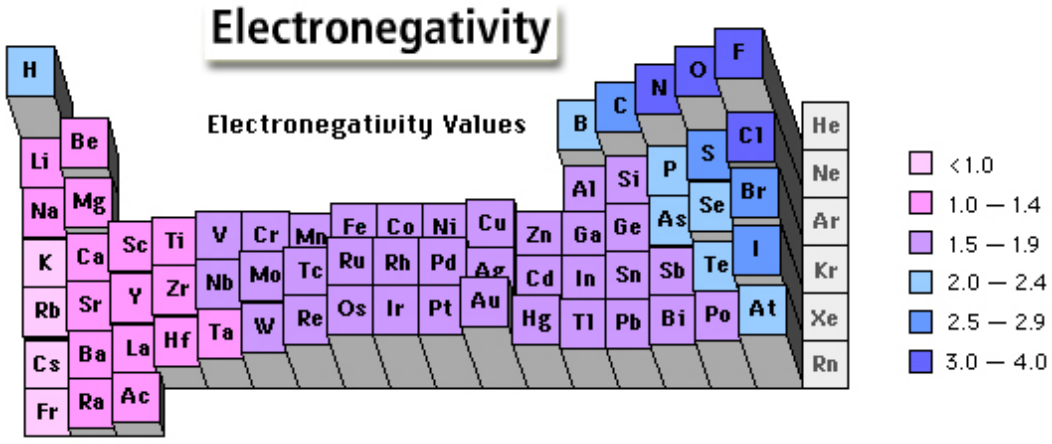
The Periodic Table

IA																	VIIIA
H 1 1.01	IIA											IIIA	IVA	VA	VIA	VIIA	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	IIIB	IVB	VB	VIB	VIIB	VIIIB	VIIIB	VIIIB	IB	IIB	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)			

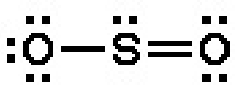
Ce 58 140.12	Pr 59 140.91	Nd 60 144.24	Pm 61 (145)	Sm 62 150.36	Eu 63 152.97	Gd 64 157.25	Tb 65 158.93	Dy 66 162.50	Ho 67 164.93	Er 68 167.26	Tm 69 168.93	Yb 70 173.04	Lu 71 174.97
Th 90 232.04	Pa 91 231.04	U 92 238.03	Np 93 237.05	Pu 94 (240)	Am 95 243.06	Cm 96 (247)	Bk 97 (248)	Cf 98 (251)	Es 99 252.08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



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

Question 1 (8 Points)

To answer the questions, interpret the following Lewis diagram for **SO_2**



a) The number of **lone pair** on central atom _____

b) The number of **single** bond(s) _____

c) The number of **double** bond(s) _____

d) The number of **equivalent Lewis** structures _____

Question 2 (8 Points)

Draw a Lewis structure for each of the following where the central atom obeys the **octet rule**.

O_2

Carbon dioxide

ClO_3^-

F_2CO

Question 3 (6 Points)

On the rough work paper provided – draw **a Lewis structure** for **NO_2^-** in which the central **N** atom **obeys the octet rule**, and answer the questions on the right based on your drawing.

a) The number of **unshared pairs** (**lone pairs**) on the central N atom is: _____

b) The central N atom forms _____ **single** bonds.

c) The central N atom forms _____ **double** bonds.

Question 4 (8 Points)

Draw a **Lewis structure** for each of the following **organic molecules**.

C_3H_8

HCOOH

CH_3COCH_3

CH_3COONH_2

Question 5
6 Points

O_3 has **resonance structures** – draw them.

Question 6
8 Points

What is the **name** of the compound with the formula:

a) **N_2O** _____

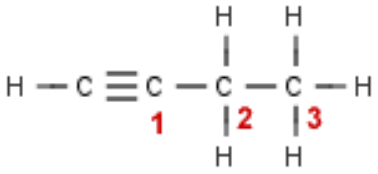
b) **BBr_3** _____

What is the **formula** for:

a) **Phosphorus pentachloride** _____

b) **Sulfur hexafluoride** _____

Question 7
6 Points



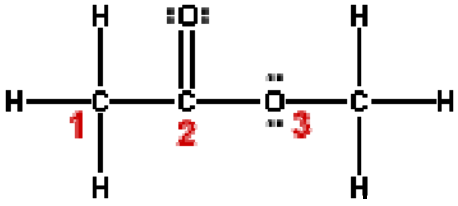
What is the **electron pair geometry** about:

