CHEM 1101 MidTerm #1 Solutions

/20

1.a) $\lambda = 287\ nm = 287 \times 10^{-9}\ m$ (-5 for not converting to m)

/15 $E = \frac{hc}{\lambda} = \frac{(6.626\times10^{-34}\ J\cdot s)(3.00\times10^{8}\ m/s)}{(286\times10^{-9}\ m)}$ (-3 for calculation error.)

$= 6.92613\times10^{-19} = \underline{6.93\times10^{-19}\ J}$

-2 for sig figs

-3 if unit not given

b) $E = (6.93\times10^{-22}\ kJ)(6.02\times10^{23}\ /mol)$

/5 $= 4.16\ldots\times10^{2}\ kJ/mol = \underline{417\ kJ/mol}$

-2 for conversion to kilo (÷1000)

-3 for conversion to "per mol"

/25

/10 2.a) $_{79}Au$: $[Xe]\,6s^1\,4f^{14}\,5d^{10}$ (long-hand ok, too) -5 if $6s^2\,4f^{14}\,5d^9$

-5 if wrong noble gas used.

/5 b) Valence: $6s^1$ $\underline{1}$ $(6,0,0,\pm\frac{1}{2})$ Consistent w. ↑

-3 for wrong choice -2 per error

/5 c) highest E: $5d^{10}$ $\underline{\uparrow\downarrow}$ $\underline{\uparrow\downarrow}$ $\underline{\uparrow\downarrow}$ $\underline{\uparrow\downarrow}$ $\underline{\uparrow\downarrow}$

$(5,2,-2,\pm\frac{1}{2})$ $(5,2,-1,\pm\frac{1}{2})$ $(5,2,0,\pm\frac{1}{2})$ $(5,2,1,\pm\frac{1}{2})$ $(5,2,2,\pm\frac{1}{2})$

-3 for wrong choice -2 per error Consistent w.

/5 d) Au^+ : $[Xe]\,(6s^0)\,4f^{14}\,5d^{10}$ (do NOT have to write $6s^0$)

No marks if not ionized from Valence

-2 per error

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-5 if reversed order (-2 if reversed but LABELLED PROPERLY)

/20

3. a) Size Ne < F < O < P < Si < Al < Hg < K
small large
-3 per error.

-5 if reversed and/or wrong labels /10
-3 if reversed but consistent /10
a. partial

-5 if not flipped.

b) I.E. K < Al < Hg < Si < P < O < F < Ne
-3 per error.

-2 if small reversed & labelled correctly

4. a) $\overset{+6}{As}_2\overset{-6}{O}_3$: Arsenic (III) oxide

Capital letters NOT relevant for any first elements

b) $\overset{+3}{In}_2\overset{-6}{O}_3$: Indium oxide

/15

c) $\overset{+2}{Mn}(\overset{-2}{SO_4})$: Manganese(II) sulfate

-1 per error
No more than -3 for any one compound.
(ie missing numeral/ numeral where one doesn't belong/ prefix where one doesn't belong...)

d) N_2O_4 : Dinitrogen tetroxide

e) lead: Pb^{4+} carbonate: CO_3^{2-} : $Pb(CO_3)_2$

f) gallium(I): Ga^+ ; carbonate CO_3^{2-} : Ga_2CO_3

g) ammonium: NH_4^+ ; phosphide P^{3-} : $(NH_4)_3P$

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5a) N : 5

/10 3×O : 18

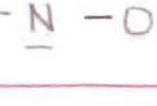
- : 1/24 $e^{\ominus}$ -6/18

$\Rightarrow 24e^{\ominus} - 8 = 16$ ✓

-4 if only one structure.. -2 if only two given

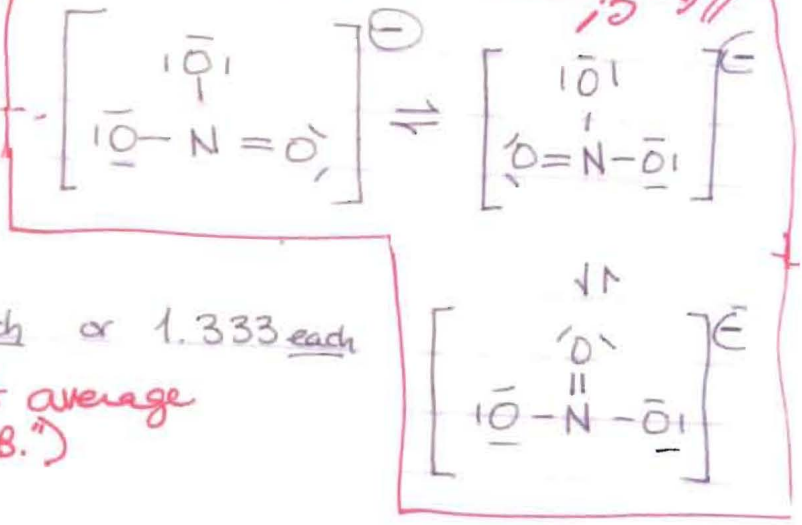
3/5 if only this shown

-2 if charge NOT shown.



missing 1 pair

-3 if two D.B.'s



b) Bond order : 4/3 each

or 1 1/3 each or 1.333 each

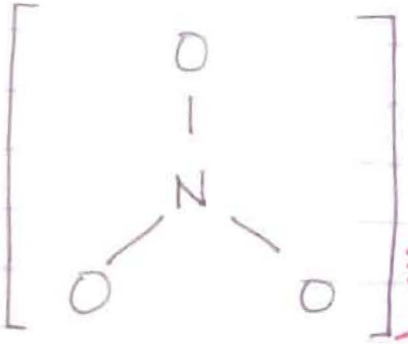
/5

2/5 if they don't average (ie "1 D.B. & 2 S.B.")

c) Geometry: 2 SB

1 DB / 3 regions

/5



3 picture

- 1 if charge Not shown. (lone pairs can be shown but don't need to be)

Triangular

2 name