CHEMISTRY 1ADV / SSP (CHEM1901/1903) June 2001

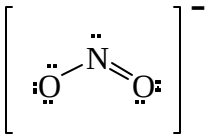
2001-J-2

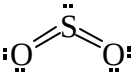
- -396.1 kJ mol^{-1}
- 6.21×10^{-19} J

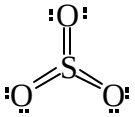
  Radius will undergo relatively large increase as outermost electron is now in the $n = 3$ energy level as opposed to $n = 2$.

  Its ionisation energy would be lower than Na. Its orbital configuration is very similar to Na, missing just one electron from the 2p orbital, so shielding and energy effects will be very similar to that of Na. The major difference will therefore be the lower nuclear charge in Ne (10 protons) compared to Na (11 protons). Nuclear attraction of the 3s electron will therefore be less in excited Ne atom and electron will be easier to remove.

2001-J-3

- 





3 pairs not involved in π bonding	3 pairs not involved in π bonding	3 pairs not involved in π bonding
bent	bent	trigonal planar

- Electrons are in constant movement in molecules. This can result in formation of temporary dipole, which in turn can cause an induced dipole in a neighbouring molecule. Dispersion forces are the attractions between these temporary dipoles.
- CO_2 CO HCl HF
- Dissolve copper(II) sulfate-5-water in water.

  $$CuSO_4(s)\cdot 5H_2O \rightarrow Cu^{2+}(aq) + SO_4^{2-}(aq)$$

  Add solution of sodium carbonate. Copper(II) carbonate will precipitate.

  $$Cu^{2+}(aq) + CO_3^{2-}(aq) \rightarrow CuCO_3(s)$$

  Filter and wash precipitate.

  Dissolve precipitate in dilute nitric acid.

  $$CuCO_3(s) + 2H^+(aq) \rightarrow Cu^{2+}(aq) + H_2O + CO_2(g)$$

  Evaporate to incipient crystallisation.

  $$Cu^{2+}(aq) + 2NO_3^-(aq) + 6H_2O \rightarrow Cu(NO_3)_2\cdot 6H_2O$$

2001-J-4

- The attractions between H^+ and SO_4^{2-} ions in sulfuric acid are much less that the attractions between the ions and the very polar water molecules.

  49.6 °C

- The distance from the nucleus increases as *n* increases. Electrons in such orbitals are less strongly attracted by the nucleus and have higher potential energy.

- The orbital with lower *l* has its probability maxima nearer the nucleus. This shields the electron(s) in the higher *l* orbital from the attractive force of the nucleus and their energy increases.

2001-J-5

- Ammonia is a polar molecule with strong intermolecular attractions. Under conditions of high pressure the molecules undergo "stick collisions" and the pressure is less than that expected for an ideal gas. This results in $PV/nRT < 1$.
  There is very little intermolecular attraction between helium atoms. Under conditions of high pressure the major deviation from ideality is due to the fact that the He atoms occupy a significant proportion of the volume of the container. The effective volume that the atoms have to move in is therefore less than that used in the ideal gas equation.

- 4 atoms of P (P_4)

2001-J-6

- (i) rate = $k[NO][Br_2]$
  (ii) rate = $k[NO]^{3/2}[Br_2]^{1/2}$
- 5.6×10^{-4} s

2001-J-7

- 4.88 g 6.93 mL
- $K_b = 6.34 \times 10^{-5}$ M $pK_a = 9.80$

2001-J-8

- $\Delta G = -745$ kJ mol^{-1} $\therefore$ spontaneous
- 2.3×10^2 or $1 : 4.4 \times 10^{-3}$
  Treat patient with pure O_2. Increase in concentration of O_2 will push the equilibrium to the left.