Chemistry 100

Final 1997

3. Avogadro's Law states: equal volumes of all gases, at the same temperature and pressure, contain _____.

GAS

a) the same mass in grams

b) the same number of moles

c) a number of moles proportional to the molar mass of the gas.

d) all of the above

e) none of the above

8. Coca-Cola® is carbonated by injecting the liquid with carbon dioxide gas. Under what conditions is the solubility of carbon dioxide gas the greatest?

SOLUTIONS

a) low temperature, low pressure

b) low temperature, high pressure

c) low temperature, pressure is not a factor

d) high pressure, temperature is not a factor

e) high temperature, high pressure

9. Which of the following increases the rate of dissolving for a solid solute in a solvent?

SOLUTIONS

a) grinding the solute

b) heating the solution

c) stirring the solution

d) all of the above

e) none of the above

10. A saturated solution is a solution where more solute will _____ in a given amount of solvent at a given temperature.

SOLUTIONS

a) rapidly dissolve

b) slowly dissolve

c) not dissolve

d) none of the above

11. What is the mass of a 10.0% sodium hydroxide solution that contains 2.50 g of dissolved solute? (molar mass NaOH = 40.0 g/mole)

SOLUTIONS

a) 0.250 g

b) 0.278 g

c) 22.5 g

d) 25.0 g

e) 250. g

12. What is the mass of water need to prepare 5.00 kg of a 40.0% antifreeze solution?

a) 2.00 kg

b) 3.00 kg

c) 3.33 kg

d) 12.5 kg

e) 200 kg

13. What volume of 6.00 *M* sulfuric acid contains 0.100 mol of H_2SO_4 (98.03 g/mol)?

a) 0.600 mL

b) 16.7 mL

c) 60.6 mL

d) 167 mL

e) 1670 mL

14. What is the **mass** of barium hydroxide dissolved in 250. mL of 0.200*M* $Ba(OH)_2$ solution? (molar mass $Ba(OH)_2$ = 171.35 g/mole)

a) 0.05 mole

b) 8.57 g

c) 17.1 g

d) 171 g

e) 8570 g

15. To what volume must you dilute 80.0 mL of 3.0 *M* $CuSO_4$ to have a 0.50 *M* solution? (molar mass $CuSO_4$ = 159.56)

SOLUTIONS

a) 190 mL

b) 480 mL

c) 1.3 L

d) 190 L

e) 480 L

16. Which of the following is the <u>best</u> net ionic equation? (Assume that $BaSO_4$ forms an insoluble precipitate)

REACTIONS

a) $K_2SO_{4\,(aq)} + Ba(NO_3)_{2\,(aq)} \rightarrow 2\,KNO_{3\,(aq)} + BaSO_{4\,(S)}$

b) $2\,K^+_{(aq)} + SO_4^{2-}{}_{(aq)} + Ba^{2+}_{(aq)} + 2\,NO_3^-{}_{(aq)} \rightarrow 2\,K^+_{(aq)} + 2\,NO_3^-{}_{(aq)} + BaSO_{4\,(S)}$

c) $2\,K^+_{(aq)} + SO_4^{2-}{}_{(aq)} + Ba^{2+}_{(aq)} + 2\,NO_3^-{}_{(aq)} \rightarrow 2\,K^+_{(aq)} + 2\,NO_3^-{}_{(aq)} + Ba^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)}$

d) $SO_4^{2-}{}_{(aq)} + Ba^{2+}_{(aq)} \rightarrow BaSO_{4\,(S)}$

e) $SO_4^{2-}{}_{(aq)} + Ba^{2+}_{(aq)} \rightarrow Ba^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)}$

