Instructions for using this MOCK FINAL as a practice tool.

1.This test is at least as difficult as the true final exam will be . . . I THINK!

2.After you have studied . . .set aside a three hour block of time to take this.

3. Use only a calculator, a periodic table and the formula/ constant sheet provided in class.

4. Complete the entire test before checking your answer key. (included at the end.)

5. Check to see how you did.

6. Be truthful with yourself as to how many you
   a. Got completely right.
   b. Guessed after eliminating some answers.
   c. Guessed right, but had no clue.

7. Decide what you need to study more.

8. Ask a friend/tutor or me to explain the ones you cannot figure out.

Success!

Dr. Bryan

1. How many neutrons are in an atom of the isotope, iron-57?

   A. 57 B. 26 C. 27 D. 31 E. 22

2. Which of the following is incorrectly paired?

	Name	Symbol
A	hydride ion	H^+
B.	nitride ion	N^{3-}
C.	cyanide ion	CN^-
D.	sulfite ion	SO_3^{2-}
E.	all of these are correctly paired	

3. Which of the following best indicates a chemical change?
   A. a substance changes shape

   B. a substance changes composition

   C. a substance changes temperature

   D. a substance changes color

   E. a substance changes from a gas to a solid.

4. _____ is the smallest unit of matter that can represent a compound.

   A. an atom

   B. a molecule

   C. an ion

   D. a proton

   E. a mole

5. The smallest division (i.e. graduation mark) on a very sensitive thermometer is 0.01 ºC. Which of the readings below would represent a temperature reported to the correct number of significant figures using this thermometer?
   A. 25 ºC.

   B. 18.1 C.

   C. 24.15 ºC.

   D. 16.235 ºC.

   E. 10.2358 ºC.

6. 13.1 cm = _____ ym (ym = "yoctometer" = 10^{-24} m)

A. 1.31×10^{-27}

B. 1.31×10^{-25}

C. 1.31×10^{23}

D. 1.31×10^{25}

E. 1.31×10^{27}

7. Metals are elements which _____.

A. tend to be malleable
B. tend to lose electrons to form cations
C. tend to be poor conductors of heat
D. Both A and B
E. A, B, and C

8. A cube of Zorkium is 1.21 inches per side and has a mass of 0.525 kg. What is Zorkium's density in g/mL?

A. 1.81×10^{1} g/mL

B. 4.34×10^{2} g/mL

C. 2.96×10^{2} g/mL

D. 3.20×10^{1} g/mL

E. 1.02×10^{1} g/mL

9. All of the following are in aqueous solution. Which is <u>incorrectly named</u>?

A. H_2SO_4 , sulfuric acid

B. H_2CO_3 , carbonic acid

C. H_3PO_4 , phosphoric acid

D. HCN, cyanic acid

E. HCl, hydrochloric acid

10. When the combustion reaction of C_3H_6 is properly balanced with the smallest whole number coefficients possible, the <u>sum of the coefficients</u> (including "one's") is

A. 12 B. 16 C. 21 D. 23 E. 28

11. Which of the following is the correct formula for cobalt (II) nitrite?

A. Co_2NO_3

B. $Co(NO_3)_2$

C. Co_2NO_2

D. $Co(NO_2)_2$

E. Co_3N_2

12. The correct name for ClF_3 is
A. chlorine fluoride

B. chlorine (III) fluoride

C. chlorine trifluoride

D. chlorine trifluorine

E. chloro fluoride

13. What is the molar mass of $Fe_3(PO_4)_2$.

A. 102.8

B. 357.5

C. 245.8

D. 268.2

E. 326.5

14. What is the %(w/w) of oxygen in $Ca(NO_3)_2$?

A. 58.5
B. 66.7
C. 9.75
D. 42.5
E. 96.0

15. What is the mass in grams of 0.250 moles of N_2O_4 ?

A. 23.0
B. 45.0
C. 92.0
D. 128.0
E. 368.1

16. How many atoms are in 5.00 grams of C_6H_6 ?

A. 3.01×10^{24}

B. 6.40×10^{-2}

C. 6.02×10^{23}

D. 3.85×10^{22}

E. 4.62×10^{23}

17. A sample of Na_2CO_3 contains 2.50 moles of sodium. How many grams of <u>oxygen</u> are in the sample?

A. 6.40
B. 26.7
C. 40.0
D. 60.0
E. 57.5

For questions 18 through 19, use the following balanced chemical equation:

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

18. If 1.28 moles of N_2 (g) are reacted with 1.56 moles of H_2 (g), how many moles of NH_3(g) can be formed?

A. 1.04
B. 2.56
C. 1.28
D. 1.56
E. 0.347

19. How many grams of N_2 (g) will completely react with 15.0 grams of H_2 (g) ?

A. 208.0
B. 104.0
C. 34.6
D. 69.4
E. 138.7

20. An artificial sweetner as the following composition:

C	57.14%
H	6.16%
N	9.52%
O	27.18%

Its most likely empirical formula is

A. $C_5H_6N_7O_2$

B. $C_{14}H_{18}N_2O_5$

C. $C_{57}H_6N_{10}O_{27}$

D. $C_3H_4N_4O_1$

E. $C_7H_9N_1O_3$

21. A compound having the empirical formula of CH_2N is found experimentally to have an molar mass of 84.1. It's molecular formula must be:

