

Exam 2a

Chem 1141

Fall 2008

Name: _____

MULTIPLE CHOICE. [2 pts ea.]

Q1. The atomic mass unit (amu) is defined as exactly equal to:

- a) 1/12 mass of an atom of C-12
- b) the mass of one atom of H-1
- c) 1/16 the mass of an atom of O-16
- d) one gram per mole
- e) the mass of one proton

Q2. The (average) atomic mass of chlorine is:

- a) 12.01
- b) 17
- c) 18
- d) 35
- e) 35.45

Q3. The molar mass of H₂O (in g/mol) is:

- a) 1.00
- b) 16.00
- c) 17.01
- d) 18.02
- e) 21.03

Q4. The number of moles of H₂ in a 3.40 g sample is:

- a) 1.00
- b) 1.69
- c) 3.40
- d) 3.43
- e) 6.85

Q5. A device used to *weigh* individual atom/molecules by measuring the deflection of a charged ion in a magnetic field:

- a) pipet
- b) mass spectrometer
- c) titration
- d) isotope
- e) analytical balance

Q6. When the equation:



is balanced using the lowest set of whole number coefficients, the number written in front of N₂O is:

- a) 1
- b) 2
- c) 4
- d) 5
- e) 6

Q7. When the equation:



is balanced using the lowest set of whole number coefficients, the number written in front of CO₂ is:

- a) 1
- b) 2
- c) 4
- d) 5
- e) 6

Q8. A substance that dissolves in water to form a solution than conducts electricity is called a(n):

- a) electrolyte
- b) non-electrolyte
- c) precipitate
- d) molecule
- e) conductor

Q9. The compound Mg(NO₃)₂ is soluble in water:

- a) TRUE
- b) FALSE

Q10. The compound Fe₂S₃ is soluble in water:

- a) TRUE
- b) FALSE

Q11. An acid is a substance that:

- a) Forms OH^- ions when dissolved in water
- b) Turns litmus blue
- c) Forms H^+ ions when dissolved in water
- d) Forms NO_3^- ions when dissolved in water
- e) Tastes bitter

Q12. The oxidation number of the ~~oxygen~~ atom in the ion: SO_3^{2-} is:

- a) +1
- b) +2
- c) +3
- d) +4
- e) +5
- f) +6

Q13. A substance that is oxidized:

- a) Reacts with hydrogen
- b) dissolves well in water
- c) burns in air
- d) gains electrons
- e) loses electrons

Q14. 100.0 mL of a solution that is 1.50 M HCl contains how many moles of HCl?

- a) 150
- b) 15.0
- c) 1.50
- d) 0.150
- e) 0.0150

Q15. What volume of 2.0 M NaCl contains 0.10 mol NaCl?

- a) 20.0 L
- b) 2.0 L
- c) 0.20 L
- d) 0.020L
- e) 0.050 L

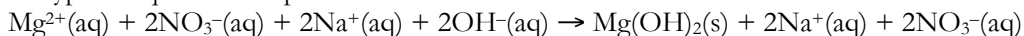
Q16. The molar concentration of a sample of NaOH that has 0.25 mol of NaOH in 125 mL of solution is:

- a) 0.00200 M
- b) 0.25 M
- c) 2.0 M
- d) 31 M
- e) 500 M

Q17. Water is added to a 10. mL sample of 15.0 M HNO_3 until the final volume is 100. mL. What is the molar concentration of the HNO_3 ?

- a) 0.015 M
- b) 0.15 M
- c) 1.5 M
- d) 15 M
- e) 150 M

Q18. What type of equation is represented below:



- a) Net ionic
- b) Full ionic
- c) Molecular
- d) Spectator
- e) Redox

Short Response.

Show ALL work to receive credit. Use the conversion factor method for all problems to receive full credit.

Q19. [9 pts.] Bornite is an important copper mineral with the chemical formula Cu_5FeS_4 . Its nickname is *peacock copper* due to its purple/bronze iridescent color. Calculate the percent composition by mass of each element in Bornite.



Q20. [15 pts.] Write the **balanced** molecular, full-ionic, and net-ionic chemical equations for the reaction between aqueous hydrochloric acid, HCl(aq) and aqueous sodium carbonate, $\text{Na}_2\text{CO}_3\text{(aq)}$. Be sure to include **all state symbols and charges**.

a) MOLECULAR

b) FULL-IONIC

c) NET-IONIC

Q21. [4 pts.] Name the following compounds:

i) CuCl

ii) N_7F_9

iii) KHCO_3

iv) FeCl_2

Q22. [4 pts.] Write formulas for the following compounds:

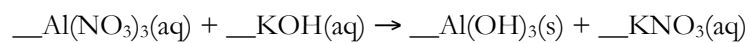
i) sodium phosphate

ii) copper(II) nitrate

iii) trisulfur pentoxide

iv) calcium sulfate pentahydrate

Q23. [16 pts.] Given the following unbalanced chemical equation:



a) Balance the equation (Write in the coefficients)

b) Calculate the number of moles of $\text{Al}(\text{OH})_3$ that can be formed from the complete reaction of 0.40 mol KOH .

c) Predict the mass of $\text{Al}(\text{OH})_3$ that can be made from mixing 20.0 mL of 1.00 M $\text{Al}(\text{NO}_3)_3(\text{aq})$ and 15.0 mL of 1.60 M $\text{KOH}(\text{aq})$.

d) If 0.402 g of $\text{Al}(\text{OH})_3$ are formed in the reaction described in part (c), then what is the percent yield?

Q24. [16 pts.] How many moles do the following contain:

a) 4.50 g of CH_2O

b) 12.3 g of NaCl

c) 22.0 mL of 0.331 M MgCl_2

d) 135 mL of 0.25 M CH_2O

BONUS: i) How many protons, neutrons, and electrons are there in an atom of sodium-24?

ii) Convert a speed of 3.4 nm/ms to units of pm/ns.

Periodic Table of the Elements

IA	IIA											IIIA	IVA	VA	VIA	VIIA	VIIIA
1																	18
1 H 1.01																	2 He 4.00
3 Li 6.94	4 Be 9.01											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											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 47.87	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 74.92160	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 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba* 137.33	57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm [145]	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04		
87 Fr [223]	88 Ra** [226]	89 Ac [227]	90 Th 232.04	91 Pa 231.04	92 U 238.03	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]		

TABLE 4.2 Solubility Rules for Common Ionic Compounds in Water at 25°C

Soluble Compounds	Exceptions
Halides (Cl ⁻ , Br ⁻ , I ⁻)	Halides of Ag ⁺ , Hg ₂ ²⁺ , and Pb ²⁺
Sulfates (SO ₄ ²⁻)	Sulfates of Ag ⁺ , Ca ²⁺ , Sr ²⁺ , Ba ²⁺ , Hg ₂ ²⁺ , and Pb ²⁺
Insoluble Compounds	Exceptions
Carbonates (CO ₃ ²⁻), phosphates (PO ₄ ³⁻), chromates (CrO ₄ ²⁻), and sulfides (S ²⁻)	Compounds containing alkali metal ions and the ammonium ion
Hydroxides (OH ⁻)	Compounds containing alkali metal ions and the Ba ²⁺ ion

$M_i V_i = M_f V_f \quad N_A = 6.022 \times 10^{23}$