

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?

- a) grinding the solute
- b) heating the solution
- c) stirring the solution
- d) all of the above
- e) none of the above

SOLUTIONS

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

- a) rapidly dissolve
- b) slowly dissolve
- c) not dissolve
- d) none of the above

SOLUTIONS

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)

- a) 0.250 g
- b) 0.278 g
- c) 22.5 g
- d) 25.0 g
- e) 250. g

SOLUTIONS

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* $\text{Ba}(\text{OH})_2$ solution? (molar mass $\text{Ba}(\text{OH})_2 = 171.35$ 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 CuSO₄ to have a 0.50 M solution?
(molar mass CuSO₄ = 159.56)

- a) 190 mL
- b) 480 mL
- c) 1.3 L
- d) 190 L
- e) 480 L

SOLUTIONS

16. Which of the following is the best net ionic equation? (Assume that BaSO₄ forms an insoluble precipitate)

- a) $K_2SO_4(aq) + Ba(NO_3)_2(aq) \rightarrow 2KNO_3(aq) + BaSO_4(s)$
- b) $2K^+(aq) + SO_4^{2-}(aq) + Ba^{2+}(aq) + 2NO_3^-(aq) \rightarrow 2K^+(aq) + 2NO_3^-(aq) + BaSO_4(s)$
- c) $2K^+(aq) + SO_4^{2-}(aq) + Ba^{2+}(aq) + 2NO_3^-(aq) \rightarrow 2K^+(aq) + 2NO_3^-(aq) + Ba^{2+}(aq) + SO_4^{2-}(aq)$
- d) $SO_4^{2-}(aq) + Ba^{2+}(aq) \rightarrow BaSO_4(s)$
- e) $SO_4^{2-}(aq) + Ba^{2+}(aq) \rightarrow Ba^{2+}(aq) + SO_4^{2-}(aq)$

REACTIONS

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

- a) K₂SO₄
- b) CaCl₂
- c) Na₂S
- d) Al(OH)₃
- e) Mg(NO₃)₂

REACTIONS/
SOLUTIONS

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

- 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

VSEPR

20. Which of the following illustrates the bond polarity of one ^{O-H}~~OH~~ bond in a water molecule?

- 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)

VSEPR

21. Is PCl_3 polar?

- a) yes
- b) no

VSEPR

22. Is O_2 polar?

- a) yes
- b) no

VSEPR

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 m²
- b) 4.00 m²
- c) 4.38 m²
- d) 4.384 m²
- e) 4.40 m²

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

- a) 2.80 mL
- b) 4.50 mL
- c) 28.0 mL
- d) 45.0 mL
- e) 280 mL

MEASUREMENT

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

- a) metals
- b) metalloids
- c) semimetals
- d) non-metals

PERIODIC TABLE

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

- a) group
- b) row
- c) family
- d) period

PERIODIC TABLE

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

- a) compound
- b) element
- c) heterogeneous mixture
- d) homogeneous mixture
- e) none of the above

VOCABULARY

31. Ammonium phosphate is used in fertilizer to replenish nitrogen to the soil. If the formula is $(\text{NH}_4)_3\text{PO}_4$, what is the total number of atoms in one molecule?

- a) 13
- b) 16
- c) 18
- d) 20
- e) none of the above

FORMULA

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

- a) producing bubbles after mixing solutions
- 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

VOCABULARY

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):

