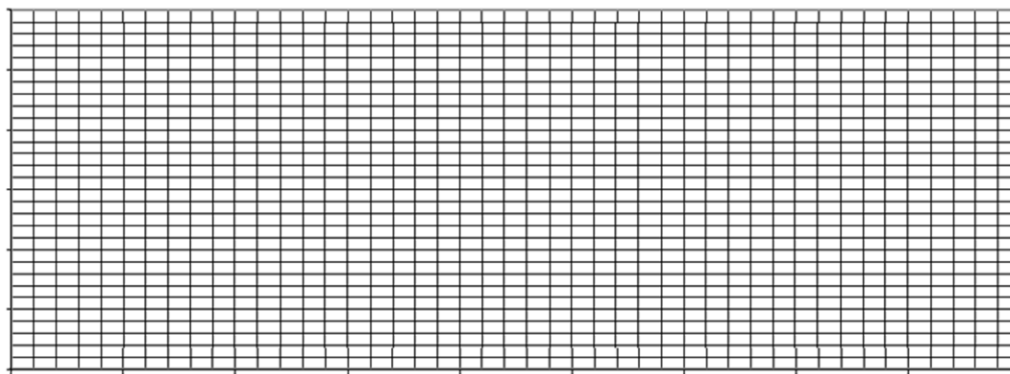**Revision Unit 3 and 4 worksheet 1**

1) A sample of contaminated water was analysed for it's lead content. Using a spectroscopic technique the absorbance of 4 solutions of accurately known lead concentration was measured. The results are shown in the table below.

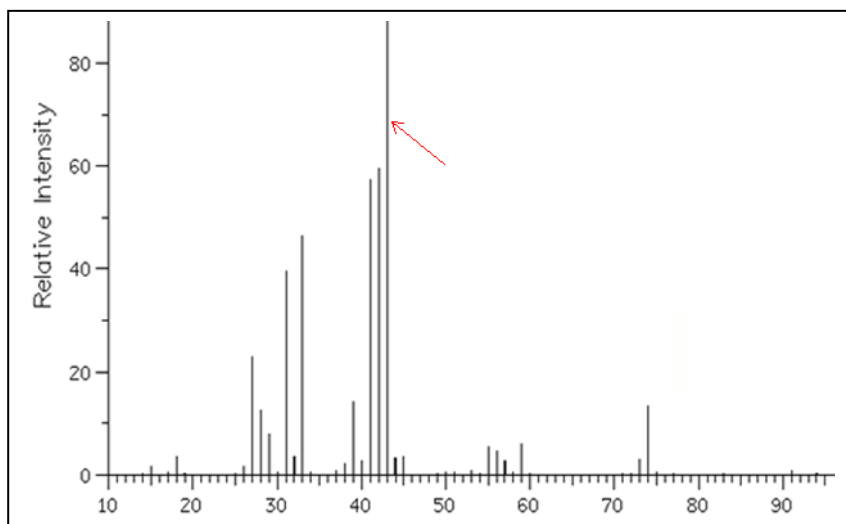| Absorbance	Concentration (g/L)
0.200	0.00125
0.440	0.00383
0.660	0.00618
1.050	0.00860

Determination of unknown lead concentration

a) Draw a calibration curve using the set of axis shown above.

b) What technique is best suited for this analysis? Explain

c) Describe the key components of this technique. What makes this technique so accurate for the analysis of lead concentrations?

d) A 20.0 mL sample of the original water was placed in a 250 mL volumetric flask and made up to the mark with distilled water. A 20.0 ml sample was then taken from the volumetric flask and placed in a clean beaker. A 2.00 mL sample was then taken from the beaker and diluted by the addition of 8.00 mL of water. This 10.0 mL sample was then analysed and found to have an absorbance reading of 0.880 . Find the concentration of the original sample of water in mol/litre.

e) What is the concentration of lead in the sample in ppm?

f) World Health Organisation studies have linked lead concentrations of 50 µg/l with neurological damage.
i.   What is the concentration of 50 µg/l of lead in ppm?

ii.   What volume of pure water, in litres, must be added to 2.00 litres of the original water sample so that the final concentration of lead is 0.005 ppm?

