Chem SOL Review

Name: _____ **Date:** _____

1. The process of filtration is performed in the laboratory to

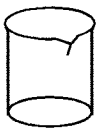
   A. form precipitates

   B. remove water from solutions

   C. separate dissolved particles from the solvent

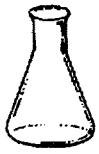
   D. separate insoluble substances in an aqueous mixture

2. Which represents an Erlenmeyer flask?

   A. 

   B. 

   C. 

   D. 

3. Recovering the salt from a mixture of salt and water could best be accomplished by

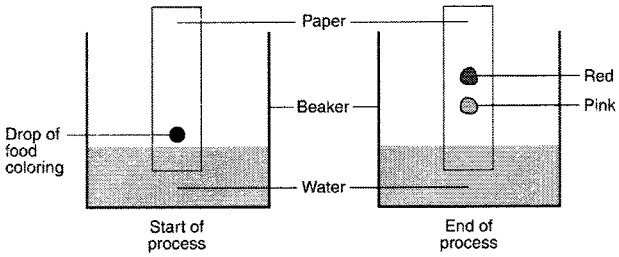
   A. evaporation

   B. filtration

   C. paper chromatography

   D. density determination

4. Given the diagram representing a process being used to separate the colored dyes in food coloring:



   Which process is represented by this diagram?

   A. chromatography B. electrolysis

   C. distillation D. titration

5. In the laboratory, a student determined the percent by mass of water in a hydrated salt to be 17.3 percent. If the accepted value is 14.8 percent, the percent error is

   A. 2.50% B. 5.92% C. 16.9% D. 27.1%

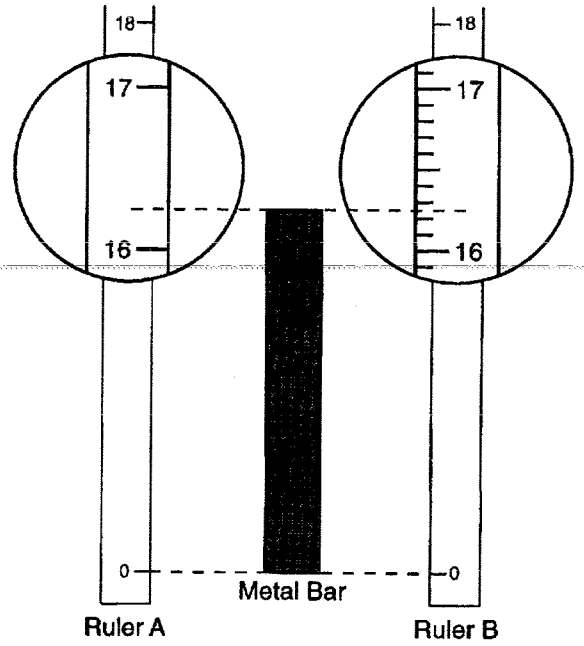
6. Expressed to the correct number of significant figures, what is the correct sum of (3.04 g + 4.134 g + 6.1 g)?

A. 13 g
B. 13.3 g
C. 13.27 g
D. 13.274 g

7. In a laboratory exercise to determine the density of a substance, a student found the mass of the substance to be 6.00 grams and the volume to be 2.0 milliliters. Expressed to the correct number of significant figures, the density of the substance is

A. 3.000 g/mL
B. 3.00 g/mL
C. 3.0 g/mL
D. 3 g/mL

8. The diagram represents a metal bar and two centimeter rulers, *A* and *B*. Portions of the rulers have been enlarged to show detail. What is the greatest degree of precision to which the metal bar can be measured by ruler *A* and by ruler *B*?

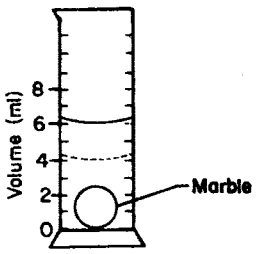


A. to the nearest tenth by both rulers
B. to the nearest hundredth by both rulers
C. to the nearest tenth by ruler *A* and to the nearest hundredth by ruler *B*
D. to the nearest hundredth by ruler *A* and to the nearest tenth by ruler *B*

9. The graduated cylinder shown is filled to the dashed line with water. A marble is then placed in the cylinder and the water level rises to the solid line as shown in the diagram. What is the volume of the marble?

A. 6 ml B. 2 ml

C. 8 ml D. 4 ml



10. The table below shows mass and volume data for four samples of substances at 298 K and 1 atmosphere.

Masses and Volumes of Four Samples

Sample	Mass (g)	Volume (mL)
A	30.	60.
B	40.	50.
C	45	90.
D	90.	120.

