

Chemistry 1110 R10 Fall 2023 Test 2

Thursday, October 26, 2023

Time: 1 hour 50 minutes

Name: _____

Student #: _____

*This test consists of **nine** pages of questions, a page containing useful constants and conversions, a page containing functional group information, and a periodic table. Please ensure that you have a complete test and, if you do not, obtain one from me **immediately**. There are **76** marks available. Good luck!*

1) **[4 marks]** The following apparatus was assembled:

Flask 1:

Volume: 6 litres

Filled with: C₄H₁₀

At a pressure of: 2000 torr

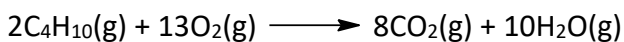
Flask 2:

Volume: 4 litres

Filled with: O₂

At a pressure of: 6500 torr

The two flasks were kept at a temperature of 528.6°C. The flasks were connected to one another by a valve (of no significant volume). When the valve was opened, the reaction



occurred. Calculate the partial pressures of all species after reaction. Give your answers in torr.

- 2) **[4 marks]** Helium effuses 5.0512 times faster than a gas of formula S_nF_m , and 5.8084 times faster than a gas of formula S_nCl_m . What are the formulas of the two gases?

3) [4 marks] For the CN_2^{2-} ion (C the centre atom):

- Draw three resonance forms.
- Assign formal charges to all atoms in each resonance form.
- Circle the "worst" of the resonance forms you've drawn.
- Which of the structures you drew are equivalent resonance forms? Label them as equivalent resonance forms.

Draw your structures in the boxes provided; only structures drawn in those boxes will be marked. (You may use the rest of the page for rough work; it will not be marked.)

Structure 1	Structure 2	Structure 3

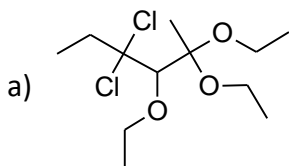
4) **[4 marks]** For the SO_3 molecule (S the centre atom):

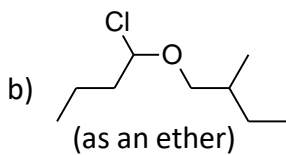
- [2 marks]** Draw three non-equivalent resonance forms. The three forms you draw must include the "best" one.
- [1 mark]** Assign formal charges to all atoms in each of your resonance forms.
- [1 mark]** Circle the "best" resonance form.

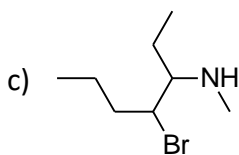
Draw your structures in the boxes provided; only structures drawn in those boxes will be marked. (You may use the rest of the page for rough work; it will not be marked.)

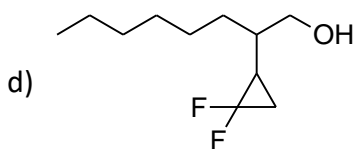
Structure 1	Structure 2	Structure 3

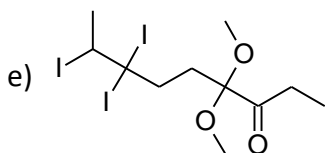
5) [24 marks] Give IUPAC (or other acceptable) names for the following structures.

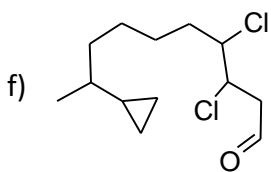


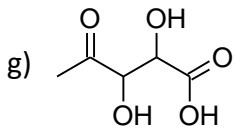


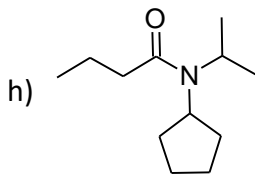


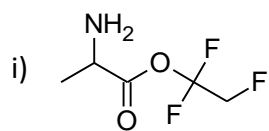


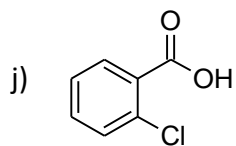


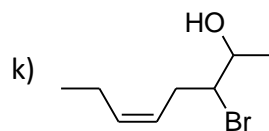


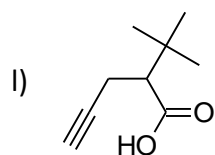












6) [24 marks] Draw structures to correspond with the names given below. For those structures, you may use either the shorthand (as was used in the previous question), or you may draw Lewis-compliant structures showing all atoms and all bonds between atoms (you need not show lone pairs). You may switch between the two styles for different structures.

a) 1,1-dichloro-3,4-dimethoxybutane



b) 1-fluorocyclopropyl 2,2-dimethylcyclobutyl ether



c) 2-bromo-N,N,3-triethylpentan-3-amine



d) 1,1,1,3-tetrafluoro-3,4-dimethylhexan-2-ol



e) 4-tert-butyl-1-iodoheptan-2-one



f) 5-(1-chlorobutoxy)-4-isopropyloctanal



g) 4-hydroxy-5,6-dioxodecanoic acid



h) 2-chloro-N-(chloromethyl)-2-methylbutanamide



i) 1-fluorocyclohexyl 2-cyclopropylpropanoate



j) p-methylphenol



k) 2,3-dichloro-4-methylpent-3-enal



l) 4-amino-5-phenyloct-6-yn-1-ol



7) **[3 marks]** Draw two compounds of formula C_3H_6O that are functional isomers of each other. Name the compounds you draw.

8) **[3 marks]** Draw two compounds of formula $C_4H_{11}N$. One must be a primary amine, and one must be a tertiary amine. Name the compounds you draw, and indicate which is the primary amine, and which is the tertiary amine.

9) **[3 marks]** Draw two compounds of formula C_4H_8 that are geometric isomers of each other. Name the compounds you draw.

10) **[3 marks]** Draw two compounds of formula $C_4H_{10}O$. One must be a secondary alcohol, and one must be a tertiary alcohol. Name the compounds you draw, and indicate which alcohol is secondary and which is tertiary.