2) An unknown compound "X" was analysed and found to contain 64.9 % C, 21.6% O and 13.5% H by mass. The mass spectrum of this compound is shown on the right. Using the information provided
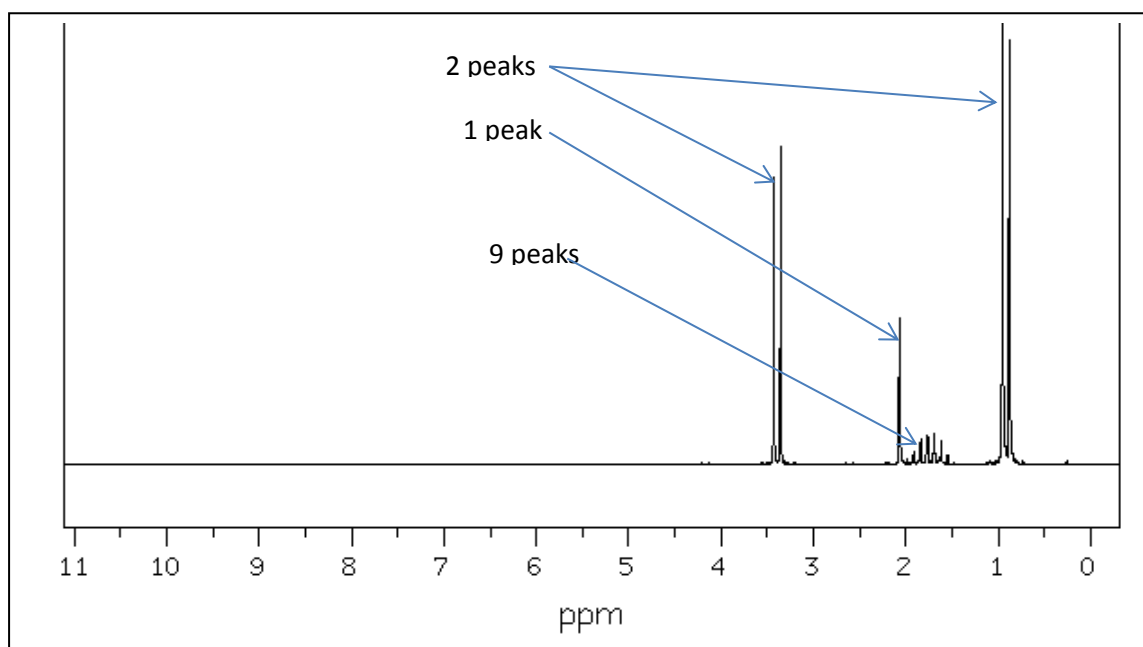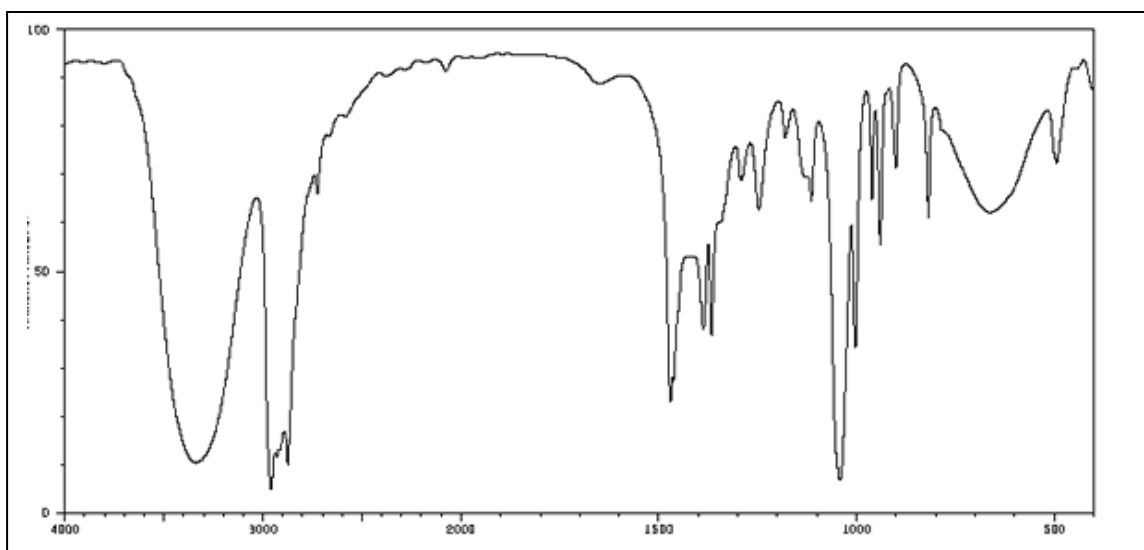
a) Calculate the empirical formula of compound "X"

b) Give the molecular formula of compound "X".

Consider the mass spectrum of compound "X", given above.
i. What are the units of the X-axis

ii. Explain how the peak at 43, on the spectrum, indicated by the arrow was formed.

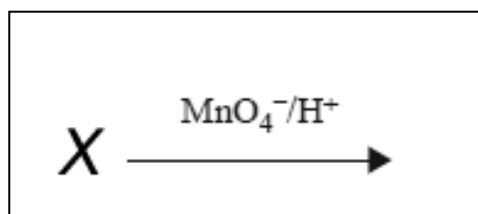Below are the H^1 NMR and IR spectra of compound "X". Interpret the spectrum using the n+1 rule.

i. Identify the compound giving its IUPAC name.

