AMERICAN CHEMICAL SOCIETY
2010 VIRGINIA SECTION
CHEMISTRY OLYMPIAD
FIRST YEAR EXAM

DIRECTIONS TO THE EXAMINER

This test is designed to be taken with an answer sheet on which the student records their responses. All answers are to be marked on the answer sheet. Each student should be provided the test booklet, Periodic Table with explanation of abbreviations, constants and equations, answer sheet, tie breaker question and scrap paper, all of which must be turned in upon completion of the exam.

Students are allowed to use calculators (the calculator may be either programmable or non programmable) and the student should be given at least 90 minutes to complete the exam.

DIRECTIONS TO THE EXAMINEE

DO NOT TURN THE PAGE UNTIL DIRECTED TO DO SO

This is a 70 question multiple-choice exam with four or five choices for each question. There is only one correct or best answer to each question. When you select your answer, blacken completely the corresponding space on the answer sheet. If you wish to change an answer, be sure to erase your original answer completely. Any answer that has more than one blackened answer will be incorrect.

The tie breaker question can be completed at the end of the examination and will be used to determine the highest score on the examination if there is more than one student with the highest score.
Turn in all exam materials when you have completed the exam.

The following information MUST be put on the answer sheet:

1. In Student name field
    a. Test, School and Teacher code (Test code F = First, S = Second; i.e. FAB, where F is first year, AB is the school and teacher code for the student's teacher) "space"
    b. Student's Last Name "space" Student's First Name. If your name is too long for the field, neatly continue writing your complete name in the margin.

ABBREVIATIONS AND SYMBOLS					
ampere	A	Faraday constant	F	molal	m
atmosphere	atm	formula molar mass	M	molar	M
atomic mass unit	u	free energy	G	molar mass	M
atomic molar mass	A	frequency	ν	mole	mol
Avogadro constant	N_A	gas constant	R	Planck's constant	h
Celsius temperature	°C	gram	g	pressure	P
centi– prefix	c	heat capacity	C_p	rate constant	k
coulomb	C	hour	h	retention factor	R_f
electromotive force	E	joule	J	second	s
energy of activation	E_a	kelvin	K	temperature, K	T
enthalpy	H	kilo– prefix	k	time	t
entropy	S	liter	L	volt	V
equilibrium constant	K	milli– prefix	m		

CONSTANTS

$R = 8.314\ \text{J·mol}^{-1}\text{·K}^{-1}$

$R = 0.0821\ \text{L·atm·mol}^{-1}\text{·K}^{-1}$

$1\ F = 96{,}500\ \text{C·mol}^{-1}$

$1\ F = 96{,}500\ \text{J·V}^{-1}\text{·mol}^{-1}$

$N_A = 6.022 \times 10^{23}\ \text{mol}^{-1}$

$h = 6.626 \times 10^{-34}\ \text{J·s}$

$c = 2.998 \times 10^{8}\ \text{m·s}^{-1}$

$0\ °\text{C} = 273.15\ \text{K}$

$1\ \text{atm} = 760\ \text{mmHg}$

EQUATIONS

$$E = E^\circ - \frac{RT}{nF}\ln Q \qquad \ln K = \left(\frac{-\Delta H}{R}\right)\left(\frac{1}{T}\right) + \text{constant} \qquad \ln\left(\frac{k_2}{k_1}\right) = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

PERIODIC TABLE OF THE ELEMENTS

1 1A												13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 H 1.008	2 2A																2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 (269)	111 (272)	112 (277)		114 (???)				

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Virginia Chemistry Olympiad First Year Exam

Directions for the First Year Virginia Olympiad Local Section Examination

When you have selected your answer to each question, blacken the corresponding space on the answer sheet using a #2 pencil. If you decide to change an answer, erase the unwanted mark very carefully, and remark the correct space. There is only one correct answer to each question. Any questions for which more than one response is given will not be counted.

