The Periodic Table

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIIIB	VIIIB	VIIIB	IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
H 1 1.01																	He 2 4.00
Li 3 6.94	Be 4 9.01											B 5 10.81	C 6 12.01	N 7 14.01	O 8 16.00	F 9 19.00	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	Sc 21 44.96	Ti 22 47.88	V 23 50.94	Cr 24 52.00	Mn 25 54.94	Fe 26 55.85	Co 27 58.93	Ni 28 58.69	Cu 29 63.55	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	***Exceptions***
Sodium (Na^+), potassium (K^+), and ammonium (NH_4^+) salts	
Nitrate (NO_3^-), acetate ($CH_3CO_2^-$), chlorate (ClO_3^-), and perchlorate (ClO_4^-) salts	
Chloride (Cl^-), bromide (Br^-), and iodide (I^-) salts	Pb^{2+}, Ag^+, Hg_2^{2+}
Fluoride (F^-) salts	Ca^{2+}, Sr^{2+}, Ba^{2+}, Pb^{2+}
Sulfate (SO_4^{2-}) salts	Ca^{2+}, Hg_2^{2+}, Sr^{2+}, Ba^{2+}, Pb^{2+}

Insoluble Ionic Compounds	***Exceptions***
Hydroxide (OH^-) and oxide (O^{2-}) compounds	Na^+, K^+, Ba^{2+}
Sulfide (S^{2-}) salts	Na^+, K^+, NH_4^+, Ba^{2+}
Carbonate (CO_3^{2-}) and phosphate (PO_4^{3-}) salts	Na^+, K^+, NH_4^+

SID | | | | | | | | Last ________________ First ________________

Question 1 6 Points

Classify each of the following molecules as **polar** or **nonpolar**?

a) NO^+: ______________

b) XeF_4: ______________

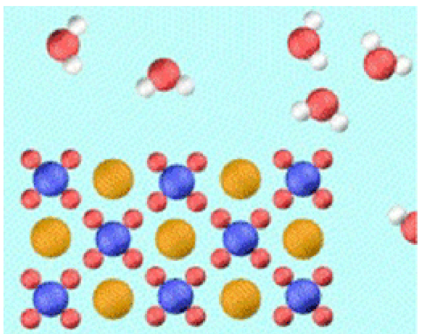
c) CH_2Cl_2: ______________

Question 2 3 Points

The hypothetical molecule $\mathbf{PY_3Z_2}$ has the general classification $\mathbf{AX_5E_0}$ and is found to be **non polar**. Based on this information what can you infer as to the **relative size** of **Y** when compared to **Z**?

____

Question 3 3 Points



In our discussion on the **consequences of molecular polarity**. The depiction on the left was used to discuss:

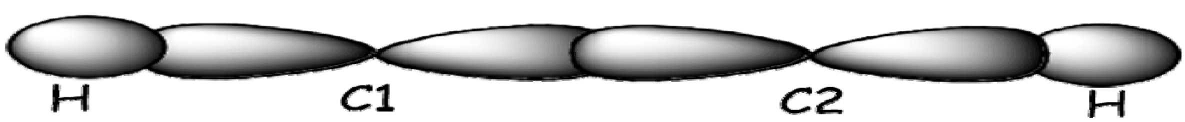
- o Detergents
- o Water dissolving $KMnO_4$
- o Fabric softeners
- o Chelating therapy

Question 4 4 Points

The **hybridization** used to describe the bonding about the central atom in **NOBr** is ______, which makes the **approximate bond angles** in this molecule ________ degrees.

Question 5 6 Points

Depicted below is the **sigma** bonds **HCCH**.



a) The **sigma** bond formed between **C1** and **C2** is best described as being between the overlap of two _____ hybrid orbitals.

b) The **sigma** bonds formed between the **hydrogen** and **carbon** is best described as being the overlap of an _____ hybrid orbital on each carbon with the _____ orbital on the hydrogen atoms.

c) If the **pi** bonds were to be depicted one would see _____ pi bond(s).

Question 6 3 Points

The bonding in a molecule is best described using **sp3d hybridization**. The **electron pair geometry** of this molecule is: ____________________

Question 7
3 Points

Classify each of the compounds as **soluble** (**s**) or **not soluble** (**ns**):

Zinc sulfate: _____ Calcium carbonate: _____ Silver(I) acetate: _____

Question 8
3 Points

Write a **balanced chemical equation** for the reaction that occurs when **aqueous solutions** of **silver(I) nitrate** and **nickel(II) chloride** are combined:

______________________ = ______________________

Question 9
3 Points

Write the **net ionic equation** for the reaction that takes place when aqueous solutions of **ammonium sulfide** and **chromium(III) chloride** are mixed.

