

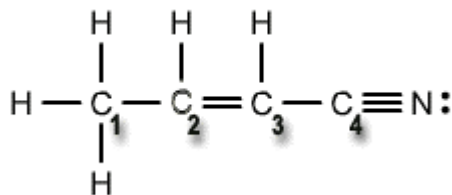
The Periodic Table

IA H 1 1.01																		VIII A He 2 4.00
II A Li 3 6.94	II A Be 4 9.01											III A B 5 10.81	IV A C 6 12.01	V A N 7 14.01	VI A O 8 16.00	VII A F 9 19.00	VIII A Ne 10 20.18	
Na 11 22.99	Mg 12 24.31											Al 13 26.98	Si 14 28.09	P 15 30.97	S 16 32.07	Cl 17 35.45	Ar 18 39.95	
K 19 39.10	Ca 20 40.08	III B Sc 21 44.96	IV B Ti 22 47.88	V B V 23 50.94	VI B Cr 24 52.00	VII B Mn 25 54.94	VIII B Fe 26 55.85	VIII B Co 27 58.93	VIII B Ni 28 58.69	IB Cu 29 63.55	IIB Zn 30 65.39	Ga 31 69.72	Ge 32 72.61	As 33 74.92	Se 34 78.96	Br 35 79.90	Kr 36 83.80	
Rb 37 85.47	Sr 38 87.62	Y 39 88.91	Zr 40 91.22	Nb 41 92.91	Mo 42 95.94	Tc 43 (97.9)	Ru 44 101.07	Rh 45 102.91	Pd 46 106.42	Ag 47 107.87	Cd 48 112.41	In 49 114.82	Sn 50 118.71	Sb 51 121.76	Te 52 127.60	I 53 126.90	Xe 54 131.29	
Cs 55 132.91	Ba 56 137.33	La 57 138.91	Hf 72 178.49	Ta 73 180.95	W 74 183.85	Re 75 186.21	Os 76 190.2	Ir 77 192.22	Pt 78 195.08	Au 79 197.97	Hg 80 200.59	Tl 81 204.38	Pb 82 207.2	Bi 83 208.98	Po 84 (209)	At 85 (210)	Rn 86 (222)	
Fr 87 223.02	Ra 88 226.03	Ac 89 227.03	Rf 104 (261)	Db 105 (262)	Sg 106 263	Bh 107 (262)	Hs 108 (265)	Mt 109 (266)	Ds 110 (271)	Rg 111 (272)	Uub 112 (285)	Uut 113 (284)	Uuq 114 (289)	Uup 115 (288)				

Ce 58 140.12	Pr 59 140.91	Nd 60 144.24	Pm 61 (145)	Sm 62 150.36	Eu 63 152.97	Gd 64 157.25	Tb 65 158.93	Dy 66 162.50	Ho 67 164.93	Er 68 167.26	Tm 69 168.93	Yb 70 173.04	Lu 71 174.97
Th 90 232.04	Pa 91 231.04	U 92 238.03	Np 93 237.05	Pu 94 (240)	Am 95 243.06	Cm 96 (247)	Bk 97 (248)	Cf 98 (251)	Es 99 252.08	Fm 100 257.10	Md 101 (257)	No 102 259.10	Lr 103 262.11

Solubility Guidelines	
Soluble Ionic Compounds	
1.	All sodium, potassium and ammonium salts are soluble.
2.	All nitrate, acetate, chlorate and perchlorate salts soluble.
3.	All chloride, bromide and iodide salts are soluble. <u>EXCEPT</u> those that contain: lead, silver or mercury(I) (Hg_2^{2+}).
4.	All fluoride salts are soluble. <u>EXCEPT</u> those that contain: magnesium, calcium, strontium, barium or lead.
5.	All sulfate salts are soluble. <u>EXCEPT</u> those that contain: calcium, silver, mercury(I), strontium, barium or lead.
Not Soluble Ionic Compounds	
1.	All hydroxide and oxide salts are not soluble. <u>EXCEPT</u> those that contain: sodium, potassium, ammonium or barium.
2.	All sulfide salts are not soluble. <u>EXCEPT</u> those that contain: sodium, potassium or ammonium.
3.	All carbonate, phosphate, chromate, and oxide salts are not soluble. <u>EXCEPT</u> those that contain: sodium, potassium or ammonium.