Which two samples could consist of the same substance?

A. *A* and *B* B. *A* and *C*

C. *B* and *C* D. *C* and *D*

11. What is the gram-formula mass of $Fe(NO_3)_3$?

A. 146 g/mol B. 194 g/mol

C. 214 g/mol D. 242 g/mol

12. Given the balanced equation representing the reaction between propane and oxygen:

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

According to this equation, which ratio of oxygen to propane is correct?

A. $\frac{5 \text{ grams } O_2}{1 \text{ gram } C_3H_8}$ B. $\frac{5 \text{ moles } O_2}{1 \text{ mole } C_3H_8}$

C. $\frac{10 \text{ grams } O_2}{11 \text{ grams } C_3H_8}$ D. $\frac{10 \text{ moles } O_2}{11 \text{ moles } C_3H_8}$

13. What is the total number of grams of HI in 0.500 liter of 1.00 M HI?

A. 1.00 g B. 0.500 g C. 64.0 g D. 128 g

14. Which quantity is equivalent to 39 grams of LiF?

A. 1.0 mole B. 2.0 moles

C. 0.50 mole D. 1.5 moles

15. What is the total mass of 3.01×10^{23} atoms of helium gas?

A. 8.00 g B. 2.00 g C. 3.50 g D. 4.00 g

16. What is the total mass in grams of 0.75 mole of SO_2?

A. 16 g B. 24 g C. 32 g D. 48 g

17. What is the percent by mass of oxygen in magnesium oxide, MgO?

A. 20% B. 40% C. 50% D. 60%

18. In which compound is the percent composition by mass of chlorine equal to 42%?

A. HClO (gram-formula mass = 52 g/mol)

B. $HClO_2$ (gram-formula mass = 68 g/mol)

C. $HClO_3$ (gram-formula mass = 84 g/mol)

D. $HClO_4$ (gram-formula mass = 100. g/mol)

19. A compound has an empirical formula of CH_2 and a molecular mass of 56. Its molecular formula is

A. C_2H_4 B. C_3H_6 C. C_4H_8 D. C_5H_{10}

20. If 0.50 liter of a 12-molar solution is diluted to 1.0 liter, the molarity of the new solution is

A. 2.4 B. 6.0 C. 12 D. 24

21. How many grams of KOH are needed to prepare 250 milliliters of a 2.00 M solution of KOH (formula mass = 56.0)?

A. 1.00 B. 2.00 C. 28.0 D. 112

22. Which equation represents a decomposition reaction?

A. $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

B. $Cu(s) + 2AgNO_3(aq) \rightarrow 2Ag(s) + Cu(NO_3)_2(aq)$

C. $2H_2(g) + O_2(g) \rightarrow 2H_2O(\ell)$

D. $KOH(aq) + HCl(aq) \rightarrow KCl(aq) + H_2O(\ell)$

23. Which balanced equation represents a single-replacement reaction?

A. $Mg + 2AgNO_3 \rightarrow Mg(NO_3)_2 + 2Ag$

B. $2Mg + O_2 \rightarrow 2MgO$

C. $MgCO_3 \rightarrow MgO + CO_2$

D. $MgCl_2 + 2AgNO_3 \rightarrow 2AgCl + Mg(NO_3)_2$

24. When the equation

$$\_\_\_\_Na(s) + \_\_\_\_H_2O(\ell) \rightarrow \_\_\_\_NaOH(aq) + \_\_\_\_H_2(g)$$

is correctly balanced using smallest whole numbers, the coefficient of the water is

A. 1 B. 2 C. 3 D. 4

25. Given the unbalanced equation:

$$\_\_\_\_C_3H_8(g) + \_\_\_\_O_2(g) \rightarrow \_\_\_\_H_2O(g) + \_\_\_\_CO_2(g)$$

When the equation is completely balanced using smallest whole numbers, the coefficient of O_2 is

A. 5 B. 2 C. 3 D. 10

26. Given the reaction:

$$4Al(s) + 3O_2(g) \rightarrow 2Al_2O_3(s)$$

What is the minimum number of grams of oxygen gas required to produce 1.00 mole of aluminum oxide?

