CHEM 110 Hand-in Sheet 2, 2013

Chapters 5 – 7: Chemical Bonding and Molecular Structure; Gases; Condensed Phases: Liquids and Solids

Please e-submit via the CHEM110 Moodle site or post to T&LC by**:** ***Wednesday 10th April***.

Name: **Student No:**		**Mark:** **(Out of 40)**	

1 Which of N_2 or N_2^+ has the stronger bond? Use molecular orbital diagrams and bond order calculations to justify selection. [6 marks]

2 Identify the hybridization of the bolded atom in each of the following species: (a) $(CH_3)_2\mathbf{N}H$ (b) $\mathbf{S}O_2$ (c) $\mathbf{C}S_2$ [3 mark]

(a)	(b)	(c)

3 Write Lewis structures and predict (a) electron-domain geometry and (b) molecular geometry of the following molecules. Also (c) identify whether each of the molecules are polar or non-polar. [6 marks]

BF_3	PF_3	BrF_3
(a) electron-domain geometry	(a) electron-domain geometry	(a) electron-domain geometry
(b) molecular geometry	(b) molecular geometry	(b) molecular geometry
(c) polar or non-polar?	(c) polar or non-polar?	(c) polar or non-polar?

4 Sodium metal reacts with chlorine gas to form sodium chloride. A closed container of volume 3×10^3 mL contains chlorine gas at 27°C and 1.67×10^5 Pa. Then 6.90 g of solid sodium is introduced, and the reaction comes to completion. What is the final pressure if the temperature rises to 47°C? [6 marks]

5 The concentration of NO_2 in a smoggy atmosphere was measured as 0.78 ppm. The barometric pressure was 1.011×10^5 Pa. Calculate the Partial pressure of NO_2 in Pa. [2 marks]

6 For each of the following pairs of liquids, choose which has the lower vapour pressure at room temperature and explain you reasoning: (a) water, H_2O or methanol, CH_3OH (b) pentan-1-ol, $C_5H_{11}OH$, or hexan-1-ol $C_6H_{14}OH$. [4 marks]

(a)	(b)

7 Silver has an atomic radius of 144 pm. What would the density of silver be in g mL^{-1} if it were to crystallise in: (a) a simple cubic lattice, (b) a body-centred cubic lattice, or (c) a face-centred cubic lattice? The actual density of silver is 10.6 g mL^{-1}. (d) Which cubic lattice does silver have?

(a) [4 marks]

(b) [4 marks]

(c) [4 marks]

(d) [1 mark]