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)			

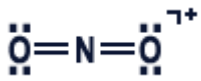
Ce 58 140.12	Pr 59 140.91	Nd 60 144.24	Pm 61 (145)	Sm 62 150.36	Eu 63 152.97	Gd 64 157.25	Tb 65 158.93	Dy 66 162.50	Ho 67 164.93	Er 68 167.26	Tm 69 168.93	Yb 70 173.04	Lu 71 174.97
Th 90 232.04	Pa 91 231.04	U 92 238.03	Np 93 237.05	Pu 94 (240)	Am 95 243.06	Cm 96 (247)	Bk 97 (248)	Cf 98 (251)	Es 99 252.08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

Solubility Guidelines:

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

SID | | | | | | | | | Last _____ First _____

Question 1
8 Points

A	B	C	D
			

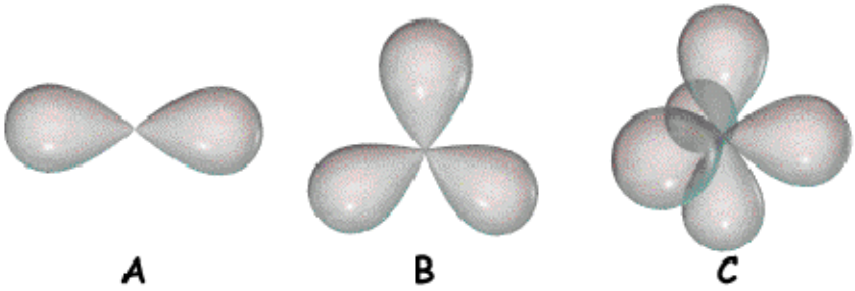
Classify the above molecules as either **polar** or **nonpolar**.

A. _____ C. _____

B. _____ D. _____

Question 2
12 Points

For each **hybridization type**, choose a **picture** that corresponds to the correct orbital picture and specify the electron pair geometry. If **no picture** matches, enter **N**.



A B C

Hybridization	Picture	Electron Pair Geometry
sp	_____	_____
sp^3d	_____	_____
sp^2	_____	_____

Question 3
6 Points

A molecule has **sp^3** hybridization with 2 lone pairs:

a) The **electron pair geometry** of this molecule is _____

b) The **geometry** of this molecule is _____

c) The **approximate bond angle** in the molecule _____

Question 4
9 Points

Give the **formula** for the **precipitate** that is formed when each of the following aqueous solutions are mixed. (If **no precipitate** is expected then write **no precipitate**)

1. **Iron(III) bromide** and **sodium hydroxide** _____
2. **Calcium chloride** and **ammonium sulfide** _____
3. **Calcium hydroxide** and **hydrochloric acid** _____

Question 5
6 Points

Write the **net ionic equation** for the reaction that takes places when aqueous solutions of **ammonium sulfide** and **chromium(III) iodide** are combined.

Question 6
6 Points

Write the **net ionic equation** for the reaction that takes places when aqueous solutions of **hydrocyanic acid (HCN)** and **lithium hydroxide** are combined.

Question 7
6 Points

Write the **net ionic equation** for the reaction that takes places when solid **calcium carbonate** is added to **hydroiodic acid**.

Question 8
5 Points

After absorbing **1.81 kJ** of heat the temperature of **a 0.723 kg** block of copper is **40.6°C**. The specific heat of copper is **0.385 J/g.°C**. What was the **initial temperature** of the copper block?

_____ **°C**

Question 9
7 Points

0.301 g of C (graphite) is burned in excess oxygen to give $CO_2(g)$

C(graphite) + O_2(g) = CO_2(g)

The temperature of the calorimeter, which contained **775**g of **water**, increases from **25.1**^{0}C to **27.48**^{0}C. What quantity of heat is evolved per mole of carbon?

[Heat capacity water = **4.184** J/g^{0}C Heat capacity calorimeter = **893** J/^{0}C]

_____ **J/mol**

Question 10
4 Points

Given the standard enthalpy changes for the following two reactions:

1. **2 Hg(l) + O_2(g) = 2 HgO(s)** ΔH° = **-181.6** kJ
2. **Hg(l) + Cl_2(g) = $HgCl_2$(s)** ΔH° = **-224.3** kJ

what is the standard enthalpy change for the reaction:

2 $HgCl_2$(s) + O_2(g) = 2 HgO(s) + 2 Cl_2(g) ΔH° = ?

_____ **kJ**

Question 11
4 Points

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

$4\ NH_3(g) + 5\ O_2(g) = 4\ NO(g) + 6\ H_2O(g)$

[ΔH^0_f: $NH_3(g)$, **-46** kJ/mol $NO(g)$, **90** kJ/mol $H_2O(g)$, **-242** kJ/mol]

_____ **kJ/mol**

Question 12
8 Points

a) A 1.13 mol sample of **He** gas is confined in a **27.3** liter container at **21.5**°C.

If **1.13** mol of **O_2** is **substituted** for the **1.13** mol of **He**, holding the volume and temperature constant, the average **kinetic energy** will

- ❍ Decrease
- ❍ Increase
- ❍ not enough information given
- ❍ remain the same

b) A **1.36** mol sample of **O_2** gas is confined in a **32.9** liter container at **21.5**°C.

If the amount of gas is **decreased** to **0.680** mol, holding the volume and temperature constant, the **pressure** will

- ❍ Decrease
- ❍ Increase
- ❍ not enough information given
- ❍ remain the same

c) A **0.708** mol sample of **CO_2** gas is confined in a **17.4** liter container at **26.8**°C.

If the volume of the gas sample is **decreased** to **8.71** L holding the temperature constant, the number of **molecule-wall collisions per unit area per unit time** will

- ❍ Decrease
- ❍ Increase
- ❍ not enough information given
- ❍ remain the same

d) A **0.708** mol sample of **CO_2** gas is confined in a **17.4 liter** container at **26.8**°C.

If the **temperature** of the gas sample is **decreased** to **8.00**°C, holding the volume constant, the **pressure will decrease because**:

- ❍ The gas molecules are moving slower.
- ❍ The average kinetic energy of the molecules has decreased.
- ❍ The number of collision per unit time decreases
- ❍ All of the above.

Question 13
5 Points

In the laboratory you dilute **4.91** mL of a concentrated **6.02** M **nitric acid** solution to a total volume of **155** mL. What is the concentration of the dilute solution ?

_____ **M**

Question 14
7 Points

For the following reaction, **4.89** grams of **sodium** are mixed with **0.308** moles of **water**.

sodium (s) + water (l) = sodium hydroxide (aq) + hydrogen (g)

What is the **maximum amount** (in grams) of **hydrogen gas** that can be produced?

For full credit you must show work and include a balanced chemical equation.

_____ **grams of hydrogen gas**

Question 15
7 Points

How many **grams** of **solid barium hydroxide** are needed to exactly **neutralize 25.8 mL** of a **0.701 M perchloric acid** solution? Assume that the volume remains constant.

For full credit you must show work and include a balanced chemical equation.

grams

Do Not Write Below This

Exam III Score