Your score will be based on the number of correctly answered questions. It is to your advantage to answer every question.

1. Round off the following measurement to three significant digits: 1255 g.
   a) 125 g
   b) 130 g
   c) 1260 g
   d) 126 g
   e) 1250 g

2. What are the products of the reaction between hydrochloric acid and ammonium hydroxide?
   a) H_2O (l) and NH_4Cl (aq)
   b) H_2 (g) and NH_4Cl (aq)
   c) H_2O (l) and NH_4Cl_2 (aq)
   d) H_2O (l) and $(NH_4)_2Cl$ (aq)
   e) H_2 (g) and NH_4Cl_2 (aq)

3. What is the chemical symbol for the halogen in the third period on the periodic table?
   a) Ca
   b) Ar
   c) Br
   d) Cl

4. What is the coefficient of oxygen gas after balancing the following equation?

   N_2 (g) + O_2(g) → N_2O_5(g)

   a) 5
   b) 2
   c) 4
   d) 1

5. Which of the following will have no effect on the equilibrium for the reaction:

   P_4(s) + 5 O_2(g) → P_4O_{10}(s) + heat
   a) Pressure increases.
   b) [P_4O_{10}] increases.
   c) [O_2] increases.
   d) Temperature increases.
   e) All of the above are correct.

6. What volume of 18 *M* sulfuric acid must be diluted with distilled water to prepare 500.0 mL of 0.50 *M* H_2SO_4?
   a) 0.014 mL
   b) 1.4 mL
   c) 140 mL
   d) 0.14 mL
   e) 14 mL

7. What is the assigned mass of the reference isotope for the atomic mass scale?
   a) 1.01 amu
   b) 4.00 amu
   c) 12.01 amu
   d) 16.00 amu

8. Apply the *like dissolves like* rule to predict which of the following solids is soluble in hexane, C_6H_{14}.
   a) Potassium iodide, KI
   b) potassium iodite, KIO_2
   c) potassium iodate, KIO_3
   d) potassium periodate, KIO_4
   e) iodine, I_2

9. What kind of radiation can be used to replace pesticides and preservatives in foods?
   a) positron radiation
   b) alpha radiation
   c) delta radiation
   d) beta radiation
   e) gamma radiation

10. What is the mass of water required to prepare 50.0 g of 10.0% sodium nitrate solution?
    a) 5.00 g
    b) 45.0 g
    c) 450 g
    d) 5.56 g
    e) 55.6 g

11. If the Moon is 246,000 miles from Earth, what is the distance in kilometers? (Given: 1 mile = 1.61 kilometer)
    a) 0.000 006 54 kilometer
    b) 15,300 kilometers
    c) 153,000 kilometers
    d) 396,000 kilometers
    e) 3,960,000 kilometers

12. Which of the following subatomic particles are found outside the nucleus?
    a) electron
    b) neutron
    c) proton
    d) positron

13. If 25.0 mL of urine has a mass of 25.725 g and contains 1.929 g of solute, what is the mass/mass percent concentration of the specimen?
    a) 1.93%
    b) 7.50%
    c) 7.72%
    d) 37.6%
    e) 97.2%

14. Many homes are treated for radon gas before a buyer decides to purchase the house. State the number of protons, neutrons, and electrons in radon-222, $^{222}_{86}Rn$.
    a) 86 protons, 136 neutrons, 136 electrons
    b) 136 protons, 86 neutrons, 136 electrons
    c) 86 protons, 136 neutrons, 86 electrons
    d) 222 protons, 136 neutrons, 86 electrons
    e) 86 protons, 222 neutrons, 86 electrons

15. If a penny has a mass of 2.507 g and is 97.5% zinc, what is the mass of zinc in the coin?
    a) 0.0627 g
    b) 0.627 g
    c) 2.44 g
    d) 0.244 g
    e) 2.38 g