A. CH_2N B. $C_2H_4N_2$ C. $C_3H_6N_3$ D. $C_4H_8N_4$ E. $C_5H_{10}N_5$

22. Given the following balanced equation:

$4\ Fe\ (s) + 3\ O_2\ (g) \rightarrow 2\ Fe_2O_3\ (s)$

1.18 moles of Fe are reacted with excess O_2 and 64.2 grams of Fe_2O_3 are formed. What is the <u>percent yield</u> of this reaction? (Molar Mass of Fe_2O_3 = 159.7)

A. 34.1%

B. 68.2%

C. 17.0 %

D. 40.2 %

E. 97.4%

23. Which of the following solutions would be the best conductor of electricity?

A. 0.10 M $C_6H_{12}O_6$ (aq)

B. 0.10 M KBr (aq)

C. 0.10 M HF (aq)

D. all of these are good conductors of electricity

E. none of these are good conductors of electricity.

24. 10.0 g of $LiNO_3$ are dissolved in enough water to make 150 mL of solution. What is the molarity of $LiNO_3$ in this solution? (Molar mass of $LiNO_3$ = 69.0 g/mole)

A. 0.966 M

B. 0.145 M

C. 1.23 M

D. 1.93 M

E. 6.67 M

25. How many grams of sodium are in 375 mL of 0.600 M Na_2CO_3 (aq) ?

A. 5.17 g

B. 10.3 g

C. 11.9 g

D. 23.9 g

E. 47.7 g

26. Which of the following is a weak acid?

A. HCl (aq)

B. H_2SO_3 (aq)

C. $HClO_4$ (aq)

D. HNO_3 (aq)

E. none of these are weak acids

27. Which of the following shows the Net Ionic Equation when HNO_2 (aq) is mixed with KOH (aq)?

A. H_3O^+ (aq) + OH^- (aq) → $2H_2O$ (l)

B. H_3O^+ (aq) + KOH (aq) → $2\ H_2O$ (l) + K^+ (aq)

C. HNO_2 (aq) + KOH (aq) → H_2O (l) + KNO_2 (aq)

D. HNO_2 (aq) + OH^- (aq) → H_2O (l) + NO_2^- (aq)

E. KNO_2 (aq) → K^+ (aq) + NO_2^- (aq)

28. According to the solubility rules, a precipitate should form when a solution of $CuCl_2$ (aq) is added to which of the following solutions?

A. $LiNO_3$ (aq)

B. $FeSO_4$ (aq)

C. KOH (aq)

D. $Ca(C_2H_3O_2)_2$ (aq)

E. two of these solutions will cause a precipitate to form.

29. What is the net ionic equation for the mixing of aqueous solutions of aluminum sulfate and potassium hydroxide?

A. $2\ K^+$ (aq) + SO_4^{2-} (aq) → K_2SO_4 (s)

B. Al^{3+}(aq) + $3\ OH^-$ (aq) → $Al(OH)_3$ (s)

C. $3\ Al^{3+}$ (aq) + OH^-(aq) → Al_3OH (s)

D. $Al_2(SO_4)_3$ (aq) + 6KOH (aq) → $3\ K_2SO_4$ (aq) + $2\ Al(OH)_3$ (s)

E. There will be no net reaction!

30. Which of the following reactions is an oxidation reduction reaction?

A. HCl (aq) + $AgNO_3$ (aq) → HNO_3 (aq) + AgCl (s)

B. HNO_3 (aq) + KOH (aq) → KCl (aq) + H_2O (l)

C. H_3O^+ (aq) + OH^- (aq) → $2\ H_2O$ (l)

D. $2\ H_2$ (g) + O_2 (g) → $2\ H_2O$ (l)

E. None of these are oxidation reduction reactions.

For questions 31 and 32 consider the following unbalanced equation:

$$Fe(s) + MnO_4^-(aq) \rightarrow Fe^{2+}(aq) + MnO_2(s) \quad (\text{acidic conditions})$$

31. Which species is the oxidizing agent?

A. Fe (s) B. MnO_4^- (aq) C. Fe^{2+} (aq) D. MnO_2 (s) E. H_2O (l)

32. How many H^+ ions are present when the equation is properly balanced?

A. 2 B. 3 C. 4 D. 6 E. 8

33. How many mL of 0.150 M NaOH (aq) is necessary to completely neutralize 35.0 mL of 0.300 M H_2SO_4 (aq) ?

A. 35.0 mL

B. 17.5 mL

C. 8.75 mL

D. 70.0 mL

E. 140. mL

34. A solution is labeled 70.4 % (w/w) HNO_3 (aq). This solution has a density of 1.42 g/mL. Calculate the molarity of HNO_3 (aq) in this solution.