A. 32.0 g B. 48.0 g C. 96.0 g D. 192 g

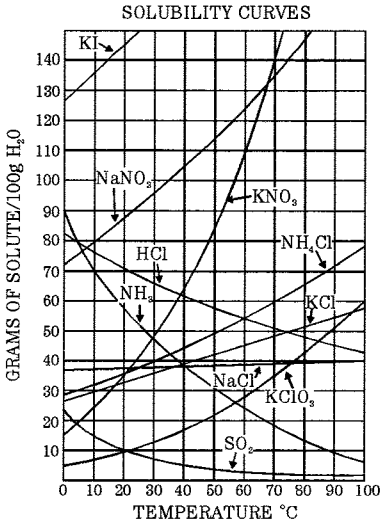
27. Given the reaction:

$$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$$

What is the total number of moles of $NH_3(g)$ produced when 10 moles of $H_2(g)$ reacts completely with $N_2(g)$?

A. 6.7 B. 2.0 C. 3.0 D. 15

28. Based on Reference Table *D*, which salt solution could contain 42 grams of solute per 100 grams of water at 40° C?



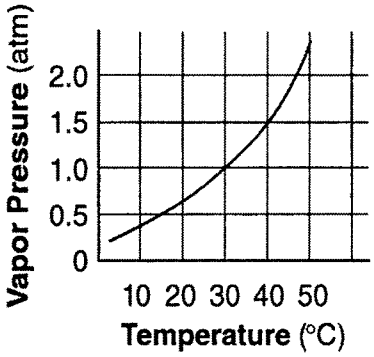
A. a saturated solution of $KClO_3$

B. a saturated solution of KCl

C. a unsaturated solution of NaCl

D. a unsaturated solution of NH_4Cl

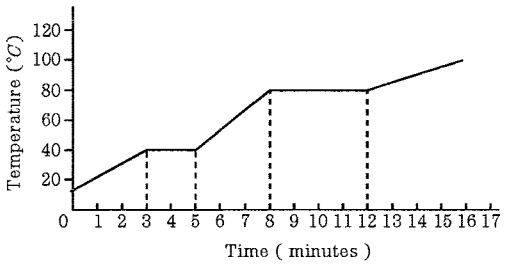
29. The accompanying graph shows the relationship between vapor pressure and temperature for substance X.



What is the normal boiling point for substance X?

A. 50° C B. 20° C C. 30° C D. 40° C

30. The graph shows the relationship between temperature and time as heat is added to one mole of a substance at a rate of 100 calories per minute. The substance is in the solid phase at Time = 0 minutes.



The temperature at which the substance begins to boil is

A. 10° C B. 40° C C. 80° C D. 110° C

31. At STP, 44.8 liters of CO_2 contains the same number of molecules as

A. 1.0 mole He B. 2.00 moles of a Ne

C. 0.500 mole of H_2 D. 4.00 mole of N_2

32. 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. 60 mL B. 40 mL C. 30 mL D. 20 mL

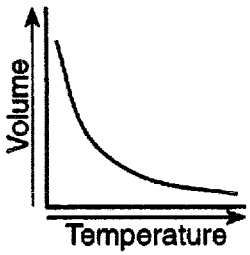
33. At 25° C, gas in a rigid cylinder with a movable piston has a volume of 145 mL and a pressure of 125 kPa. Then the gas is compressed to a volume of 80 mL. What is the new pressure of the gas if the temperature is held at 25° C?

A. 69 kPa B. 93 kPa

C. 160 kPa D. 230 kPa

34. Which graph represents the relationship between volume and Kelvin temperature for an ideal gas at constant pressure?

A.



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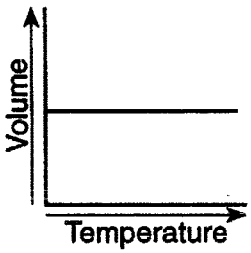
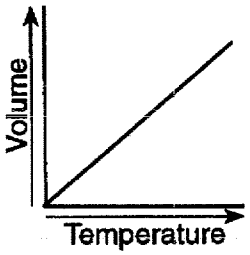
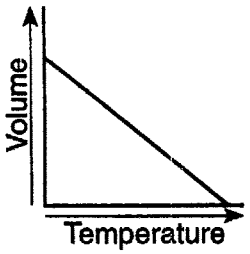


C.



D.



35. A 1-liter flask contains two gases at a total pressure of 3.0 atmospheres. If the partial pressure of one of the gases is 0.5 atmosphere, then the partial pressure of the other gas must be

A. 1.0 atm
B. 2.5 atm
C. 1.5 atm
D. 0.50 atm

36. Base your answer(s) to the following question(s) on the information below.

Natural gas is a mixture that includes butane, ethane, methane, and propane. Differences in boiling points can be used to separate the components of natural gas. The boiling points at standard pressure for these components are listed in the table below.