16. Classify the following type of reaction:
    $LiHCO_3(s) \rightarrow Li_2CO_3(s) + H_2O(g) + CO_2(g)$
    a) double replacement
    b) decomposition
    c) single replacement
    d) combination

17. Add 2.33×10^3 to 4.16×10^2 and express the answer in scientific notation.
    a) 2.75×10^2
    b) 27.5×10^2
    c) 4.39×10^3
    d) 2.75×10^3
    e) 4.39×10^2

18. Which set of reactants results in a chemical reaction?
    a) $Fe(s) + Mg(NO_3)_2 \rightarrow$
    b) $Zn(s) + NaCl(aq) \rightarrow$
    c) $Cu(s) + H_2SO_4(aq) \rightarrow$
    d) $Ca(s) + H_2O(l) \rightarrow$
    e) $Al(s) + H_2O(l) \rightarrow$

19. Round off the following measurement to three significant digits: 19.945 g.
    a) 19.0 g
    b) 19.9 g
    c) 19.950 g
    d) 19.945 g
    e) 20.0 g

20. The radius of a sulfur atom is 0.000 000 104 centimeter. Express the atomic radius in scientific notation.
    a) 1.04×10^{-8} cm
    b) 1.04×10^{-7} cm
    c) 1.04×10^{-6} cm
    d) 1.04×10^{6} cm
    e) 1.04×10^{7} cm

21. If a diamond weighs 1.33 carats, what is the mass in grams? (Given: 1 carat = 0.200 gram)
    a) 0.133 grams
    b) 0.200 grams
    c) 6.65 grams
    d) 0.150 grams
    e) 0.266 grams

22. Write a balanced equation for the reaction between zinc metal and oxygen gas to produce solid zinc oxide.
    a) $2\ Zn(s) + O_2(g) \rightarrow 2\ ZnO(s)$
    b) $Zn(s) + O(g) \rightarrow ZnO(s)$
    c) $Zn(s) + O_2(g) \rightarrow ZnO_2(s)$
    d) $4\ Zn(s) + O_2(g) \rightarrow 2\ Zn_2O(s)$
    e) $Zn(s) + O_2(g) \rightarrow ZnO(s)$

23. A 7.500 g sample of ammonium carbonate decomposes into ammonia, 1.407 g of water vapor, and 3.434 g of carbon dioxide gas. What mass of ammonia is produced?
    a) 5.473 g ammonia
    b) 1.559 g ammonia
    c) 2.659 g ammonia
    d) 8.907 g ammonia
    e) 12.341 g ammonia

24. In 1861 a green line was observed in the spectrum of selenium ore that led to the discovery of the element thallium. Which of the following was responsible for the green line in the spectrum?
    a) electrons jumping to a higher energy level
    b) electrons dropping to a lower energy level
    c) protons jumping to a higher energy level
    d) protons dropping to a lower energy level
    e) none of these

25. Which of the following mixtures is heterogeneous?
    a) chocolate chip cookies
    b) hot tea
    c) liquid hand soap
    d) salad oil, a blend of canola oil and corn oil
    e) salt water from the Dead Sea

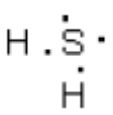
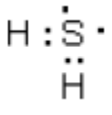
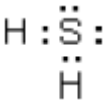
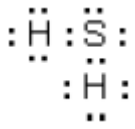
26. How many neutrons are in the nucleus of an atom of platinum – 195?
    a) 78 c) 117
    b) 195 d) 273

27. How many oxygen atoms are in $Ca_3(PO_4)_2$?
    a) 4 oxygen atoms c) 8 oxygen atoms
    b) 6 oxygen atoms d) 2 oxygen atoms

28. The term **sublimation** refers to
    a) the change from solid to gas.
    b) the change from liquid to vapor.
    c) the change from gas to solid.
    d) the change from solid to liquid.

