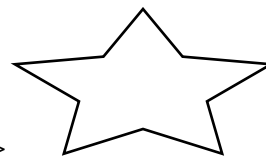


# Test 3

Chemistry 10 – Dr. Kline  
February 1, 2010

first letter of last name -->

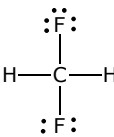
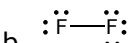
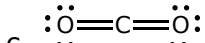
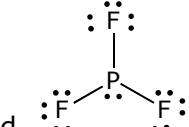


Name \_\_\_\_\_

*This test consists of a combination of multiple choice and other questions. There should be a total of 15 questions on four pages; please check to make sure that they are all here. Do not use your own tables, scratch paper or other information. Please turn off all cell phones, pagers and other communication devices; they will be confiscated if they make noise. No food. No water. No gum. No bathroom breaks. A regular calculator is OK, but you may not use graphing or programmable calculators and they will be confiscated if they are discovered during the test. The test will end 90 minutes after it starts. The last page is an info sheet that you may separate from the rest of the test; please check out the information on said sheet before asking questions about missing information in the body of the test.*

## Multiple Choice Questions

These nine questions are worth four points each, for a total of 36 points. Unless it is stated otherwise in a given problem, there is only one correct answer for each question; giving >1 answer for those questions will give you zero points. Answer each question by circling all letter(s) corresponding to the correct choice(s). If more than one answer **is** correct, you should circle **all** of the correct ones. It is not necessary to show work for these questions; however, you may write on the exam.

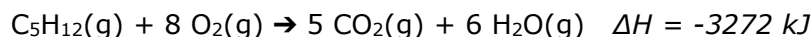
- Which of the following would increase the least in temperature when 1.267 joules of heat is applied to the metal at 301 K?  
a. 100. g Fe      b. 300. g Au      c. 200. g Ag      d. it is impossible to tell
- Which of the following molecules is/are polar? More than one may be. Note that the molecules may not be drawn with their correct molecular shapes.  
a.       b.       c.       d.       e. none of them
- Which of the following molecules is/are correctly matched with its molecular shape? More than one may be  
a.  $\text{NO}_2^-$  bent  
b.  $\text{BF}_3$  trigonal pyramidal  
c.  $\text{SF}_2$  linear  
d.  $\text{NCl}_3$  trigonal pyramidal  
e. none of them
- Which of the following statements is/are true? More than one may be.  
a. Te is more electronegative than Se  
b. Fe has four unpaired electrons in the ground state  
c. Sn has a greater ionization energy than Pb  
d. As is larger than Kr  
e. none of them

5. Which of the following contains the smallest number of atoms?  
a. 1.0 g Si                      b. 2.0 g Se                      c. 2.0 g Zn                      d. it is impossible to tell
6. Which of the following contains the largest percent by mass of carbon?  
a. C<sub>8</sub>H<sub>16</sub>                      b. C<sub>6</sub>H<sub>6</sub>                      c. C<sub>11</sub>H<sub>24</sub>
7. What is the limiting reagent when 28.0 g of carbon monoxide and 25.0 g of oxygen gas are combined to perform the following reaction:  $2\text{CO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g})$  ?  
a. CO                      b. O<sub>2</sub>                      c. neither
8. Which of the following has the same ground-state electron configuration as a noble gas? More than one answer may be correct.  
a. P<sup>3-</sup>                      b. Ti<sup>2+</sup>                      c. In<sup>3+</sup>                      d. Ca<sup>2+</sup>                      e. none of them
9. What is the percent by mass of nitrogen in aluminum nitrate, Al(NO<sub>3</sub>)<sub>3</sub>, to three significant figures? Note that you answer may not come out exactly to one of these: pick the closest one.  
a. 6.58%                      b. 19.7%                      c. 20.6%                      d. 29.1%                      e. 41.1%                      f. 52.8%

### Other Questions

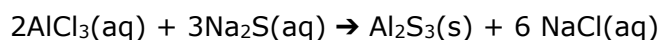
Each of the following questions is worth the indicated number of points, for a total of 64 points. Please be sure to provide all of the information requested for each question. **Show work with units for all problems!**

10. *9 points* Determine the mass of CO<sub>2</sub> produced by burning enough pentane to produce  $1.9 \times 10^3$  kJ of heat. The reaction is written below and  $\Delta H$  is given for the reaction as written.



11. *12 points* At the close of the market last Thursday, the price of platinum was \$1510.00 USD per ounce and the exchange rate was \$1.612 USD to £1.000 GBP. At this point in time, how many platinum atoms could have been purchased for £100. GBP? Note that 1 ounce = 28.35 g.

12. *12 points* When aqueous solutions of  $\text{AlCl}_3$  and  $\text{Na}_2\text{S}$  are combined a precipitate of  $\text{Al}_2\text{S}_3$  is formed. Suppose that 48.9 g of  $\text{Na}_2\text{S}$  is used with an excess of  $\text{AlCl}_3$  and that 24.2 g of  $\text{Al}_2\text{S}_3$  are produced. What is the percent yield of  $\text{Al}_2\text{S}_3$  formed in the reaction?



13. *6 points* Write the **complete** electron configuration of polonium ( $Z=84$ ) in the ground state using *spdf* notation.

14. *13 points* Propofol is a hypnotic agent used to induce anesthesia and that was a factor in the death of Michael Jackson. It has a molecular weight of 178.27 and the following percent composition by mass: 80.85% carbon, 10.18% hydrogen, and 8.97% oxygen. Determine its molecular formula.

15. *12 points* Draw Lewis structures of each of the following: **a**-SiS<sub>2</sub>, **b**-N<sub>2</sub>H<sub>4</sub> and **c**-NO<sub>2</sub><sup>+</sup>. You need not draw them with their correct shapes. Draw them all in the space provided below and put a box or circle around your final structures that you want to have graded.

## Chem 10 - Test #3 - Information

### PERIODIC CHART OF THE ELEMENTS

IA	IIA	IIIB	IVB	VB	VIB	VIIIB	VIII	IB	IIB	IIIA	IVA	VA	VIA	VIIA	INERT GASES		
1 H 1.00797														1 H 1.00797	2 He 4.0026		
3 Li 6.939	4 Be 9.0122										5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183	
11 Na 22.9898	12 Mg 24.312										13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948	
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30
55 Cs 132.905	56 Ba 137.34	*57 La 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	†89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 ? (271)	111 ? (272)	112 ? (277)						

Numbers in parenthesis are mass numbers of most stable or most common isotope.

Atomic weights corrected to conform to the 1963 values of the Commission on Atomic Weights.

The group designations used here are the former Chemical Abstract Service numbers.

#### \* Lanthanide Series

58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97
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#### † Actinide Series

90 Th 232.038	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (258)	102 No (258)	103 Lr (257)
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### Specific Heat Values (units are J/g°C) for some solid metals

Ag-0.24 Al-0.89 Au-0.13 Cu-0.39 Fe-0.45 Mn-0.48 Zn-0.39

### Electronegativity Values

B-2.1 C-2.5 Cl-3.0 F-4.0 H-2.1 N-3.0 O-3.5 P-2.1 S-2.5 Si-1.8

### Equations

$$q = s \times m \times \Delta T$$

$$E = hv; v = c/\lambda$$

### Conversions

$$1 \text{ ounce} = 28.35 \text{ g}$$

$$K = ^\circ C + 273$$

$$1 \text{ Joule} = 4.184 \text{ calories}$$

### Constants

$$\text{Avagadro's Number, } N_A = 6.022 \times 10^{23}$$

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

$$c = 2.998 \times 10^8 \text{ m/s}$$