CHEMISTRY 1A (CHEM1102) - November 2012

2012-N-2

- Blue/green

  7.4×10^{-9} mol L^{-1}

2012-N-3

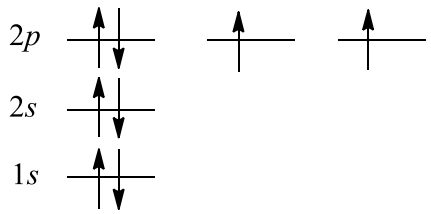
No

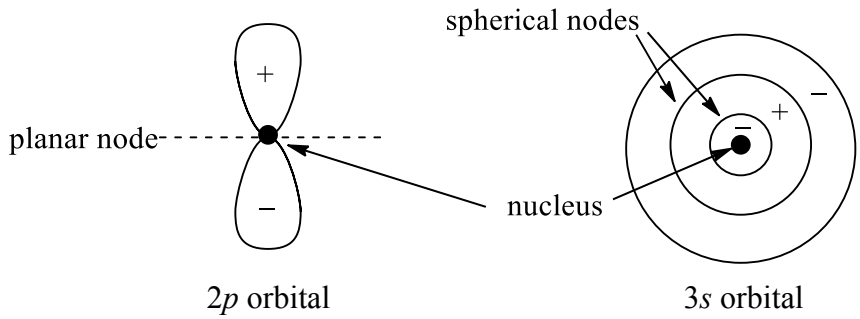
0.012 Pa

300 kJ mol^{-1}

2012-N-4

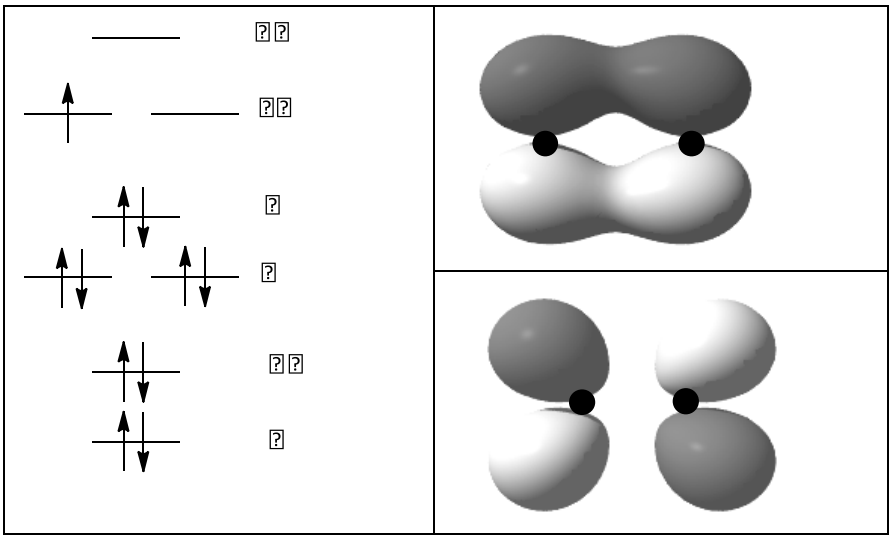
$1s^2\ 2s^2\ 2p^4$





2*p* orbital 3*s* orbital

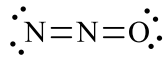
2012-N-5



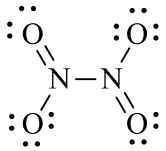
2.5

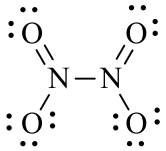
paramagnetic

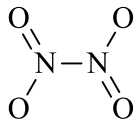
2012-N-6



NNO bond angle of 180°
YES







all angles ~120°
NO

2012-N-7

- As N_2O is only sparingly soluble in water, it follows that any H-bonds from H_2O to N_2O must be quite weak. N_2O can only act as an H-bond acceptor, not as a donor. As nitrogen and oxygen are of similar electronegativity, the N–O bond is not as polarised as the O–H bonds in water. As a consequence, any H-bonds formed between water and N_2O will be weaker than those between 2 water molecules.

2012-N-8

- The proton to neutron ratio slowly increases from 1 (for deuterium) to ~1.5 for bismuth.

  The optimal n:p ration increases as *Z* increases. Splitting a large nucleus in two will almost certainly produce nuclides with similar n:p ratios to the parent, which will now be too high. They will emit negative charge to convert neutrons to protons, bringing about a more satisfactory n:p ratio. *i.e.* they will be β emitters.

  ^{131}I would do more damage. It has the shorter half-life so undergoes more disintegrations and produces more radiation in a given time period.

2012-N-9

- 229.6 kJ
- l75 g

2012-N-10

- 26 casks

  That all the heat that melts the ice and then warms the water comes solely from the casks being cooled. (This clearly won't be the case - the system is exposed to the atmosphere so that people can access the drinks.)

2012-N-11

- $K_p = \dfrac{p^2(NH_3)}{p(N_2)\,p^3(H_2)}$

  5.6×10^5

  to the right (products)

2012-N-12

- Positive: the ice is melting so reaction is endothermic.

  Positive: entropy is increasing as system goes from solid ice to liquid water.

  $\Delta G° = \Delta H° - T\Delta S°$
  As $\Delta S°$ is positive, $\Delta G°$ decreases as T increases. When T exceeds 273 K, the reaction becomes spontaneous, *i.e.* $\Delta G°$ becomes negative.

2012-N-13

- 2.05 mol

2012-N-14

- Oxidation: $2I_3^-(aq) \rightarrow 3I_2(aq) + 2e^-$

  Reduction: $CrO_4^{2-}(aq) + 8H^+ + 3e^- \rightarrow Cr^{3+} + 4H_2O(l)$

  Overall: $2CrO_4^{2-}(aq) + 16H^+ + 6I_3^-(aq) \rightarrow 2Cr^{3+} + 8H_2O(l) + 9I_2(aq)$