29. What is the systematic name for $Li_2Cr_2O_7$?
    a) lithium chromate
    b) lithium dichromate
    c) dilithium chromate
    d) dilithium dichromate

30. Draw the electron dot formula for H_2S.

    a) 
    c) 
    b) 
    d) 

31. Cobalt metal reacts with oxygen to produce cobalt(III) oxide:

    $4\ Co(s) + 3\ O_2(g) \rightarrow 2\ Co_2O_3(s)$

    If 6.00 mol of cobalt reacts with 4.00 mol oxygen, then how many moles of cobalt(III) oxide are produced?
    a) 2.67 mol Co_2O_3
    b) 4.00 mol Co_2O_3
    c) 3.00 mol Co_2O_3
    d) 5.67 mol Co_2O_3

32. Which of the following is an observed property of liquids?
    a) liquids flow readily
    b) liquids do not compress or expand significantly
    c) liquids have a variable shape and fixed volume
    d) liquids are more dense than gases

33. What is the chemical formula for the ternary compound composed of Ag^+ and NO_3^{1-} ions?
    a) $AgNO_3$ c) $Ag(NO_3)_3$
    b) Ag_3NO_3 d) $Ag_3(NO_3)_3$

34. What is the chemical formula for the manganese (II) ion?
    a) Mg^{2+} c) Mg^{3+}
    b) Mn^{2+} d) Mn^{3+}

35. Calculate the molar mass of cobalt (III) nitrate, $Co(NO_3)_3$.
    a) 244.96 g/mol c) 120.94 g/mol
    b) 196.96 g/mol d) 168.96 g/mol

36. Given the following equation, how many moles of Br_2 are required to produce 14.7 mol $BiBr_3$?

    $Bi + Br_2 \rightarrow BiBr_3$

    a) 22.05 mol Br_2 d) 9.80 mol Br_2
    b) 22 mol Br_2 e) 14.7 mol Br_2
    c) 22.1 mol Br_2

37. What is the volume of 3.00 *M* sulfuric acid that contains 9.809 g of H_2SO_4 solute (98.09 g/mol)?
    a) 0.300 mL d) 333 mL
    b) 30.0 mL e) 3330 mL
    c) 33.3 mL

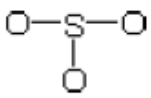
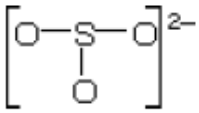
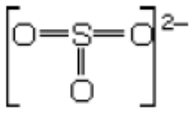
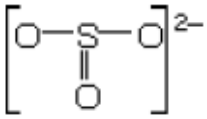
38. What is the difference between a scientific theory and a natural law?
    a) A theory is a tentative proposal and a law is a tested proposal.
    b) A law is a tentative proposal and a theory is a tested proposal.
    c) A theory explains behavior and a law states a measurable relationship.
    d) A law explains behavior and a theory states a measurable relationship.
    e) none of these

39. What is the chemical formula for the nitride ion?
    a) N^{3-} c) N
    b) N^{2-} d) NO

40. Which of the following elements exists naturally as a diatomic molecule and a liquid under normal conditions?
    a) Hg d) Br
    b) N e) F
    c) I

41. Which of the following is a redox reaction?
    a) $4\ Co\ (s) + 3\ O_2\ (g) \rightarrow 2\ Co_2O_3(s)$
    b) $Mg\ (s) + 2\ AgNO_3(aq) \rightarrow 2\ Mg(NO_3)_2(aq) + 2\ Ag\ (s)$
    c) $2\ LiClO_3\ (s) \rightarrow 2\ LiCl\ (s) + 3\ O_2(g)$
    d) $Ca\ (s) + 2\ H_2O\ (l) \rightarrow 2\ Ca(OH)_2\ (aq) + H_2(g)$
    e) all of the above

42. Draw the structural formula for the sulfite ion.

    a) 
    c) 
    b) 
    d) 

43. Which of the following pairs both exhibit covalent bonding?
    a) Br_2 and $AlCl_3$
    b) $NiCl_2$ and HgO
    c) NH_3 and CO
    d) $AgNO_3$ and SF_6
    e) $BiCl_3$ and $KMnO_4$

