

SCHM 109 Study Guide Exam 1

Spring 2012

Write your **name** on the **back** of the last page; **initial** the **backs** of the other pages.
Use a pencil or pen on the exam. Supplementary materials will be provided. No additional material (notes, etc.) permitted. Do the easiest problems first. Try to be as efficient with your time as possible. Show logic, calculations, units, correct sig fig and rounding for all problems.
(Note: On the actual exam, short answer questions will be modified to be in multiple choice format.)

Example of some of the types of questions you might encounter on the test:

1. Short answer:

- Describe a genetic disease that demonstrates the importance of biochemistry to human health including its cause and pathophysiology. How can this disease be treated?
- What things do chemists study?
- Who was James Lind, and what did he do that has had a significant effect on science?

2. Perform the following conversions:

- $4.07 \times 10^5 \mu\text{g} \rightarrow \text{g}$
- $9.31 \text{ feet} \rightarrow \text{cm}$
- $5.00 \times 10^{-2} \text{ km} \rightarrow \text{nm}$

3. For a) & b) below, how many s.f. does each value have, & which **place** is the least sig. place?

- Also, express 0.0007601 in scientific notation.
- Also, express 8.320075×10^4 in standard notation.

4. Calculate the following. Express with appropriate sf.

$$\frac{(5.43 - 4.761)(0.3477)}{(2.785 + 189.5)} =$$

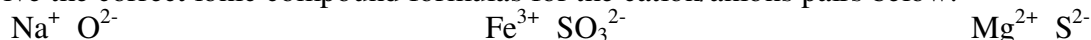
5. Give the number of p^+ , e^- , n , number of valence e^- and electronic configuration of:

- ^{40}K p^+ e^- n # valence e^- electronic configuration
- $^{32}\text{P}^{3-}$

6. Explain Mendeleev's Periodic Table and why scientists considered Mendeleev's development of the Periodic Table an important scientific advance.

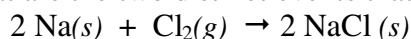
7. What is an ionic bond?

8. a) Give the correct ionic compound formulas for the cation/anions pairs below:



b) What is the charge of the $\text{NO}_2^{??}$ ion in: $\text{Ca}(\text{NO}_2)_2$?

9. What are the two distinct events that occur in the following reaction?



10. Fill in the table shown below: (Central atom is underlined.)

Formula	<u>C</u> H ₂ Cl ₂	<u>N</u> Cl ₃
# valence e^-		
Lewis structure		
molecular type		
e^- pair geom. name/sketch		
molecular shape name/sketch		
polar? (Y or N)		

11. From Q#9, what are the orbital hybridization patterns of CH₂Cl₂, and NCl₃?

12. What is the definition of valence electrons, and why are they important?

13. Give the symbol for a metal with one valence electron and an atomic number between 10 and 36.

14. What is the Lewis Octet Principle?

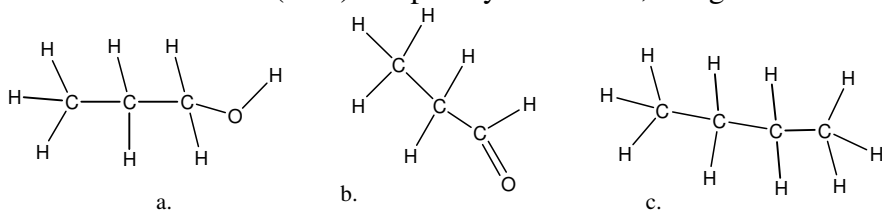
15. Regarding the Boltzmann molecular simulator program used in lecture, would increasing the number of red spheres in the box increase or decrease the pressure? Explain your answer using the Kinetic Molecular Theory.

16. What pressure is exerted by 0.533 moles of Ar(g) at 24.7° C in a 2.500 L container?

17. A syringe if filled with 48.0 mL of air at a pressure of 748 mm Hg. What would the pressure in the syringe be when the volume is decreased to 9.2 mL?

18. A weather balloon at 35.0 °C has a volume of 2.44 L and a pressure of 730 mm Hg. As the balloon rises, its temperature drops to 11.7 °C and the pressure changes to 683 mm Hg. What will the new volume of the balloon be?

19. Which of the following compounds would have the strongest, intermediate, and weakest intermolecular force (IMF). Explain your answer, using structures where appropriate.