______________________ = ______________________

Question 10
3 Points

Write a **net ionic equation** for the reaction that occurs when aqueous solutions of **sodium hydroxide** and **perchloric acid** are combined.

______________________ = ______________________

Question 11
3 Points

Write a **net ionic equation** for the reaction that occurs when a **hydrochloric acid (aq)** and **chromium(II) sulfide (s)** are combined.

______________________ = ______________________

Question 12
8 Points

A chunk of **silver** weighing **19.7 grams** and originally at **97.48°C** is dropped into an insulated cup containing **76.6 grams of water** at **23.38°C**. Assuming that all of the heat is transferred to the water, calculate the **final temperature** of the water.

Heat Capacity : H_2O = 4.184 J/g°C Ag = 0.237 J/g°C

For full credit you must show work.

°C

Question 13
4 Points

The reaction of iron(III) oxide(s) with hydrogen(g) to form iron(s) and water(g) proceeds as follows:

$$Fe_2O_3(s) + 3H_2(g) = 2Fe(s) + 3H_2O(g)$$

When **56.5 grams** of **Fe_2O_3(s)** react with sufficient H_2(g), **35.0 kJ** of energy are **absorbed**. What is the value of Δ**H** for the reaction **per mole of Fe_2O_3**?

For full credit you must show work.

kJ

Question 14
8 Points

When **0.32g** of **hydrazine** (N_2H_4) is burned in a bomb calorimeter containing **600g** of **water** the temperature of the water **increases** by **1.8°C**. Calculate the heat of combustion of hydrazine in J.mol^{-1}

Heat Capacities: H_2O = 4.184 J/g°C Calorimeter = 420 J/°C

For full credit you must show work.

J/mol

Question 15
4 Points

Given the standard enthalpy changes for the following two reactions:

(1) $2\ C(s) + 2\ H_2(g) = C_2H_4(g)$ ...... $\Delta H^\circ = 52.3$ kJ

(2) $2\ C(s) + 3\ H_2(g) = C_2H_6(g)$ ......$\Delta H^\circ = -84.7$ kJ

what is the standard enthalpy change for the reaction:

(3) $C_2H_4(g) + H_2(g) = C_2H_6(g)$ ......$\Delta H^\circ = ?$

For full credit you must show work.

kJ

Question 16
4 Points

Using **standard heats of formation given** below, calculate the **standard enthalpy** change for the following reaction.

$$2NO(g) + 2H_2(g) = N_2(g) + 2H_2O(l)$$

ΔH°_f: $NO(g) = 90.3\ kJ.mol^{-1}$ $\quad H_2O(l) = -285.8\ kJ.mol^{-1}$

kJ

Question 17
4 Points

A **0.884 mol** sample of **O_2 gas** is confined in a **21.0 liter container** at **16.2°C**.
If the **temperature** of the gas sample is **decreased** to **-1.10°C**, holding the **volume constant**, the **pressure will decrease** because:

Choose all that apply

- With higher average speeds, the molecules hit the walls of the container more often.
- At lower temperatures molecules have lower average speeds.
- As the average speed increases, the number of molecule-wall collisions decreases.
- With lower average speeds, on average the molecules hit the walls of the container with less force.

Question 18
5 Points

You need to make an aqueous solution of **0.142M calcium nitrate** for an experiment in lab, using a **250mL** volumetric flask. How much **solid calcium nitrate** should you add?

For full credit you must show work.

g

Question 19
5 Points

For the following reaction, **0.355 moles of carbon disulfide** are mixed with **0.579 moles of chlorine gas**.

carbon disulfide (s) + chlorine (g) = carbon tetrachloride (l) + sulfur dichloride (s)

What is the **maximum amount** of **carbon tetrachloride** that can be **produced**?

For full credit you must show work and give balanced chemical equation(s).

mol

Question 20
8 Points

For the following reaction, **3.86 grams of oxygen gas** are mixed with **excess nitrogen gas**. The reaction yields **5.81 grams of nitrogen monoxide**.

nitrogen (g) + oxygen (g) = nitrogen monoxide (g)

What is the **percent yield** for this reaction?

For full credit you must show work and give balanced chemical equation(s).

%

Question 21
10 Points

47.2mL of 0.113M hydrobromic acid is added to **21.4mL of calcium hydroxide**, and the **resulting solution is found to be acidic**.

29.8mL of 0.0862M sodium hydroxide is required to reach neutrality.

What is the **molarity** of the **original calcium hydroxide** solution?

For full credit you must show work and give balanced chemical equation(s).

M

Do Not Write Below This

Exam III Score