44. Which of the following is the best estimate for the mass of a 5¢ coin?
    a) 1 gram
    b) 5 grams
    c) 20 grams
    d) 2 grams
    e) 10 grams

45. Which of the following types of crystalline solids is hard and brittle, has a high melting point, and conducts electricity only when melted?
    a) Ionic
    b) Molecular
    c) metallic
    d) all of these

46. The pressure of an air sample at 190 K increases from 415 mm to 830 mm Hg. What is the final Kelvin temperature if the volume remains constant?
    a) -42K
    b) 95K
    c) 653K
    d) -166K
    e) 380K

47. Which of the following is probably derived from a petrochemical?
    a) a fuel
    b) a pesticide
    c) a paint
    d) all of these

48. Which of the following bonds is covalent?
    a) Li-H
    b) H - F
    c) Na – Cl
    d) C-O

49. What is the strongest intermolecular force in a liquid containing molecules with H-N bonds?
    a) covalent bonds
    b) dipole forces
    c) dispersion forces
    d) hydrogen bonds
    e) none of these

50. Express 10,000,000,000,000,000,000,000 in exponential form.
    a) 1×10^{-22}
    b) 1×10^{-21}
    c) 1×10^{21}
    d) 1×10^{22}

51. Which of the following are basic units and symbols in the English system?
    a) inch (in.), ounce (oz), pint (pt)
    b) foot (ft), pound (lb), quart (qt)
    c) yard (yd), pound (lb), gallon (gal)
    d) mile (mi), ton (ton), gallon (gal)
    e) The English system does not have basic units.

52. Which of the following acids is named: nonmetal stem + ous acid?
    a) $HNO_3(aq)$
    b) $H_3PO_3(aq)$
    c) $H_2SO_4(aq)$
    d) HCl (aq)

53. Which of the following is a currently accepted symbol and basic unit of mass in the metric system?
    a) centimeter (cm)
    b) kilogram (kg)
    c) milliliter (mL)
    d) picoseconds (ps)

54. How many moles is 3.01×10^{24} molecules of oxygen (*g*)?
    a) 5 moles oxygen
    b) 5.00×10^{23} mol oxygen
    c) 5.00 mol oxygen
    d) 5.0 mol oxygen
    e) 1.81×10^{48} mol oxygen

55. What is the hydrogen ion concentration of an aqueous acid solution having a pH of -1?
    a) -1 *M*
    b) 1 *M*
    c) 0 *M*
    d) 10 *M*

56. Consider the general equation:

2A + B 3C

If 8.00 g of A react with 3.00 g of B, then what mass of C is produced?

a) 2.67 g C
b) 5.00 g C
c) 11.0 g C
d) 24.0 g C
e) 11.00 g C

57. If the density of silver is 10.5 g/cm^3, which of the following is a related unit factor?

a) 1 g/1 mL
b) 1 g/10.5 mL
c) 10.5 g/1 mL
d) 10.5 g/10.5 mL
e) 10.5 mL/1 g

58. If the radius of an oxygen atom is 6.60 x 10^{-10} dm, what is the radius in nm?

a) 6.60 x 10^{-11} nm
b) 6.60 x 10^{-5} nm
c) 6.60 x 10^{-2} nm
d) 6.60 x 10^{1} nm
e) 6.60 x 10^{4} nm

