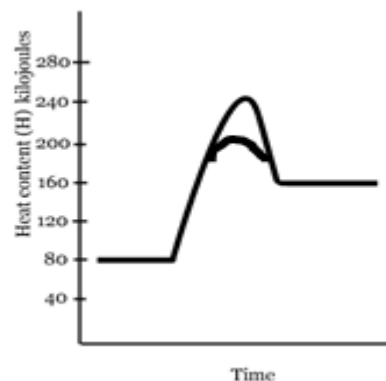
2.1.5 What causes an inflated balloon to shrink when it is cooled?

- a. because cooling the balloon causes gas to escape from the balloon
- b. because cooling the balloon causes the gas molecules to collide more frequently
- c. because cooling the balloon causes gas molecules to become smaller
- d. because cooling the balloon causes the average kinetic energy of the gas molecules to decrease

2.1.5 What happens to the volume of a sample of gas when both the Kelvin temperature and the pressure are doubled? What will be the effect on the density of gas?

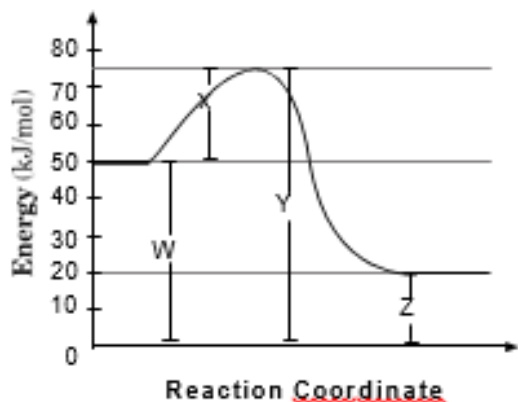
2.2.1 Given the energy diagram to the right, which statement describes the forward reaction?

- a. It is an exothermic reaction with an energy change of 160 kJ.
- b. It is an exothermic reaction with an energy change of 80 kJ.
- c. It is an endothermic reaction with an energy change of 160 kJ.
- d. It is an endothermic reaction with an energy change of 80 kJ.



2.2.1 What type of reaction is represented by the energy diagram below? _____

Potential Energy Diagram



Label the location of the energy of reactants, energy of the products, activation energy, and enthalpy (heat of reaction.)

If a catalyst were added to this reaction, what quantities would change? _____

Justify your reasoning.

2.2.2 A student mixes two chemicals in a test tube. The test tube becomes warmer and bubbles appear. What indicators of chemical reaction is the student observing?

- Change in color and formation of precipitate.
- Change in color and formation of gas.
- Change in temperature and formation of precipitate.
- Change in temperature and formation of gas.

2.2.2 List one observation for each of the following chemical reactions.

Write a balanced chemical equation for each reaction (include phases). Identify the type of reaction.

1. Sodium metal dropped into a beaker of water.

2. Silver nitrate is added to sodium chloride.

2.2.3 Consider this combustion reaction equation: $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$

When the equation is balanced with whole number coefficients, what will be the coefficient of O_2 ? _____

2.2.3 10.3 grams of sodium hydrogen carbonate reacts with an excess of hydrochloric acid. The products are then heated to dryness. After heating only a white crystalline substance remains. The mass of the product is 7.59 g.

- What type or types of reaction occurred? _____
- Write the balanced chemical equation for this reaction.

- What is the identity of the white crystalline product?

Based on the data from the reaction, determine the molar ratio between the given reactant and product.

2.2.4 Given the balanced chemical equation the reaction, $P_4 + 5O_2 \rightarrow P_4O_{10}$

What mass of oxygen is needed to completely react with 7.75 g P_4 ?

- a. 2.00 grams
- b. 5.00grams
- c. 10.00 grams
- d. 40.00 grams

2.2.4 Write the balanced chemical equation for the following reaction.

A 70.0 g sample of limestone consists of a large percentage of calcium carbonate. The sample reacts with an excess of hydrochloric acid and 14.0 L of carbon dioxide is generated at STP.

What is the percentage of calcium carbonate in the limestone?