ii. What information about the compound is revealed by the IR spectrum?
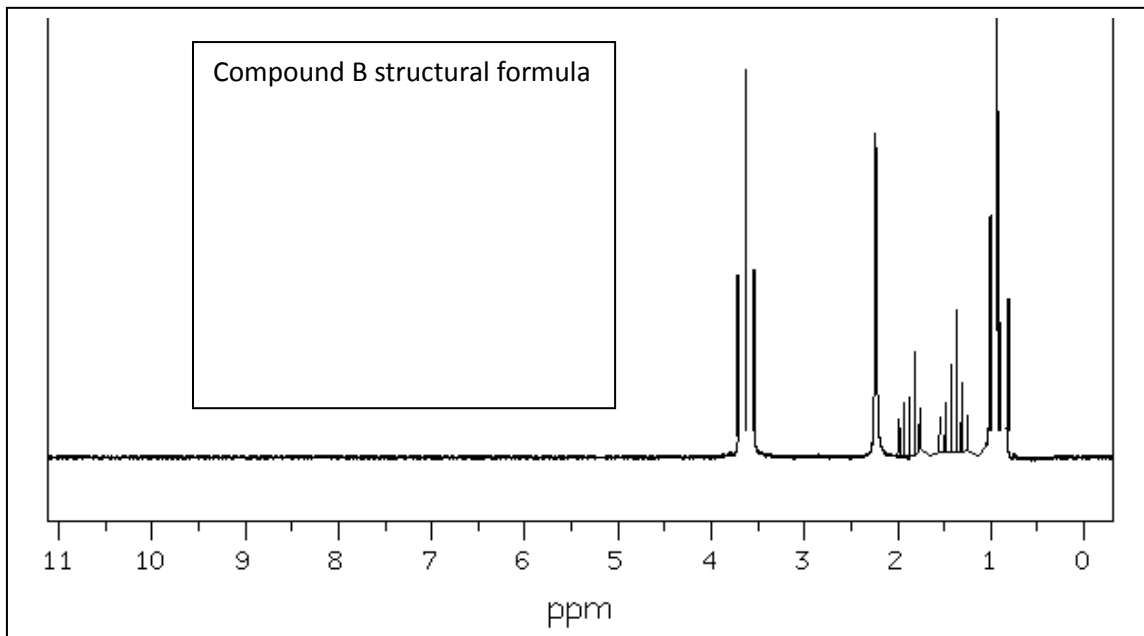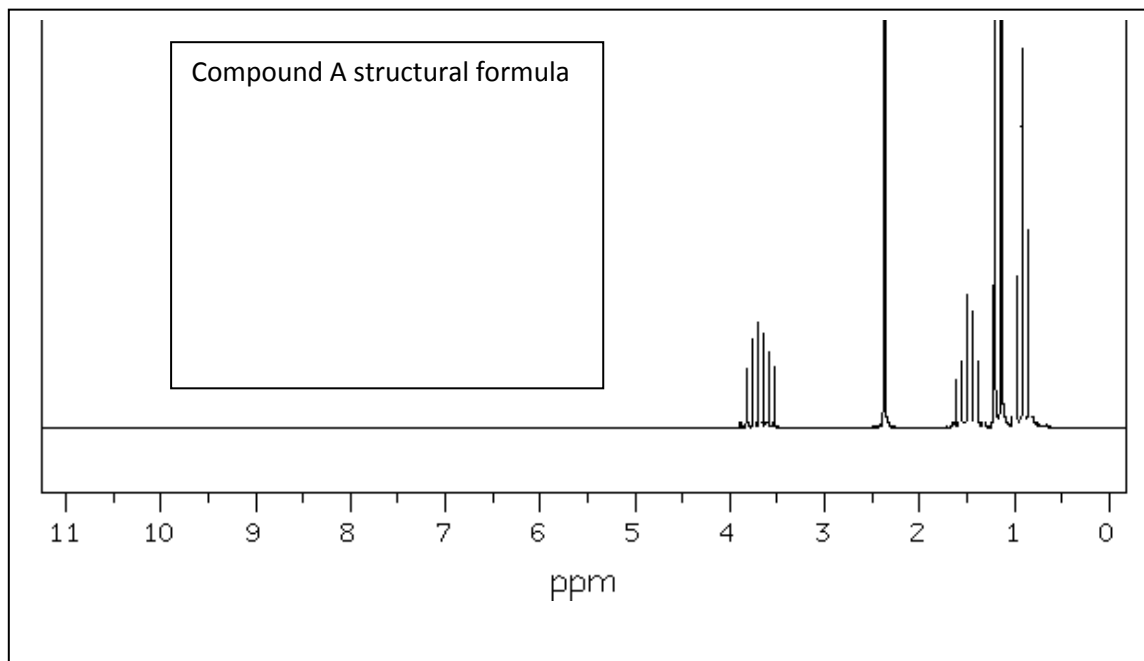
iii. Give the structural formula of the compound

c) What is the IUPAC name of the product of the reaction pictured on the right?

$$X \xrightarrow{MnO_4^-/H^+}$$

d) Below are two compounds with the same molecular formula as the unknown compound above. Give the IUPAC name of each. They are isomers of the compound above and hence have the same molecular formula but different structural formula.

A. _____ _____

B. _____ _____

Compound A structural formula

11   10   9   8   7   6   5   4   3   2   1   0

ppm

Compound B structural formula

11   10   9   8   7   6   5   4   3   2   1   0

ppm

e) There are four isomers with the molecular formula of compound "X". Three are mentioned here, in the question above.
i. What is the IUPAC name of the forth isomer?

ii. Explain how the H^1NMR spectra of compound "B" above and this forth compound differ