59. Which of the following expresses standard atmospheric pressure?

a) 29.9 in. Hg
b) 760 mm Hg
c) all of these
d) 76.0 cm Hg
e) 14.7 psi

60. Write the equilibrium constant expression for the following reversible reaction:

$$2\,NO_2(g) + 7\,H_2(g) \rightleftharpoons 2\,NH_3(g) + 4\,H_2O(l)$$

a) $K_{eq} = \dfrac{[NH_3]^2}{[NO_2]^2\,[H_2]^7}$

b) $K_{eq} = \dfrac{[NH_3]^2\,[H_2O]^4}{[NO_2]^2\,[H_2]^7}$

c) $K_{eq} = \dfrac{[NH_3]}{[NO_2]\,[H_2]}$

d) $K_{eq} = \dfrac{[NO_2]^2\,[H_2]^7}{[NH_3]^2\,[H_2O]^4}$

e) $K_{eq} = \dfrac{[NO_2]^2\,[H_2]^7}{[NH_3]^2}$

61. Previous to the X-ray emission evidence of 1913, the order of the elements in the periodic table was based on which of the following?

a) increasing atomic number
b) increasing mass number
c) increasing neutron number
d) increasing atomic mass
e) increasing isotopic mass

62. What is the electron configuration using core notation for $Sr^{2+?}$

a) [Kr]
b) [Kr] $5s^2$
c) [Kr] $4d^{10}$
d) [Kr] $5s^2\,4d^8$

63. Predict the density for rhodium, Rh, given the density of cobalt, Co, and iridium, Ir,

a) 2.01 g/cm^3
b) 6.88 g/cm^3
c) 13.76 g/cm^3
d) 15.77 g/cm^3
e) 29.53 g/cm^3

64. Which fourth period transition element has the highest atomic number?

a) Ca
b) Kr
c) Cd
d) Zn

65. Referring to the periodic table, predict which element has this electron configuration:

[Kr] $5s^2\,4d^7$.

a) technetium, Tc
b) krypton, Kr
c) cobalt, Co
d) manganese, Mn
e) rhodium, Rh

66. Which of the following is a general property of a basic solution?

a) tastes bitter
b) feels slippery
c) turns litmus blue
d) neutralizes acids
e) all of these

67. Hydrochloric acid is a strong acid and acetic acid is a weak acid. Which of the following correctly portrays aqueous solutions of the two acids?
    a) HCl(aq) *and* $HC_2H_3O_2$(aq)
    b) H^+(aq) + Cl^-(aq) *and* $HC_2H_3O_2$(aq)
    c) HCl(aq) *and* H^+(aq) + $C_2H_3O_2^-$(aq)
    d) H^+(aq) + Cl^-(aq) *and* H^+(aq) + $C_2H_3O_2^-$(aq)
    e) none of these

68. Which of the following has an atom that has an oxidation number of +4?
    a) nitrogen in NH_3
    b) titanium in TiO_2
    c) carbon in HCN
    d) sulfur in SO_4^{2-}
    e) all of the above

69. If a glass marble weighs 3150 mg, what is the mass in centigrams?
    a) 3.15 cg
    b) 31.5 cg
    c) 315 cg
    d) 31,050 cg
    e) none of these

70. Which of the following statements is true?
    a) Alpha radiation has high penetration, passing through the body.
    b) Beta radiation can be shielded by paper or clothing.
    c) Beta radiation is equivalent to a helium nucleus.
    d) Gamma radiation travels at the speed of light.
    e) Alpha radiation travels at the speed of light.

End of Exam

Continue to Tie Breaker

Return all test papers, answer sheet, and scrap paper to the proctor.

Virginia Section First Year Exam – Tie Breaker Questions:

Student Name _____
School _____ Teacher _____

Box in your answer to each part. 2 Pts each

When solutions of sodium phosphate and iron (II) chloride are mixed a precipitate is formed.

(a) Write the over-all balanced chemical reaction and the net ionic equation for this reaction.

(b) What type of reaction does this represent?

(c) How many moles of Na_3PO_4 are present in 41.25 mL of a 0.246 M solution?

(d) How many moles are present in 1.50 g of iron (II) chloride?

(e) If the two solutions above are mixed according to the balanced chemical reaction, how many grams of the precipitate are formed?

(f) Assuming your answer to the above question is the calculated theoretical yield for the reaction, what is the % yield if you produce only 0.25 grams of the precipitate?