20. What would be the physical state of a compound at room temperature that boiled at 55.9 °C and melted at 10.8 °C.?

21. Draw a picture of three molecules of water connected by hydrogen bonds.

22. For the following pairs of atoms sharing a bond, indicate which bonds are polar. In the appropriate case(s), locate $\delta+$ and $\delta-$.

a) N – C

b) C – C

Supplemental Information (that will be provided)

Periodic Table (see below) Electronegativity Table (see below)

Equations for temperature: °F = 1.8 °C + 32

K = °C + 273.15

English to metric conversions (**Note: The list of these may vary.**)

Length 1 m = 39.47 in

1 in = 2.54 cm (exact)

1 mi = 1.6093 km

1 m = 1.0936 yd

Mass

1 kg = 2.205 lb

1 lb = 453.5 g

1 oz = 28.35 g

1 ton = 907.185 kg

Volume 1 L = 1.0567 qt

1 gal = 3.7854 L

Internal metric conversions like cm → mm, *etc.* and internal English conversions like oz → lb, or qt → gal. *etc.*, you should memorize.

R = 0.082058 (L•atm/mol•K)

1 atm = 760.0 mm Hg

1 atm = 760.0 Torr

Periodic Table of the Elements

1A										8A										
1 H 1.00794	2A										2 He 4.00260									
3 Li 6.941	4 Be 9.01218											5 B 10.811	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.99840	10 Ne 20.1797			
11 Na 22.98977	12 Mg 24.305	3B	4B	5B	6B	7B	←-----8B-----→			1B	2B	13 Al 26.98154	14 Si 28.0855	15 P 30.97376	16 S 32.066	17 Cl 35.4527	18 Ar 39.948			
19 K 39.0983	20 Ca 40.07838	21 Sc 44.9556	22 Ti 47.88	23 V 50.9415	24 Cr 51.994	25 Mn 54.938	26 Fe 55.847	27 Co 58.9332	28 Ni 58.6934	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 93.80			
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.224	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.9055	46 Pd 105.42	47 Ag 107.868	48 Cd 112.41	49 In 114.82	50 Sn 118.710	51 Sb 121.757	52 Te 127.60	53 I 126.9045	54 Xe 131.29			
55 Cs 132.9045	56 Ba 137.33	57 La 138.9055	72 Hf 178.49	73 Ta 180.9479	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.966	80 Hg 200.59	81 Tl 204.383	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)			
87 Fr (223)	88 Ra 226.0254	89 Ac (227)	104 Rf (261)	105 Ha (263)	106 Sg (263)	107 Ns (265)	108 Hs (265)	109 Mt (266)	110 - (269)	111 - (272)	112 - (277)									

58 Ce 140.12	59 Pr 140.9077	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.965	64 Gd 157.25	65 Tb 158.9253	66 Dy 162.50	67 Ho 164.9303	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04	71 Lu 174.967
90 Th 232.0381	91 Pa 231.0359	92 U 238.029	93 Np 237.0482	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 (260)

Electronegativity Table (Pauling scale)

1A										8A										
1 H 2.1	2A										2 He									
3 Li 1.0	4 Be 1.5											5 B 2.0	6 C 2.5	7 N 3.0	8 O 3.5	9 F 4.0	10 Ne			
11 Na 0.9	12 Mg 1.2	3B	4B	5B	6B	7B	←-----8B-----→			1B	2B	13 Al 1.5	14 Si 1.8	15 P 2.1	16 S 2.5	17 Cl 3.0	18 Ar			
19 K 0.8	20 Ca 1.0	21 Sc 1.3	22 Ti 1.5	23 V 1.6	24 Cr 1.6	25 Mn 1.5	26 Fe 1.8	27 Co 1.9	28 Ni 1.9	29 Cu 1.9	30 Zn 1.6	31 Ga 1.6	32 Ge 1.8	33 As 2.0	34 Se 2.4	35 Br 2.8	36 Kr			
37 Rb 0.8	38 Sr 0.8	39 Y 0.8	40 Zr 0.8	41 Nb 0.8	42 Mo 0.8	43 Tc (98)	44 Ru 0.8	45 Rh 0.8	46 Pd 0.8	47 Ag 0.8	48 Cd 0.8	49 In 0.8	50 Sn 0.8	51 Sb 0.8	52 Te 0.8	53 I 2.5	54 Xe			
55 Cs 0.7	56 Ba 0.7	57 La 0.7	72 Hf 0.7	73 Ta 0.7	74 W 0.7	75 Re 0.7	76 Os 0.7	77 Ir 0.7	78 Pt 0.7	79 Au 0.7	80 Hg 0.7	81 Tl 0.7	82 Pb 0.7	83 Bi 0.7	84 Po (209)	85 At 2.1	86 Rn			
87 Fr (223)	88 Ra 226.0254	89 Ac (227)	104 Rf (261)	105 Ha (263)	106 Sg (263)	107 Ns (265)	108 Hs (265)	109 Mt (266)	110 - (269)	111 - (272)	112 - (277)									

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