

Sample Solutions for Review

Name: _____

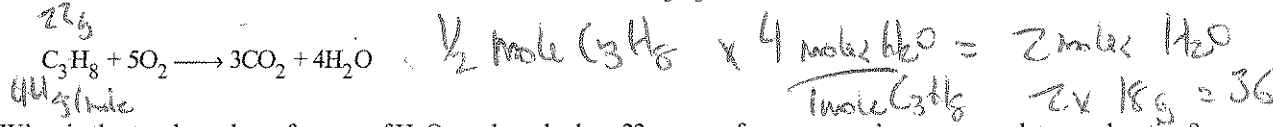
- D 1) What is the total mass of iron in 1.0 mole of Fe_2O_3 ? $2 \times 55.8 = 112 \text{ g}$
 A) 56 g B) 72 g C) 160 g **D) 112 g**
- C 2) What is the mass, in grams, of 1.0 mole of $(\text{NH}_4)_2\text{S}$? $2 \times 16 + 32$
 A) 54 g B) 64 g **C) 68 g** D) 50 g
- A 3) What is the total number of molecules in 1.0 mole of $\text{Cl}_2(\text{g})$? $= 6.02 \times 10^{23}$
A) 6.0×10^{23} Best answer B) 70 C) 35 **D) 12×10^{24}**
- D 4) What is the total number of molecules of SO_2 , in a 0.10-mole sample of SO_2 ? $0.1 = 10^{-1} \times 10^{23} = 10^{22}$
 A) ~~6.0×10^{23}~~ B) ~~6.0×10^{24}~~ C) 6.0×10^{21} **D) 6.0×10^{22}**
- B 5) How many moles of hydrogen atoms are there in one mole of $\text{C}_6\text{H}_{12}\text{O}_6$ molecules?
 A) 24 **B) 12** C) $24(6.0 \times 10^{23})$ D) $12(6.0 \times 10^{23})$
- B 6) How many moles of carbon atoms are there in one mole of $\text{C}_6\text{H}_{12}\text{O}_6$?
 A) $12(6.0 \times 10^{23})$ **B) 6** C) $6(6.0 \times 10^{23})$ D) 12
- D 7) What is the mass in grams of 1.00 mole of O_2 gas? $2 \times 16 \text{ g}$
 A) 16.0 B) 22.4 C) 11.2 **D) 32.0**
- C 8) Which quantity of neon may be represented by the symbol Ne? Best Answer
 A) 2 moles B) 4 liters **C) 6×10^{23} atoms** D) 1 gram
- A 9) Approximately how many atoms are there in 3.0 moles of Al?
A) $3(6.0 \times 10^{23})$ B) 6.0×10^{23} C) $2(6.0 \times 10^{23})$ D) $4(6.0 \times 10^{23})$
- C 10) A sample of $\text{H}_2(\text{g})$ at STP contains 9.03×10^{23} molecules. The volume of the sample is 1 mole @ STP = 22.4 L.
 A) ~~22.4 L~~ B) 44.8 L $\downarrow 1.5 \text{ moles} \times 22.4 = 33.6$ **C) 33.6 L** D) ~~11.2 L~~
- P 11) Given the balanced equation:
 $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$



What is the total number of grams of H_2O produced when 116 grams of the product, NaCl, is formed?

- A) 54 g B) 18 g C) 9.0 g **D) 36 g**

- C 12) Given the balanced equation for the combustion of propane (C_3H_8):



What is the total number of grams of H_2O produced when 22 grams of propane undergoes complete combustion?

- A) 18 g B) 72 g **C) 36 g** D) 44 g

- B 13) Given the reaction:



What is the total number of grams of NaOH needed to react completely with 196 grams of H_2SO_4 ?