- a) isotope
- b) cation
- c) anion
- d) isoelectronic
- e) neutral

ATOMIC
STRUCTURE

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

- a) neutron
- b) electron
- c) proton
- d) isotope
- e) isoelectronic

ATOMIC
STRUCTURE

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

- a) 25 amu
- b) 56 amu
- c) 81 amu
- d) 137.33 amu
- e) 193.33 amu

PERIODIC
TABLE

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

- a) 8, 8, 18
- b) 8, 6, 10
- c) 8, 10, 6
- d) 8, 10, 10
- e) 16, 16, 18

ATOMIC
STRUCTURE

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

- a) 2
- b) 6
- c) 8
- d) 10
- e) 18

ELECTRON
CONFIGURATION

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

- a) cloverleaf
- b) dumbbell
- c) sphere
- d) circle

ELECTRON
CONFIGURATION

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

- a) N
- b) Al
- c) P
- d) K
- e) Sc

ELECTRON
CONFIGURATION

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

- a) F
- b) Cl
- c) O
- d) S
- e) Se

PERIODIC
TRENDS

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

- a) S^{2-}
- b) Cl
- c) K^+
- d) Mg^{2+}
- e) all are isoelectronic with argon

PERIODIC
TABLE

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

- a) monoatomic cation
- b) monoatomic anion
- c) polyatomic cation
- d) polyatomic anion
- e) none of the above

FORMULA

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

- a) Bi_2CN_2
- b) BiCN_3
- c) Bi_3CN
- d) $\text{Bi}(\text{CN})_3$
- e) $\text{Bi}_3(\text{CN})_3$

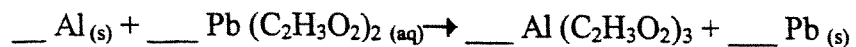
FORMULA

45. What is the systematic name for Co_2S_3 ?

- a) dicobalt trisulfur
- b) cobalt (II) sulfide
- c) cobalt (II) sulfate
- d) cobalt (III) sulfide
- e) cobalt (III) sulfate

FORMULA

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



- a) 1
- b) 2
- c) 3
- d) 4
- e) 6

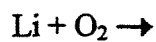
REACTIONS

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

- a) combination
- b) decomposition
- c) single replacement
- d) double replacement
- e) acid/base

REACTIONS

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



- a) LiO
- b) Li₂O
- c) LiO₂
- d) Li₂O₃
- e) Li₃O₂

REACTIONS

49. How many moles of Br₂ are in 65.0 g?

- a) 1.23 mol
- b) 0.813 mol
- c) 0.407 mol
- d) 2.44×10^{23} mol
- e) 4.88×10^{23} mol

MOLE

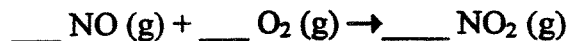
50. Calculate the empirical formula of the compound that consists of 53.73% iron and 46.27% sulfur. (molar mass: Fe=55.85 g/mole; S=32.06 g/mole)

- a) FeS
- b) Fe₂S
- c) Fe₂S₃
- d) Fe₃S₂
- e) Fe₃S₄

MOLE

51. How many moles of oxygen gas, O₂, will react with 2 moles of nitrogen monoxide gas, NO, according to the following equation?

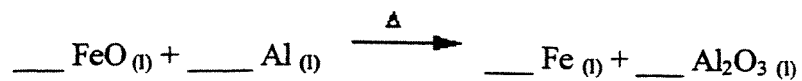
(molar mass: O₂= 32.00 g/mol; NO = 30.01; NO₂ = 46.01)



- a) 1 mol
- b) 2 mol
- c) 3 mol
- d) 4 mol
- e) none of the above

STOICHIOMETRY

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; Al₂O₃ = 101.096)



- a) 345 g
- b) 689 g
- c) 1030 g
- d) 1550 g
- e) 3100 g

STOICHIOMETRY

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

- a) CO₂
- b) HgO
- c) PbO
- d) MgO
- e) all of the above

BONDING

54. What is the number of valence electrons (v) in CO₃²⁻?

- a) 18
- b) 20
- c) 22
- d) 24
- e) 28

VSEPR

56. What is the oxidation number of chromium in the dichromate ion, $\text{Cr}_2\text{O}_7^{2-}$?

a) + 6

b) + 7

c) + 12

d) + 14

e) - 14

FORMULA

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

a) redox

b) reduction

c) oxidation

d) electronegativity

e) electron affinity

REACTIONS