

3) **[4 marks total]** A gas mixture consists of three gases (gas A, gas B, and gas C). The mole fraction of gas A is 0.2. There are three moles of gas B, and the partial pressure of gas C is 10 atm. If the total pressure of the mixture is 20 atm:

a) **[2 marks]** Calculate the mole fractions of gases B and C.

b) **[2 marks]** Calculate the partial pressures of gases A and B. Give your answers in atm.

c) **[3 marks - BONUS]** Calculate the moles of gases A and C.

4) [4 marks] The following apparatus was assembled:

Bulb 1:

Volume: 4 litres

Gas: C₂H₂

Pressure: 2280 torr

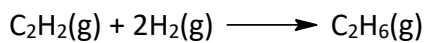
Bulb 2:

Volume: 6 litres

Gas: H₂

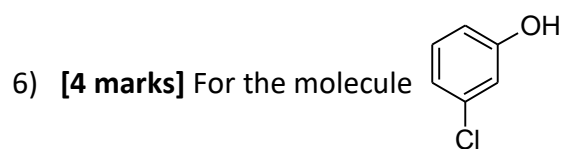
Pressure: 1520 torr

The two bulbs were separated by a valve. When the valve was opened, the following reaction occurred:



Both bulbs were maintained at a temperature of 945.51°C before, during, and after reaction. Calculate the partial pressures of all species *after reaction*.

- 5) **[3 marks]** A gas of formula SCl_n effuses about 30 percent faster than a gas of formula SCl_{n+2} . What is the value of n ?



- a) The number of bonding pairs of electrons is: _____
- b) The number of non-bonding (lone) pairs of electrons is: _____
- c) The number of sigma bonds is: _____
- d) The number of pi bonds is: _____

7) [5 marks] Complete the following table for the OCN^{-1} ion (C the centre atom):

- Include all non-zero formal charges.
- Circle the “best” resonance form.
- Draw only non-equivalent resonance forms.

I'll mark only what you write in the table; you can use the rest of the page for rough work (if you wish).

Resonance Form 1	Resonance Form 2	Resonance Form 3

8) **[4 marks]** The NO molecule tends to dimerize (attach to another NO molecule) while the NO⁺ ion does not. Give a possible explanation for this using Lewis structures.

9) **[2 marks]** The OCF₂ molecule (C the centre atom, other atoms attached only to it) has only one possible Lewis resonance form. Why?

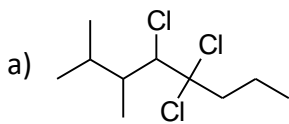
10) [5 marks] Complete the following table for the SO_2F_2 molecule (S the centre atom):

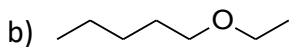
- Include all non-zero formal charges.
- Circle the “best” resonance form.
- Draw only non-equivalent resonance forms.

I'll mark only what you write in the table; you can use the rest of the page for rough work (if you wish).

Resonance Form 1	Resonance Form 2	Resonance Form 3

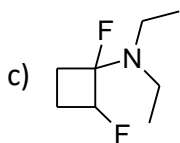
11) [10 marks] Give IUPAC (or other acceptable) names for the following compounds:

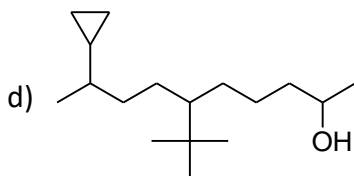




(as an ether)

(NOT as an ether)





12) [3 marks] Use the formula C_3H_9N to draw one example each of a primary, secondary, and tertiary amine. You do not need to name the compounds you draw, and you may use either the shorthand notation (as discussed in class) or draw all atoms.

13) [8 marks] Give structures consistent with the following names:

a) 1,1-diethyl-4-methoxy-2,2-dimethylcyclohexane

b) 2-chloroethyl ethyl ether

c) 4,4-dibromo-5,5-dimethoxyhexan-2-amine

d) 2,2-difluoro-3-pentylcyclopropanol