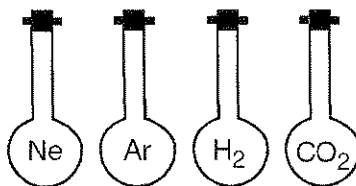
- A) 392 g **B) 160 g** C) 80 g D) 20 g

- 14) Given the reaction:
- $$2\text{CO} + \text{O}_2 \rightarrow 2\text{CO}_2$$
- Handwritten notes: 28 g/mol, 88 g = 2 moles, 12 + 16 = 28 g, 12 = 56 g*
- What is the minimum number of grams of CO required to produce 88 grams of CO₂?
- 15) The forces of attraction that hold a diamond together are called
- 16) Which particles may be gained, lost, or shared by an atom when it forms a chemical bond?
- 17) Which bond has the *greatest* ionic character?
- 18) A characteristic of ionic solids is that they
- 19) What type of bonding is characteristic of a substance that has a high melting point and electrical conductivity only in the liquid phase?
- 20) A substance that has a melting point of 1,074 K conducts electricity when dissolved in water, but does *not* conduct electricity in the solid phase. The substance is *most* likely
- 21) Which atoms are *most* likely to form covalent bonds?
- 22) Two atoms with an electronegativity difference of 0.4 form a bond that is
- 23) What type of bond is present in a water molecule?
- 24) Which electron-dot formula represents a polar molecule?
- 25) Which electron-dot formula represents a nonpolar molecule?
- 26) What type of bond is present in copper wire?
- 27) What type of bonds are present in a strip of magnesium ribbon?
- Handwritten notes for 17: Farthest apart on periodic table*
- Handwritten notes for 24: Uneven distribution of charge*
- Handwritten notes for 25: even distribution of charge*
- Handwritten note for 24: Asymmetrical*

- B** 28) The chemical properties of elements are periodic functions of their
 A) oxidation states **B** atomic numbers C) mass numbers D) ionic charges
- D** 29) Which element is in Group 2 and Period 7 of the Periodic Table?
 A) manganese B) radon C) magnesium **D** radium
- C** 30) On the Periodic Table, an element classified as a semimetal (metalloid) can be found in *Best answer*
 A) Period 6, Group 15 B) Period 3, Group 16 **C** Period 4, Group 15 D) Period 2, Group 14
- A** 31) An atom of an element contains 20 protons, 20 neutrons, and 20 electrons. This element is
A an alkaline earth metal C) a noble gas
 B) a halogen D) an alkali metal
- D** 32) Which compound contains an alkali metal and a halogen?
 A) CaS B) Rb₂S C) CaCl₂ **D** RbCl
- A** 33) In the Periodic Table of the Elements, *all* the elements within Group 16 have the same number of
A valence electrons B) protons C) neutrons D) energy levels
- D** 34) If X represents an element of Group 1, the formula of its oxide would be
 A) XO₂ B) XO C) X₂O₃ **D** X₂O
M O
- A** 35) If M represents an atom of an alkali metal, the correct formula for a compound of this atom with chlorine is
A MCl *M O* B) MCl₂ C) MCl₃ **D** M₂Cl
:Cl:
- B** 36) Which group of elements occur only as compounds in nature because they are extremely reactive?
~~A~~ 18 **B** 1 C) 16 D) 11
- A** 37) Beryllium is classified as
A an alkaline earth metal *look up on table* C) a transition element
 B) a noble gas D) an alkali metal
- C** 38) Which of the following statements is a part of Dalton's atomic theory?
~~A~~ Atoms can be created or destroyed.
B During a chemical reaction, atoms cannot be separated, combined, or rearranged.
 C) Different atoms combine in simple whole-number ratios to form compounds.
~~D~~ All atoms of a given element are not identical.
- C** 39) What term refers to the region of an atom where an electron is *most* likely to be found?
 A) quantum B) orbit **C** orbital D) spectrum
- B** 40) What is the approximate mass of an electron?
 A) $\frac{1}{12}$ of a C-12 atom **B** $\frac{1}{1,836}$ of a proton C) $\frac{1,835}{1,836}$ of a proton D) 1 atomic mass unit
- D** 41) What particle has a mass of approximately one atomic mass unit and a unit positive charge?
 A) an alpha particle B) a neutron C) a beta particle **D** a proton
- B** 42) What particle has approximately the same mass as a proton?
 A) alpha **B** neutron C) beta D) electron
- A** 43) What two particles account for most of the mass in the atom?
A protons and neutrons C) protons and electrons
 B) neutrons and electrons D) neutrons and positrons
- C** 44) All atoms in a given sample of an element contain the same number of
 A) protons and neutrons **C** protons and electrons
 B) nucleons and neutrons D) nucleons and electrons
- D** 45) The atomic number of an atom is *always* equal to the total number of *Best answer*
 A) neutrons plus protons in the atom C) protons plus electrons in the atom
 B) neutrons in the nucleus **D** protons in the nucleus

