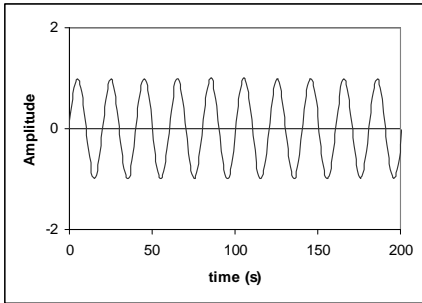
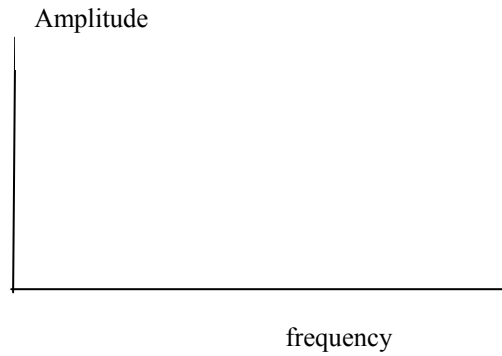


CHEMISTRY 133
Spring, 2015 Homework Set 1.2
Complete for quiz on Feb. 19

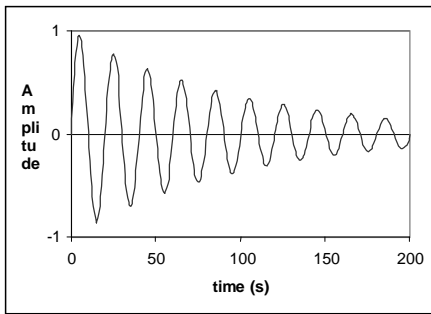
1. Sketch waveforms or Fourier transforms of waveforms
 a) assume infinite waveform



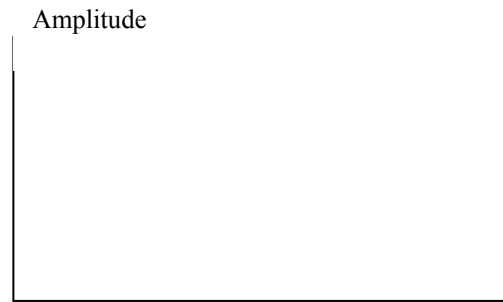
F.T.
→



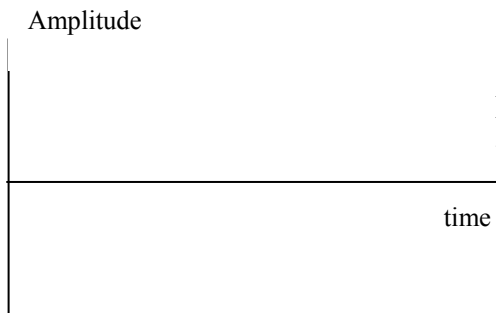
- b)



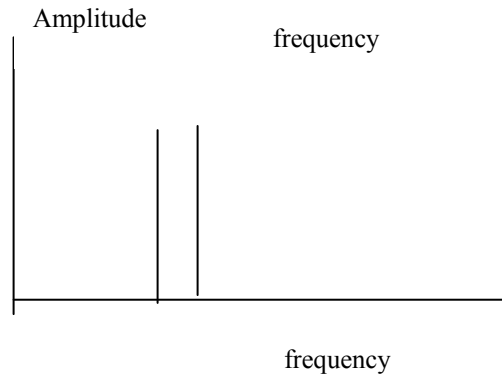
F.T.
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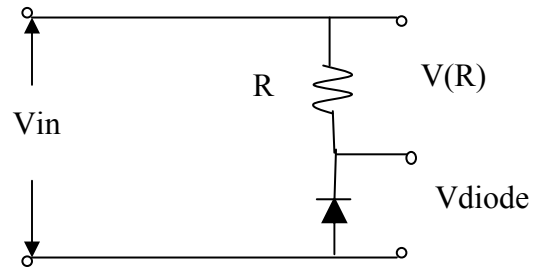
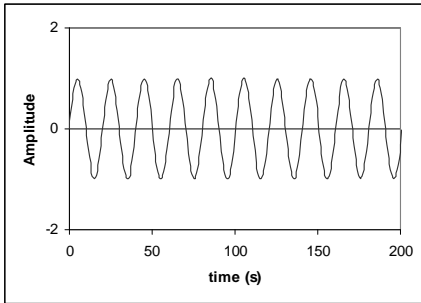
- c)



F.T.
→



2. Sketch V_R and V_{diode} in the circuit to the right when V_{in} looks as follows:
Assume the diode acts ideally.



3. Convert the following numbers between binary and decimal (a and b to decimal, c and d to binary):

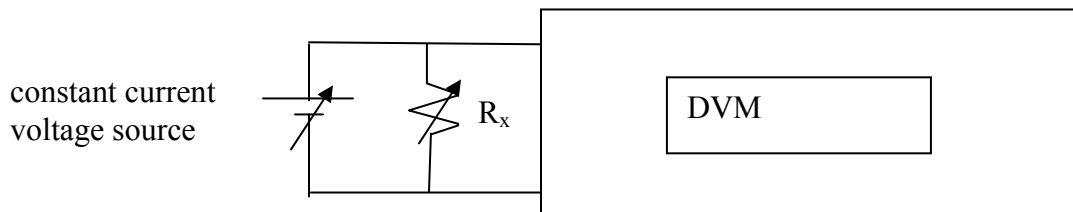
- a) 11011 b) 1001011 c) 13 d) 93

4. A CO monitor with an analog signal of 0.050 V/ppm put is placed in a parking garage. It is desired to be able to record "normal" garage air (concentration ranging between 1 and 10 ppm) as well as to measure high concentration periods when cars drive by (up to 100 ppm). An analog to digital converter with 10 bits with an input range of 0 to 10V is used (0 corresponding to 10 0's and 10 corresponding to 10 1's).

- Calculate the voltage from the monitor and corresponding decimal and binary numbers from the digitizer given a CO concentration of 8.20 ppm.
- What is the maximum CO concentration that can be recorded (without exceeding the A/D board's limit)?
- It is desired to be able to record concentrations as low as 1 ppm with a relative uncertainty of 5% or less. What is the minimum number of bits needed to accomplish this?

5. A voltmeter was used to measure the potential of a cell with an internal resistance of 750Ω. What must be the internal resistance of the meter be if the relative error in the measurement is to be less than -0.10%?

6. The following circuit is used to measure the resistance R_x of a thermistor:



The constant current voltage source puts out a constant current 500.0 μA (over some voltage range). The DVM (digital volt meter) can read voltage between 0 and 2 V with a 10 bit digitizer. The thermistor's resistance is a function of temperature.

- If the binary reading on the DVM is 0011011011, calculate the associated decimal

number.

- b) For the DVM reading in a), determine the voltage of the voltmeter.**
- c) Using the value of V in b), determine R_x .**
- d) What is the smallest change in resistance that can be discerned by the digitizer?**