17. Using the solublitiy table given with this exam, determine which compound is insoluble in water.

REACTIONS/
SOLUTIONS

a) K_2SO_4

b) $CaCl_2$

c) Na_2S

d) $Al(OH)_3$

e) $Mg(NO_3)_2$

19. The polarity of a molecule depends on what factor(s)?

VSEPR

a) polarity of the bonds in the molecule

b) shape of the molecule

c) size of the molecule

d) both a and b

e) a, b, and c

20. Which of the following illustrates the bond polarity of one ONH bond in a water molecule?

O-H

VSEPR

a) (δ-) O-H (δ+)

b) (δ-) O-H (δ-)

c) (δ+) O-H (δ+)

d) (δ+) O-H (δ-)

e) (δ) O-H (δ)

21. Is PCl_3 polar?

VSEPR

a) yes

b) no

22. Is O_2 polar?

VSEPR

a) yes

b) no

24. One milliliter equals

MEASUREMENT

a) 1000 L

b) 1/1000 L

c) 100 L

d) 1/100 L

e) 1 L

25. 0.0023010 has ___ significant figures.

MEASUREMENT

a) 3

b) 4

c) 5

d) 6

e) 7

26. Multiply 2.505 m times 1.75 m and round off the product to the proper number of significant digits.

MEASUREMENT

a) 4.0 m^2

b) 4.00 m^2

c) 4.38 m^2

d) 4.384 m^2

e) 4.40 m^2

27. If the density of ethyl alcohol is 0.789 g/ mL, what is the volume of 35.5 g of ethyl alcohol?

MEASUREMENT

a) 2.80 mL

b) 4.50 mL

c) 28.0 mL

d) 45.0 mL

e) 280 mL

28. Elements on the right side of the periodic table are

PERIODIC TABLE

a) metals

b) metalloids

c) semimetals

d) non-metals

29. A horizontal row in the periodic table is called a

PERIODIC TABLE

a) group

b) row

c) family

d) period

30. Which of the following examples of matter can only be separated into two or more substances by chemical methods?

a) compound VOCABULARY

b) element

c) heterogeneous mixture

d) homogeneous mixture

e) none of the above

31. Ammonium phosphate is used in fertilizer to replenish nitrogen to the soil. If the formula is $(NH_4)_3PO_4$, what is the total number of atoms in one molecule?

a) 13 FORMULA

b) 16

c) 18

d) 20

e) none of the above

32. Which of the following observations is *not* evidence for a chemical change?

a) producing bubbles after mixing solutions VOCABULARY

b) giving a precipitate after mixing solutions

c) liberation of heat after mixing solutions

d) changing color after mixing solutions

e) adding water to dilute a solution

33. Two atoms are walking down the street and they run into each other.

One says to the other, "Are you all right?" "No, I lost an electron!"

"Are you sure?" "Yeah, I'm positive!"

The atom that lost an electron is a(n):