- B 46) Which nuclide contains the *greatest* number of neutrons?
 A) $^{41}_{20}\text{Ca}$ 21 n⁰ B) $^{40}_{18}\text{Ar}$ 22 n⁰ C) $^{39}_{19}\text{K}$ 20 n⁰ D) $^{37}_{17}\text{Cl}$ 20 n⁰
- D 47) Which pair of atoms contain the same number of neutrons?
 A) ^3_1H and ^3_2He B) ^2_1H and ^4_2He C) ^1_1H and ^3_2He D) ^3_1H and ^4_2He
- B 48) What is the total number of protons and neutrons in the nuclide below?
 $^{37}_{17}\text{Cl}$ *that's what this is = 16*
 A) 54 B) 37 C) 20 D) 17
- e 49) How many particles are contained in the nucleus of the following atom?
 $^{226}_{88}\text{Rn}$
 A) 88 electrons and 226 protons C) 88 protons and 138 neutrons
 B) 88 electrons and 226 neutrons D) 88 protons and 138 electrons
- C 50) The elements with atomic number 10 has an electron configuration that is the same as
 A) Cl^- B) Na C) Na^+ = *Ne configuration* D) Cl
- A 51) Four valence electrons of an atom in the ground state would occupy the
 A) *s* and *p* sublevels, only C) *s* sublevel, only
 B) *p* sublevel, only D) *s*, *p*, and *d* sublevels
- D 52) An atom in the ground state has 7 valence electrons. What electron configuration could represent the outermost principal energy level of this atom in the ground state?
 A) $3s^1 3p^4 3d^2$ B) $3s^2 3p^4 3d^1$ C) $3s^1 3p^6$ D) $3s^2 3p^5$
- C 53) Which atom in the ground state has only 3 electrons in the 3*p* sublevel?
 A) aluminum B) argon C) phosphorus D) potassium
- A 54) What is the formula for the compound that forms when magnesium bonds with phosphorus?
 A) Mg_3P_2 B) Mg_2P_3 *Mg²⁺, P³⁻* C) MgP_2 D) Mg_2P
- A 55) Which molecular formula is correctly paired with its corresponding empirical formula?
 A) P_4O_{10} and P_2O_5 B) C_2H_2 and CH_2 C) C_6H_6 and C_2H_2 D) CO_2 and CO
- B 56) The formula Cl_2 represents one
 A) atom B) molecule C) gram D) liter
- C 57) Which element at STP exists as monatomic molecules?
 A) N B) Cl C) Ne D) O
- D 58) A chemical formula is an expression used to represent
 A) compounds, only C) mixtures, only
 B) elements, only D) compounds and elements
- A 59) What is the total number of atoms represented in the formula $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$?
 A) 21 B) 8 C) 27 D) 13
- C 60) How many oxygen atoms are represented by the formula $\text{Al}_2(\text{CO}_3)_3$?
 A) 6 B) 10 C) 9 D) 3
- B 61) The chemical reaction $4\text{Na}(s) + \text{O}_2(g) \rightarrow 2\text{Na}_2\text{O}(s)$, is *best* described as a
 A) single replacement reaction C) decomposition reaction
 B) synthesis reaction D) double replacement reaction

- 62) Which balanced chemical equation represents a synthesis reaction?
- A) $\text{MgBr}_2(\ell) \longrightarrow \text{Mg}(\ell) + \text{Br}_2(\text{g})$ C) $\text{C}_2\text{H}_4(\text{g}) + 3\text{O}_2(\text{g}) \longrightarrow 2\text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$
 B) $2\text{Al}(\text{s}) + 3\text{Cl}_2(\text{g}) \longrightarrow 2\text{AlCl}_3(\text{s})$ D) $\text{Zn}(\text{s}) + 2\text{HCl}(\text{aq}) \longrightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$
- 63) Which balanced chemical equation represents a single replacement reaction?
- A) $\text{KCl}(\text{aq}) + \text{AgNO}_3(\text{aq}) \longrightarrow \text{KNO}_3(\text{aq}) + \text{AgCl}(\text{s})$ C) $\text{Cl}_2(\text{g}) + 2\text{KI}(\text{aq}) \longrightarrow 2\text{KCl}(\text{aq}) + \text{I}_2(\text{aq})$
 B) $\text{C}_2\text{H}_4(\text{g}) + 3\text{O}_2(\text{g}) \longrightarrow 2\text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$ D) $2\text{H}_2\text{O}(\ell) \longrightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$
- 64) If the pressure on a given mass of gas in a closed system is decreased and the temperature remains constant, the volume of the gas will
- A) remain the same B) increase *Boyle's Law* C) decrease
- 65) As the pressure of a gas at 101.3 kPa is changed to 50.65 kPa at constant temperature, the volume of the gas
- A) increases B) remains the same C) decreases
- 66) As the pressure on a given sample of a gas increases at constant temperature, the mass of the sample
- A) increases B) decreases C) remains the same
- 67) What volume will a 300.-milliliter sample of a gas at STP occupy when the pressure is doubled at constant temperature?
- A) 150. mL B) 300. mL C) 600. mL D) 450. mL
- 68) The pressure on 200. milliliters of a gas is decreased at constant temperature from 130. kPa to 120. kPa. The new volume of the gas, in milliliters, is equal to
- A) $120. \times \frac{200.}{130.}$ B) $200. \times \frac{120.}{130.}$ C) $120. \times \frac{130.}{200.}$ D) $200. \times \frac{130.}{120.}$ *Volume goes up, so pick ratio that increases it*
- 69) The volume of a sample of hydrogen gas at STP is 1.00 liter. As the temperature decreases, pressure remaining constant, the volume of the sample
- A) remains the same B) increases C) decreases *Charles Law*
- 70) A gas occupies a volume of 30 milliliters at 273 K. If the temperature is increased to 364 K while the pressure remains constant, what will be the volume of the gas?
- A) 30 mL B) 40 mL C) 60 mL D) 20 mL
- 71) Equal volumes of all gases at the same temperature and pressure contain an equal number of
- A) molecules B) electrons C) atoms D) protons *Avogadro's principle*
- 72) As a given volume of gas is compressed, the number of molecules
- A) remains the same B) increases C) decreases
- 73) The diagrams below represent four 500-milliliter flasks. Each flask contains the gas represented by its symbol. All gas samples are at STP.

