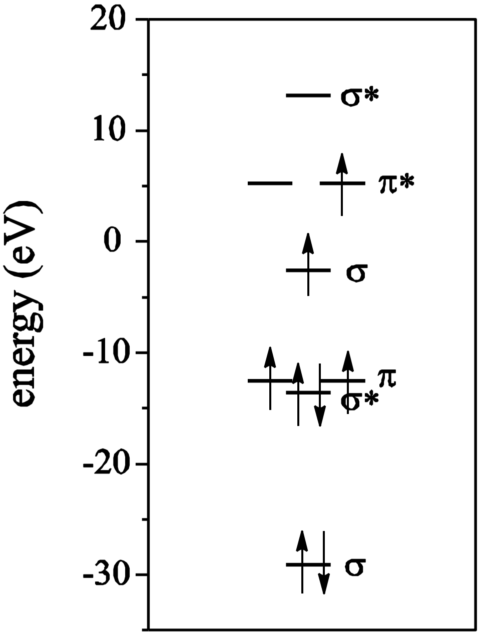
Chemistry 1Adv/1SSP (CHEM1901/1903) June 2012

2012-J-2

- 8



1

Yes. It has 4 unpaired electrons.

2

2012-J-3

- 8.51 eV

4.03 eV

7.18×10^{-19} J

3.21×10^{-10} m

2012-J-4

- 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.

$${}^{1}_{0}\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{141}_{56}\text{Ba} + {}^{92}_{36}\text{Kr} + 3\,{}^{1}_{0}\text{n}$$

$${}^{1}_{0}\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{95}_{38}\text{Sr} + {}^{138}_{54}\text{Xe} + 3\,{}^{1}_{0}\text{n}$$

^{90}Sr: 0.05% ^{137}Cs: 0.1%

2012-J-5

^{90}Sr: 5.09×10^{12} Bq g^{-1} ^{137}Cs: 3.19×10^{12} Bq g^{-1}

6×10^{14} Bq

2012-J-6

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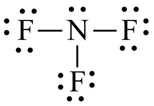
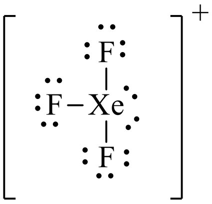
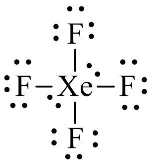
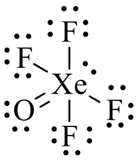
	109°	trigonal pyramidal
	90°, 180°	T-shaped
	90°, 180°	square planar
	90°, 180°	square pyramid

2012-J-7

- –316 kJ mol^{-1}

2012-J-8

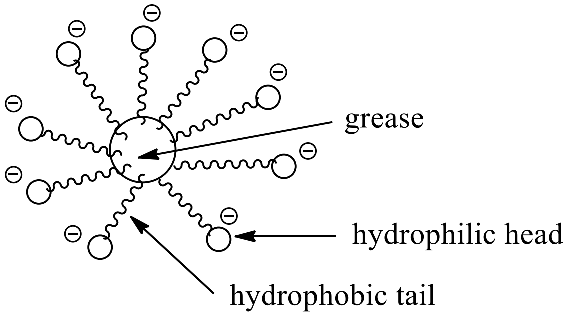
- The decrease in entropy of O_2 going from (g) → (aq) outweighs the increase in entropy of pure water going to water with O_2 dissolved in it.

  The hydration spheres around the dissolved ions (especially the small Mg^{2+} ion) create a denser structure than that of random H_2O molecules in pure water.

  Defects increase enthalpy, but they also increase entropy. So a small number of defects will lower the total free energy (except at $T = 0$ K).

2012-J-9

- Sodium stearate dissolves in water to give stearate ions which act as surfactants. They have non-polar (hydrophobic) "tails" that associate with grease and charged, polar (hydrophilic) "heads" that associate with water. This leads to the formation of stable spherical micelles in which the grease molecules are contained within a monolayer of stearate anions with their heads pointing outwards.



- C–N bonds are covalent. They are relatively short, strong and highly directional.

  Mn–CN coordination bonds are due to the donation of the lone pair of electrons on C to the Mn^{2+}. These bonds are weaker, longer and less directional than covalent bonds.

  $[Mn(CN)_6]^{4-}$ and K^+ are ionically bonded in the solid state due to coulombic attraction between the oppositely charged ions. These bonds are strong but not directional.

2012-J-10

- 2.1 mol
  1.3 mol
  YES

2012-J-11

- $3Pt^{2+}(aq) + 2Rh(s) \rightarrow 3Pt(s) + 2Rh^{3+}(aq)$
  $Rh(s) \mid Rh^{3+}(aq) \parallel Pt^{2+}(aq) \mid Pt(s)$
  Pt
  0.38 V