2.2.3 A compound consisting of 56.38% phosphorus and 43.62% oxygen has a molecular mass of 220 g/mole. What is the molecular formula of this compound? **SHOW WORK!**

- a. PO
- b. PO_2
- c. P_2O_3
- d. P_4O_6

2.2.4 10.10 g sample of barium chloride hydrate is heated in crucible. After all of the water is driven off, 8.50 g of the anhydrous barium chloride remains in the crucible. What is the formula of the hydrate? **SHOW WORK!**

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3.1.1 Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst). Give examples of each.

3.1.1 When a set amount of marble chips (CaCO_3) is added to a small amount of dilute hydrochloric acid, a reaction occurs. What should be done to decrease the rate of reaction the next time the experiment is performed?

- Use more acid.
- Stir.
- Use larger marble chips.
- Add heat.

3.1.2 A scientist observes a chemical reaction as it takes place. How can the scientist tell if the reaction has achieved equilibrium?

- Measure concentrations of products and reactants over time.
- Monitor the temperature of the reaction over time.
- Measure the pH of the solution over time.
- Wait for the formation of a precipitate.

3.1.3 Given different equilibrium equations, determine the shift in equilibrium and the effects for a variety of changes (concentration of reactant or product, change in temperature, change in pressure, addition of a catalyst).

For the reaction : $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g}) + \text{heat}$

Which action will increase the concentration of SO_3 ?

- removing SO_2
- increasing the temperature
- increasing the pressure
- adding a catalyst

3.2.1 Based on hydroxide ion concentration, which unknown substance would be an acid?

- Substance A, $[\text{OH}^-] = 1.0 \times 10^{-2}\text{M}$
- Substance B, $[\text{OH}^-] = 1.0 \times 10^{-4}\text{M}$
- Substance C, $[\text{OH}^-] = 1.0 \times 10^{-6}\text{M}$
- Substance D, $[\text{OH}^-] = 1.0 \times 10^{-8}\text{M}$

3.2.1 Complete the table.

pH	[H ₃ O ¹⁺]	pOH	[OH ¹⁻]	ACID or BASE?
3.78				
	3.89 x 10 ⁻⁴ M			
		5.19		
			4.88 x 10 ⁻⁶ M	
8.46				

3.2.1 Given the data table to the right, which substance is an acid? _____

	Substance			
	W	X	Y	Z
Tastes bitter	?	Yes	Yes	No
Tastes sour	No	No	?	Yes
Feels slippery	No	Yes	Yes	?
Turns litmus blue	Yes	Yes	Yes	?
Turns litmus red	?	No	No	Yes

3.2.1 Draw a Venn diagram showing the differences/similarities of acids and bases.

3.2.1 The pH scale goes from ____ to ____.

A pH of ____ to ____ is acidic. A pH of ____ to ____ is basic. A pH of ____ is neutral.

3.2.2 What volume of 0.200M HCl will neutralize 10.0mL of 0.400M KOH?

- 40.0mL
- 20.0mL
- 8.00mL
- 5.00mL

3.2.3 25.0 mL of 12.0 M H₂SO₄ is diluted to a total volume of 1.00L. What is the concentration of the newly diluted solution? Justify your answer.

3.2.3 Heat is added to a solution to

- increase the solubility of a solid solute.
- increase the solubility of a gas solute.
- increase the miscibility of the solution
- increase the degree of saturation of the solution.

3.2.4 Define the following properties of solutions:

- solubility: _____
- miscibility: _____
- concentration : _____
- unsaturated: _____
- supersaturated: _____
- saturated: _____

3.2.5 How many grams of KCl are required to make a saturated solution in 50.0 g of water at 80°C?

- _____
- How many grams of NaCl will make a saturated solution at 70°C? _____
- If 110 g of KNO₃ are dissolved in solution at 50°C, what type of solution is it considered to be? (sat/unsat/supersat) _____

3.2.5 Why does the solubility of NH₃ decrease as the temperature increases? (NH₃ is a gas.)

3.2.6

When considering the energetics of the solution process, which process is *always* exothermic?

- Solute particles separate from one another.
- Solvent particles separate from one another.
- Solute and solvent particles form attractions for one another.
- Solution formation as a whole is always endothermic.

3.2.6 Explain how solutions form on a particulate level. Draw diagrams to help explain.