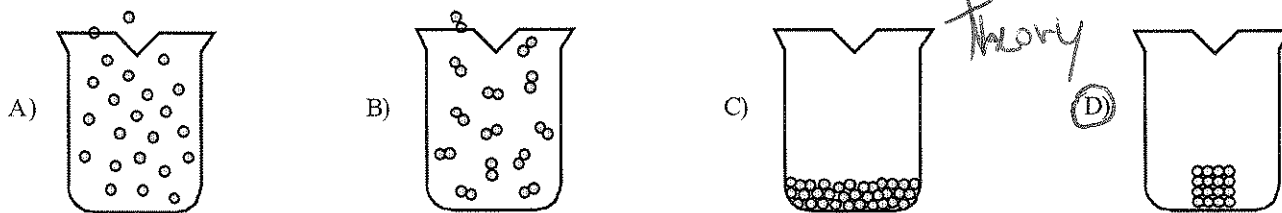


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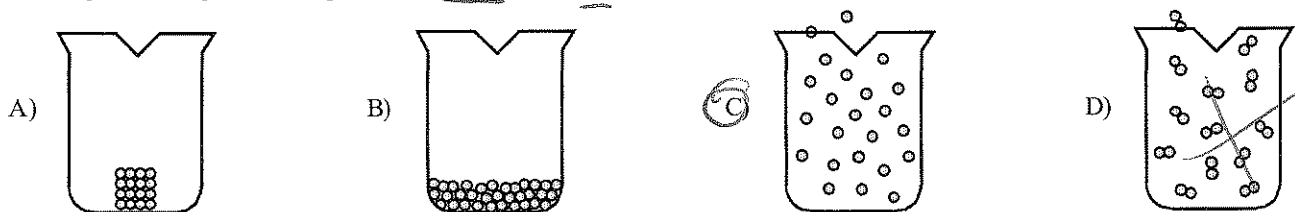
- Each flask contains the same number of
- A) atoms, only C) atoms, but different numbers of molecules
 B) molecules, only D) atoms and molecules

74) Which particle diagram *best* represents a substance in the solid state?

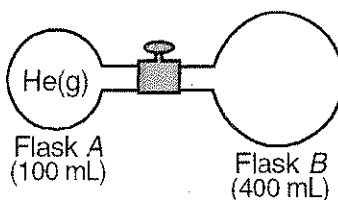
Kinetic Molecular Theory



75) Which particle diagram *best* represents a monoatomic gas?



76) The diagram below shows two flasks connected by a stopcock. Flask A contains helium gas. Flask B contains a vacuum.



What final volume will the gas occupy after the stopcock is opened?

- A) 300 mL B) 100 mL C) 400 mL D) 500 mL

77) Under the same conditions of temperature and pressure, a liquid differs from a gas because the particles of the liquid

- A) have stronger forces of attraction between them C) have no regular arrangement
B) are in constant straight-line motion D) take the shape of the container they occupy

78) In which sample are the particles arranged in a regular geometric pattern?

- A) HCl(l) B) I₂(s) C) N₂(g) D) NaCl(aq)

79) The characteristic which distinguishes a true solid from other phases of matter at STP is that in a true solid, the particles are

- A) motionless but changing their relative positions C) motionless without changing their relative positions
B) vibrating and changing their relative positions D) vibrating without changing their relative positions

80) Which of the following statements *best* describes the molecules of H₂O in the solid phase?