Data Table

Component of Natural Gas	Boiling Point at Standard Pressure (°C)
butane	−0.5
ethane	−88.6
methane	−161.6
propane	−42.1

List the *four* components of natural gas in order of increasing strength of intermolecular forces.

Weakest intermolecular forces _____ _____ _____ Strongest intermolecular forces

37. An atom of an element contains 20 protons, 20 neutrons, and 20 electrons. This element is

A. an alkali metal
B. an alkaline earth metal
C. a halogen
D. a noble gas

38. An atom of $^{226}_{88}Rn$ contains

A. 88 protons and 138 neutrons
B. 88 protons and 138 electrons
C. 88 electrons and 226 neutrons
D. 88 electrons and 226 protons

39. What is the total number of electrons in a Cu^{+} ion?

A. 28 B. 29 C. 30 D. 36

40. Which sequence represents a correct order of historical developments leading to the modern model of the atom?

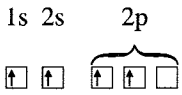
A. the atom is a hard sphere → most of the atom is empty space → electrons exist in orbitals outside the nucleus

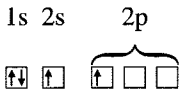
B. the atom is a hard sphere → electrons exist in orbitals outside the nucleus → most of the atom is empty space

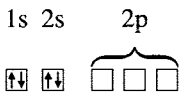
C. most of the atom is empty space → electrons exist in orbitals outside the nucleus → the atom is a hard sphere

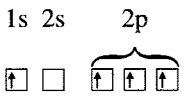
D. most of the atom is empty space → the atom is a hard sphere → electrons exist in orbitals outside the nucleus

41. Which orbital notation represents an atom of beryllium in the ground state?

A. 

B. 

C. 

D. 

42. Which electron configuration represents an element with the highest first ionization energy?

A. $1s^2 2s^1$ B. $1s^2 2s^2$

C. $1s^2 2s^2 2p^6 3s^1$ D. $1s^2 2s^2 2p^6 3s^2$

43. Which atom has the strongest attraction for electrons?

A. Cl B. F C. Br D. I

44. The atoms of which element require the greatest amount of energy to remove an electron?

A. helium B. neon

C. argon D. krypton

45. The correct formula for sodium oxide is

A. SO_2 B. S_2O C. NaO_2 D. Na_2O

46. Which formula correctly represents iron (III) oxide?

A. Fe_2O_3 B. Fe_3O_2 C. FeO_3 D. Fe_3O

47. Which formulas represent two polar molecules?

A. CO_2 and HCl B. CO_2 and CH_4

C. H_2O and HCl D. H_2O and CH_4

48. Which kind of bond is formed when two atoms share electrons to form a molecule?

A. ionic B. metallic

C. electrovalent D. covalent

Version A

ACPS SCIENCE CHEMISTRY STOICHIOMETRY

Name: _____

Date: _____

Show work in box and circle the correct answer.

1. $2H_2S\ (g) + 3O_2\ (g) \rightarrow 2H_2O\ (g) + 2SO_2\ (g)$

If 3.50 g of H_2S are used in the above reaction, what will be the theoretical yield of water in grams?

A. 0.102 g
B. 0.185 g
C. 1.85 g
D. 185 g

2. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

The number of grams of oxygen required for the complete combustion of 4.00 grams of methane (CH_4) is -

A. 4.00 g
B. 8.00 g
C. 16.0 g
D. 32.0 g

3. $Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$

When copper reacts with silver nitrate according to the equation, the number of grams of copper required to produce 432 grams of silver is -

A. 31.5 g
B. 127 g
C. 216 g
D. 252 g

4. $$Zn + 2HCl \rightarrow ZnCl_2 + H_2$$

If 0.600 gram of zinc is used, what is the amount of zinc chloride that is produced in the above reaction?

A. 0.125 gram
B. 1.25 grams
C. 12.5 grams
D. .018 gram

5. **When magnesium metal is burned in the presence of oxygen gas, it forms Magnesium oxide. How many moles of oxygen gas are needed to burn 10 moles of Magnesium?**

Write the balanced chemical equation here:

A. 2
B. 5
C. 10
D. 20

6. $$2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$$

What is the mole ratio of C_4H_{10} to CO_2 in the reaction shown?

A. 1 : 4
B. 2 : 13
C. 4 : 5
D. 13 : 8

7. $$2KOH + H_2SO_4 \rightarrow 2H_2O + K_2SO_4$$

What mass of potassium hydroxide is required to react completely with 2.70 g of sulfuric acid to produce potassium sulfate and water?

A. 4.73 g
B. 3.09 g
C. 2.36 g
D. 1.54 g