ATOMIC STRUCTURE

a) isotope

b) cation

c) anion

d) isoelectronic

e) neutral

34. State the subatomic particle having a relative charge of zero and an approximate mass of one atomic mass unit.

ATOMIC STRUCTURE

a) neutron

b) electron

c) proton

d) isotope

e) isoelectronic

35. Refer to the periodic table and determine the atomic mass of barium.

PERIODIC TABLE

a) 25 amu

b) 56 amu

c) 81 amu

d) 137.33 amu

e) 193.33 amu

36. $^{18}O^{2-}$ has ___ protons, ____ electrons, and ____ neutrons

ATOMIC STRUCTURE

a) 8, 8, 18

b) 8, 6, 10

c) 8, 10, 6

d) 8, 10, 10

e) 16, 16, 18

37. What is the maximum number of electrons that can occupy the 2nd energy level?

a) 2

ELECTRON CONFIGURATION

b) 6

c) 8

d) 10

e) 18

38. What is the shape of a 2p orbital?

a) cloverleaf

ELECTRON CONFIGURATION

b) dumbbell

c) sphere

d) circle

39. Which element has the following electron configuration: $1s^2 2s^2 2p^6 3s^2 3p^3$

ELECTRON CONFIGURATION

a) N

b) Al

c) P

d) K

e) Sc

40. Predict which of the following elements has the largest atomic radius.

PERIODIC TRENDS

a) F

b) Cl

c) O

d) S

e) Se

42. Which of the following is not isoelectronic with argon?

PERIODIC TABLE

a) S^{2-}

b) Cl^-

c) K^+

d) Mg^{2+}

e) all are isoelectronic with argon

43. The ammonium ion, NH_4^+, is classified as which of the following?

FORMULA

a) monoatomic cation

b) monoatomic anion

c) polyatomic cation

d) polyatomic anion

e) none of the above

44. What is the formula for the ionic compound composed of the bismuth ion, Bi^{3+}, and the cyanide ion, CN^-?

FORMULA

a) Bi_2CN_2

b) $BiCN_3$

c) Bi_3CN

d) $Bi(CN)_3$

e) $Bi_3(CN)_3$

45. What is the systematic name for Co_2S_3?

FORMULA

a) dicobalt trisulfur

b) cobalt (II) sulfide

c) cobalt (II) sulfate

d) cobalt (III) sulfide

e) cobalt (III) sulfate

46. What is the coefficient of lead metal after balancing the following equation?

__ $Al_{(s)}$ + ___ $Pb(C_2H_3O_2)_{2\ (aq)}$ → ___ $Al(C_2H_3O_2)_3$ + ___ $Pb_{(s)}$

REACTIONS

a) 1

b) 2

c) 3

d) 4

e) 6

47. Classify the type of chemical reaction illustrated in question #46

REACTIONS

a) combination

b) decomposition

c) single replacement

d) double replacement

e) acid/base

48. What is the predicted product from the following combination reaction?

$Li + O_2 \rightarrow$

REACTIONS

a) LiO

b) Li_2O

c) LiO_2

d) Li_2O_3

e) Li_3O_2

49. How many moles of Br_2 are in 65.0 g?

MOLE

a) 1.23 mol

b) 0.813 mol

c) 0.407 mol

d) 2.44×10^{23} mol

e) 4.88×10^{23} mol

50. Calculate the empirical formula of the compound that consists of 53.73% iron and 46.27% sulfur. (molar mass: Fe=55.85 g/mole; S=32.06 g/mole)

MOLE

a) FeS

b) Fe_2S

c) Fe_2S_3

d) Fe_3S_2

e) Fe_3S_4

51. How many moles of oxygen gas, O_2, will react with 2 moles of nitrogen monoxide gas, NO, according to the following equation?

(molar mass: O_2= 32.00 g/mol; NO = 30.01; NO_2 = 46.01)

STOICHIOMETRY

___ NO (g) + ___ O_2 (g) → ____ NO_2 (g)

a) 1 mol

b) 2 mol

c) 3 mol

d) 4 mol

e) none of the above

52. How many grams of iron are produced for the reaction of 500. g of aluminum metal? (molar mass: FeO = 71.85; Al = 26.98; Fe = 55.85; Al_2O_3 = 101.096)

$$\_\_\_ FeO_{(l)} + \_\_\_\_ Al_{(l)} \xrightarrow{\Delta} \_\_\_ Fe_{(l)} + \_\_\_ Al_2O_{3\,(l)}$$

STOICHIOMETRY

a) 345 g

b) 689 g

c) 1030 g

d) 1550 g

e) 3100 g

53. Which of the following compounds is held together by covalent bonds.

a) CO_2

BONDING

b) HgO

c) PbO

d) MgO

e) all of the above

54. What is the number of valence electrons (v) in CO_3^{2-}?

VSEPR

a) 18

b) 20

c) 22

d) 24

e) 28

56. What is the oxidation number of chromium in the dichromate ion, $Cr_2O_7^{2-}$?

FORMULA

a) + 6

b) + 7

c) + 12

d) + 14

e) - 14

57. The change of Al^{3+} to Al is:

REACTIONS

a) redox

b) reduction

c) oxidation

d) electronegativity

e) electron affinity