- A) They are arranged in a regular geometric pattern. ✓ C) They move slowly in straight lines.
B) They are arranged in a random pattern. D) They move rapidly in straight lines.

81) At what point do a liquid and a solid exist at equilibrium?

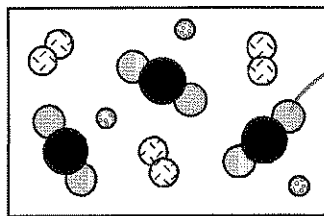
- A) melting point B) vaporization point C) boiling point D) sublimation point

Boiling

liq → gas

Solid → gas

- C 82) The particle diagram below represents a sample of matter.



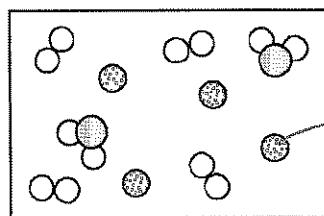
compound

element

Which *best* describes the composition of the sample?

- A) a single compound
 B) a mixture of compounds
 C) a mixture of elements and compounds
 D) a mixture of elements

- D 83) The particle diagram below represents a sample of matter in the gas state.



compound

element

Some distribution
= homogeneous

Which *best* describes the composition of the sample?

- A) heterogeneous mixture of compounds
 B) heterogeneous mixture of elements and compounds
 C) homogeneous mixture of compounds
 D) homogeneous mixture of elements and compounds

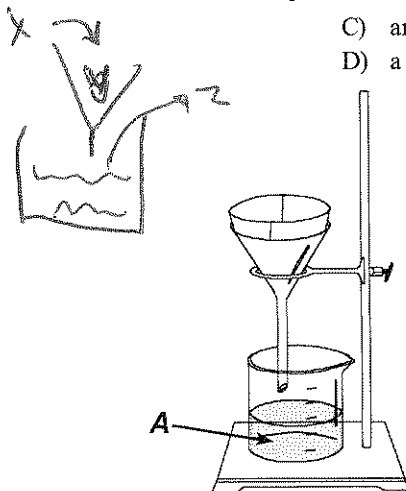
- C 84) A true solution is *best* described as a

- A) heterogeneous compound
 B) homogeneous compound
 C) homogeneous mixture
 D) heterogeneous mixture

- B 85) When sample *X* is passed through a filter paper, a white residue, *Y*, remains on the paper and a clear liquid, *Z*, passes through. When liquid *Z* is vaporized, another white residue remains. Sample *X* is *best* classified as

- A) a compound
 B) a heterogeneous mixture
 C) an element
 D) a homogeneous mixture

Because there is a solid in X



- D 86)

What separation procedure uses the laboratory apparatus shown above?

- A) titration
 B) distillation
 C) chromatography
 D) filtration

- C 87) Objects are recognized by their

- A) shape
 B) color
 C) properties
 D) odor

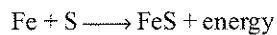
- A 88) Which of the following statements describes a chemical property of the element iodine?

- A) It reacts with hydrogen to form a gas.
 B) It vaporizes into a violet-colored gas.
 C) Its crystals are a metallic gray.
 D) It dissolves in alcohol.

rest are physical

- B 89) Burning is an example of a change that is
 A) endothermic B) chemical C) physical D) intensive
- C 90) Which of the following is an example of a physical change?
 A) Acid rain causes the decomposition of a marble statue.
 B) Hydrochloric acid is neutralized by a base to produce a salt and water.
 C) Concentrated hydrochloric acid is diluted with water.
 D) Zinc metal is added to hydrochloric acid and a gas is released.

- D 91) Given the reaction:



energy is exiting the reaction

Which of the following statements about this reaction is true?

- A) The potential energy of the reactants is the same as the potential energy of the product.
 B) It is endothermic.
 C) The potential energy of the reactants is lower than the potential energy of the product.
 D) It is exothermic.
- B 92) Which substance is made of particles with the *highest* average kinetic energy?
 A) $\text{H}_2\text{O}(\ell)$ at 30°C B) $\text{Fe}(\text{s})$ at 35°C C) $\text{Br}_2(\ell)$ at 20°C D) $\text{CO}_2(\text{g})$ at 25°C
- P 93) At what temperature does a water sample have the *highest* average kinetic energy?
 A) 0°C B) 100 K C) 0 K D) 100°C
- A 94) What Kelvin temperature is equal to -73°C ?
 A) 200 K B) 100 K C) 346 K D) 173 K