Question 1 The following questions relate to the molecule depicted:
16 Points



- The **total** number of **sigma bonds** in this molecule is: _____
- The **total** number of **pi bonds** in this molecule is: _____
- The hybridization used to describe the bonding around:
C1 is: _____ **C2** is: _____ **C4** is: _____
- The sigma bond formed between **C3** and **C4** is best describe as the overlap of a(n) _____ orbital on **C3** with a(n) _____ orbital on **C4**.
- The **pi** bonds in this molecule are best described as being formed from the overlap of _____ orbitals.

Question 2
6 Points

- What is the **driving force** in the following reaction? _____

$$2 \text{HNO}_3(\text{aq}) + \text{CoCO}_3(\text{s}) = \text{Co}(\text{NO}_3)_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$$
- Give the **net ionic equation** for this reaction?

Question 3
6 Points

- When a solution **nickel(II) chloride** and **ammonium sulfide** are mixed a precipitate is formed.
- Write the balanced chemical equation for this reaction:

 - Write the net ionic equation for this reaction:

Question 4
4 Points

HNO_2 is a **weak acid** that reacts with $\text{CoCO}_3(\text{s})$ to form $\text{Co}(\text{NO}_2)_2(\text{aq})$, $\text{H}_2\text{O}(\text{l})$ and $\text{CO}_2(\text{g})$.
Write the **net ionic equation** for this reaction:

Question 5
4 Points

- What reaction, if any, will occur when a solution of **potassium chloride** is mixed with an aqueous solution of **iron(II) nitrate**. **Circle** the correct answer.
- An acid base reaction
 - A gas forming reaction
 - A precipitation reaction
 - No reaction

Question 6 What quantity of heat (in joules) is required to raise the temperature of 52.8 mL of water from 24.9°C to 28.1°C. The density of water at this temperature is 0.997 g/mL. The specific heat capacity of water is 4.184 J/g°C.
6 Points

Answer: _____

Question 7 What quantity of heat (in joules) must be absorbed by CH₃Cl to convert 91.6g of liquid to a vapor at its boiling point, -24.09°C? The heat of vaporization of CH₃Cl is 21.40 kJ/mol.
6 Points

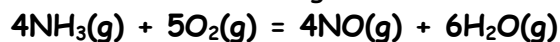
Answer: _____

Question 8 If 0.61g of C is burned in excess O₂(g) in a calorimeter which contains 775g of water, the calorimeter temperature increases from 25.0°C to 28.0°C. The heat capacity of water is 4.184 J/g°C, the calorimeter constant is 893 J/°C. What quantity of heat is evolved per mole of carbon?
9 Points

Answer: _____

Question 9
6 Points

The first step in the production of nitric acid is given below:



What quantity of heat is evolved or absorbed in the production of 1 mole of NO?

ΔH_f° 's in kJ/mol: NO(g) = 90.29 NH₃(g) = -45.90 H₂O(g) = -241.83

Question 10
10 Points

Answer: _____

1. Two vessels, **A** and **B**, contained equal molar quantities of the same gas; both vessels are at the **same temperature**. However the **pressure** of vessel **B** is **twice** that of vessel **A**. If vessel **A** has a volume of 4L what is the volume of vessel **B**?

Volume of vessel B: _____

2. Briefly, without any calculations, justify your answer.

3. What assumption (if any) did you have to make in determining the volume of B

Question 11 How many grams of solid **calcium hydroxide** are needed to exactly neutralize **24.9 mL** of a **0.351M monoprotic acid solution**? Assume that the volume remains constant.
9 Points **Show All Work.**

Answer: _____

Question 12 In the laboratory you dissolve **16.9g** of **iron(III) sulfate** in a volumetric flask and add water to a total volume of **100mL**.
8 Points

1. What is the **molarity** of the solution? _____ M
2. What is the **concentration** of the **iron(III) cation**? _____ M
3. What is the **concentration** of the **sulfate anion**? _____ M

Question 13 For the following reaction, **23.0 grams** of **hydrochloric acid** are allowed to react with **64.4 grams** of **barium hydroxide** to produce **barium chloride** and **water**.
10 Points

1. Balanced **chemical equation**: _____
2. What is the **formula** of the **limiting reagent**? _____
3. The **maximum amount (in grams)** of **barium chloride** formed? _____ g

Do Not Write Below This Line

Exam III Score

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