BERGEN COMMUNITY COLLEGE
DIVISION OF NATURAL SCIENCES AND MATHEMATICS
CHM 100 PROFICIENCY TEST REVIEW QUESTIONS

A PERIODIC TABLE DURING THE TEST WILL BE PROVIDED. PLEASE REMEMBER TO BRING YOUR CALCULATOR.

1. Write chemical symbols for
    a. chlorine
    b. potassium
    c. sulfur
    d. nitrogen
2. Give the number of significant digits in
    a. 6.4×10^{-6}
    b. 2.0005
    c. 4.00
    d. 0.000341
3. Perform the following conversions
    a. 3.4km to mm
    b. 74.3L to qt [1L = 1.057qt]
4. Calculate the mass that 7.3 cm^3 (mL) of copper would weigh if its density is 8.92 g/mL.
5. Convert
    a. 53.6°C to °F
    b. -420°F to K
6. An element has 9 protons and 10 neutrons. For this element give
    a. the atomic number
    b. the mass number
7. Write electron configurations for
    a. chlorine
    b. sodium
    c. potassium
8. Calculate the number of protons, electrons and neutrons in
    a. Ca^{+2}
    b. Cl^-
9. Calculate the number of atoms of hydrogen present in 3 moles of $C_6H_{12}O_6$.
10. Calculate the percent composition by mass of $C_6H_{12}O_6$.
11. Balance the following equation: $C_2H_5OH + O_2$ ------> $CO_2 + H_2O$
12. Calculate the molar mass for $Ca_3 (PO_4)_2$
13. Convert 2.6 moles C_2H_6 to grams of C_2H_6

14. Calculate the number of molecules of C_3H_8 present in 11.0g C_3H_8.

15. For the reaction $2NaHCO_3$ -----> $Na_2CO_3 + H_2O + CO_2$; Calculate the number of grams of CO_2 formed when 28.0g $NaHCO_3$ decompose.

16. Evaluate:
    a. $(2.1 \times 10^{-4}) + (3.6 \times 10^{-5})$
    b. $(7.3 \times 10^{-4})(2.6 \times 10^{5})$
17. Write in correct exponential notation
    a. 472000
    b. 0.000204
18. Write formulas for
    a. sulfuric acid
    b. dinitrogen monoxide
    c. magnesium nitride
    d. iron (111) nitrate
19. Name the following compounds.
    a. N_2O_5
    b. $Cu(OH)_2$
    c. HC1
    d. $MgSO_4$
20. Calculate the mass of KC1 required to make 250g of a 5% (w/w) KC1 solution.

21. Calculate the volume in mL of a 3M HC1 solution that contains 0.430 mo1 HC1.

22. Determine which of the following are elements, compounds or mixtures.
    a. air
    b. iodine
    c. lithium nitrate
23. Determine which of the following are chemical or physical changes:
    a. melting of ice
    b. boiling an egg until it is hard boiled
    c. burning magnesium ribbon in air
24. State which of the following are metals or nonmetals:
    a. sulfur
    b. oxygen
    c. magnesium
25. Determine which of the following are main group or transition elements:
    a. carbon
    b. nickel
    c. cobalt
    d. phosphorus
26. Calculate the maximum number of electrons that can be accommodated in the main energy level 2.

27. What kind of bond is found in each of the following substances?

    a. $MgC1_2$
    b. C_4H_{10}
    c. HC1

28. Determine the molecular formula of a compound given the following percent composition: N, 30.4% and O, 69.6% and a molecular mass of 92.

29. Consider the reaction $4A1 + 3O_2$ -----> $2A1_2O_3$ Calculate the mass of $A1_2O_3$ formed if 9g A1 and 9g O_2 are allowed to react.

30. What are the shapes of the
    a. s orbital
    b. p orbitals

31. Determine the covalence number of
    a. Carbon
    b. Oxygen
    c. Nitrogen
    d. Fluorine

32. State which of the following elements exist as monatomic or diatomic molecules.
    a. Neon
    b. Oxygen

33. Consider the elements Li, F and K.
    a. Which has the largest size?
    b. Which has the highest ionization energy?
    c. Which has the highest electronegativity?

34. Consider the substance silver, sulfur and neon.
    a. Which of these substances is expected to have a luster, be malleable and ductile, and be a good conductor of heat and electricity?
    b. Which of these substances is expected to have an octet of electrons in its outermost energy level?
    c. Which of these substances is a solid, is brittle and a nonconductor of electricity?

The following reactions A through D apply to questions 35 through 38.

a. $Mg + 2HC1$ -----> $MgC1_2 + H_2$
b. $HC1 + NaOH$ -----> $NaC1 + H_2O$
c. $2HgO$ -----> $2Hg + O_2$
d. $AgNO_3 + NaC1$ -----> $NaNO_3 + AgC1$

35. Which of the above reactions is a neutralization reaction?

36. Which of the above reactions is a decomposition reaction?

37. Which of the above reactions is a single replacement reaction?

38. Which of the above reactions is an oxidation reaction?

39. Consider the following compounds: HNO_3, $MgBr_2$, Ba $(OH)_2$ and $C_6H_{12}O_6$
    a. Which compound is an acid?
    b. Which compound is a base?
    c. Which compound is a salt?
40. Consider the molecules CH_4, H_2O and CO_2
    a. Which molecule has a bent shape?
    b. Which molecule has a tetrahedral shape?
    c. Which molecule has linear shape?

ANSWERS TO REVIEW QUESTIONS

1. **a.** C1 **b.** K **c.** S **d.** N
2. **a.** 2 **b.** 5 **c.** 3 **d.** 3
3. **a.** 3.4×10^6 **b.** 78.5 qt
4. 65.1 g
5. **a.** 128^oF **b.** 22K
6. **a.** 9 **b.** 19
7. **a.** $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$ **b.** $1s^2\ 2s^2\ 2p^6\ 3s^1$ **c.** $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
8. **a.** p, 20; e, 18; n, 20 **b.** p, 17; e, 18; n, 18
9. 2×10^{25}
10. C, 40%; H, 6.7%; O, 53.3%
11. $C_2H_5OH + 3O_2$ -----> $2CO_2 + 3H_2O$
12. 310amu
13. 78g
14. 1.5×10^{23}
15. 7.33g
16. **a.** 2.5×10^{-4} **b.** 1.9×10^2
17. **a.** 4.72×10^5 **b.** 2.04×10^{-4}
18. **a.** H_2SO_4 **b.** N_2O **c.** Mg_3N_2 **d.** $Fe(NO_3)_3$
19. **a.** dinitogen pentoxide **b.** copper (11) hydroxide **c.** hydrochloric acid **d.** magnesium sulfate
20. 12.5g
21. 143mL
22. **a.** mixture **b.** element **c.** compound
23. **a.** physical **b.** chemical **c.** chemical
24. **a.** nonmetal **b.** nonmetal **c.** metal
25. **a.** main group **b.** transition element **c.** transition element **d.** main group
26. 8
27. **a.** ionic **b.** covalent **c.** polar covalent
28. N_2O_4
29. 17g
30. **a.** spherical **b.** dumb bell
31. **a.** 4 **b.** 2 **c.** 3 **d.** 1
32. **a.** monatomic **b.** diatomic
33. **a.** K **b.** F **c.** F
34. **a.** silver **b.** neon **c.** sulfur
35. b
36. c
37. a
38. a
39. **a.** HNO_3 **b.** $Ba(OH)_2$ **c.** $MgBr_2$
40. **a.** H_2O **b.** CH_4 **c.** CO_2