a) **Atom 1**: _____

b) **Atom 2**: _____

c) **Atom 3**: _____

Question 8
6 Points



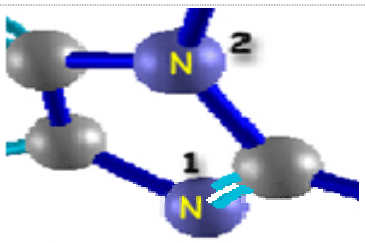
What is the **predicted bond angle** about:

a) **Atom 1**: _____

b) **Atom 2**: _____

c) **Atom 3**: _____

Question 9
4 Points



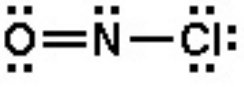
What is the **predicted bond angle** about the following atoms?

a) **Nitrogen 1** _____

b) **Nitrogen 2** _____

Question 10
6 Points

The **Lewis Dot Structure** for **NOCl** is depicted on the right.



a) The **electron pair geometry** around **N** is: _____

b) The **molecular geometry** around **N** is: _____

Question 11
8 Points

The **electron-pair geometry** around the **S** atom in **SBr_2**? _____.

There is/are _____ **lone pair(s)** around the central atom, so the **molecular geometry** of the **SBr_2** molecule is predicted to be _____.

SBr_2 is _____ . **(Polar/Nonpolar)**

Question 12
2 Points

In our discussion on the **consequences of molecular polarity**, the data shown below was used to discuss:

Solubility of Some Common Substances

Compound	Solubility in H_2O g/100mL	
O_2	$4.5x10^{-3}$	18°C
N_2	$2.0x10^{-3}$	18°C
NH_3	89.5	0°C
CO_2	0.179	18°C
HCl	72.1	20°C

a) Membranes
b) Micelle action
c) Fabric softeners
d) Like dissolves like
e) Detergents

Question 13
4 Points

$ClO^-(aq) + H_2O(l) \Leftrightarrow HClO(aq) + OH^-(aq)$ K = **$2.86x10^{-7}$** at 298K.

Assuming you start with **ClO^-** and no **HClO** or **OH^-**, **circle** those of the following that **best** describes the **equilibrium system?**

a) The **reverse** reaction is favored at equilibrium.
b) **Appreciable** quantities of **all species** are present at equilibrium.
c) The **forward** reaction is favored at equilibrium.
d) **Very little HClO** will be present at equilibrium.

Question 14
6 Points

Write the **equilibrium constant expression**, K, for the following reactions:

a) $2\ NOCl(s) \Leftrightarrow 2\ NO(g) + Cl_2(g)$ K = _____

b) $HF(aq) + H_2O(l) \Leftrightarrow H_3O^+(aq) + F^-(aq)$ K = _____

Question 15
4 Points

Consider the following system at equilibrium at 698K:

$H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$

When some **$I_2(g)$** is added to the equilibrium system at constant temperature:

The reaction must:

a) Run in the **forward** direction.
b) Run in the **reverse** direction.
c) Remain the **same**.

The concentration of **H_2** will:

a) **Increase**
b) Remain the **same**
c) **Decrease**

Question 16
6 Points

Dinitrogen tetraoxide and **nitrogen dioxide** are two gases that exist in equilibrium at a range of temperatures. **NO_2** is a **reddish brown** gas while **N_2O_4** is **colorless**.

If we represent the equilibrium as: $N_2O_4(g) \Leftrightarrow 2NO_2(g)$

Consider the following experimental observations:

- At **High Temperature** the **red color is very strong**.
- At **Low Temperature** the gas has **very little color**.

We can conclude from these observations:

a) That the reaction is:

☐ Exothermic ☐ Endothermic ☐ Neutral

b) When the **temperature** is **decreased** the **equilibrium constant**, K

☐ Increases ☐ Decreases ☐ Remains the same.

c) When the **temperature** is **decreased** the **equilibrium concentration** of NO_2

☐ Increases ☐ Decreases ☐ Remains the same.

Question 17
4 Points

Consider the following system at equilibrium at 350 K:

$2\ CH_2Cl_2(g) \Leftrightarrow CH_4(g) + CCl_4(g)$

If the volume of the equilibrium system is suddenly increased at constant temperature::

The reaction must:

a) Run in the **forward** direction.

b) Run in the **reverse** direction.

c) Remain the **same**.

The number of moles of **CCl_4** will:

a) **Increase**

b) Remain the **same**

c) **Decrease**

Exam II Score