A. 0.787 M

B. 11.2 M

C. 15.9 M

D. 12.7 M

E. 6.30 M

35. ~~Solid samples of $NaNO_3$ and $MgCl_2$ are accidently mixed resulting in 125. grams of solid.~~ The mixture is dissolved in 500. mL of water. When an excess amount of 0.500 M Na_3PO_4 is added to the solution, 25.0 grams of $Mg_3(PO_4)_2$ is formed. What is the % (w/w) of $MgCl_2$ in the solid mixture?

$$2Na_3PO_4\,(aq) + 3\,MgCl_2\,(aq) \rightarrow 6NaCl\,(aq) + Mg_3(PO_4)_2\,(s)$$

(Molar mass of $Mg_3(PO_4)_2$ = 262.9 g/mole)

A. 7.24 %(w/w)

B. 20.0 %(w/w)

C. 21.7 %(w/w)

D. 40.0 %(w/w)

E. 43.6 %(w/w)

36. An gas sample is found to have a density of 3.16 g/L at STP. Which is the identity of the gas?

A. H_2

B. CO_2

C. N_2

D. Cl_2

E. CH_4

37. A sample of nitrogen gas is heated from 25.0º C to 150.0 º C. If the initial volume of the gas is 455 mL, what will the final volume be if pressure is kept constant?

A. 2730 mL

B. 321 mL

C. 556 mL

D. 646 mL

E. 752 mL

38. A sample of hydrogen gas is collected at STP. If it has a volume of 638 mL, how many moles of gas are present?

A. 0.0284 mole

B. 0.0261 mole

C. 0.0244 mole

D. 14.3 moles

E. 35.1 moles

39. Using the Bohr Model for the hydrogen atom, which of the following must be true when an electron moves from the state n=2 to n=4 in the hydrogen atom?

A. 1.36×10^{-19} J is released

B. 1.88×10^{-1} J is released

C. 4.09×10^{-19} J is absorbed

D. 1.36×10^{-19} J is absorbed

E. 5.45×10^{-19} J is absorbed

40. What is the ground state electron configuration for bromine?

A. [Ar] $4s^2\ 4p^5$

B. [Ar] $4s^2\ 4d^{10}\ 4p^5$

C. [Ar] $4s^2\ 3d^{10}\ 4p^5$

D. $1s^2\ 2s^2\ 2p^6\ 3s^2 3p^6\ 4s^2\ 4p^5$

E. more than one of these is correct.

41. Which of the following is a possible set of quantum numbers the last electron placed in krypton?

A. n=4, l = 0, $m_l = 0$, $m_s = ½$

B. n=4, l = 1, $m_l = 2$, $m_s = ½$

C. n=4, l = 2, $m_l = 2$, $m_s = ½$

D. n=4, l = 0, $m_l = 2$, $m_s = ½$

E. n=4, l = 1, $m_l = -1$, $m_s = ½$

42. What is the electron configuration for the chromium (III) ion?

A. [Ar] $4s^2\ 3d^4$

B. [Ar] $4s^2\ 3d^7$

C. [Ar] $4s^2\ 3d^3$

D. [Ar] $3d^3$

E. [Ar] $4s^2\ 3d^1$

43. Which of the following has the greatest electronegativity?

A. Rb

B. Na

C. Al

D. Ga

E. N

44. What is the formal charge on the bromine atom in BrO_3^- (drawn with three single bonds)?
A. -2

B. -1

C. 0

D. +1

E. +2

45. Which of the following is a polar molecule

A. O_2

B. CCl_4

C. NCl_3

D. CS_2

E. none of these is polar

46. Which of the following represents a polar covalent bond?

A. Cl-Cl

B. Si-Si

C. Ca-Cl

D. Cr-Br

E. P-Cl

47. At a given temperature and pressure, the average speed a hydrogen molecules be _____times the speed of sulfur dioxide molecules.

A. 31.7

B. 5.63

C. 7.97

D. 0.178

E. 0.125

48. If uranium-235 undergoes alpha decay, the product isotope will be _____.

A. radium-226

B. cobalt-60

C. radon-222

D. protactinium-230

E. thorium-231

49. A certain isotope X has a half-life of 3.56 days. Given 3.00 gram sample of X, how much will remain after 24 hours have passed?

A. 2.47 g

B. 2.54 g

C. 0.254 g

D. 2.83 g

E. 1.50 g

50. Which of the following is true concerning radioactive decay?

A. Fission is a form of radioactive decay.

B. Gamma decay is due to an unstable protons and neutrons.

C. Alpha particles travel at slower speeds than Beta particles.

D. All forms of radioactive decay provide the same threat to human tissue.

E. At least two of the above are true .

ANSWER KEY TO MOCK TEST

1-D	11-D	21-C	31-B	41-E
2-A	12-C	22-B	32-E	42-D
3-B	13-B	23-B	33-E	43-E
4-B	14-A	24-A	34-C	44-E
5-D	15-A	25-B	35-C	45-C
6-C	116-E	26-B	36-D	46-E
7-D	17-D	27-D	37-D	47-B
8-A	18-A	28-C	38-A	48-E
9-D	19-D	29-B	39-C	49-A
10-D	20-B	30-D	40-C	50-C

Tricky Questions: 16, 25, 33, 42, 47

Harder Questions: 34, 35, 36, 44