

## AP WORKSHEET 01B: Mass Spectrometry

1. How many peaks would be observed in the mass spectrum of  $O_2^+$ , given that there are three, commonly occurring isotopes of O with mass numbers of 16, 17 and 18? (2)
2. Bromine has two isotopes,  $Br^{79}$  and  $Br^{81}$ . The isotopes occur in a 50:50 (1:1) ratio. Given that the mass spectrum of bromine contains peaks for both bromine atoms *and* diatomic bromine molecules, predict the number of peaks in the spectrum. What would be the relative height of the atomic peaks? What would be the relative height of the molecular peaks? Assume that  $z = +1$  in each case. (4)
3. A sample of carbon atoms were chemically combined with a sample of oxygen atoms to yield the compound carbon dioxide. The sample of oxygen atoms was artificially manufactured to have a 3:1 ratio of  $O^{16}$  and  $O^{18}$ . Assuming carbon to have only a single isotope  $C^{12}$ , predict the mass spectrum that the resulting sample of carbon dioxide would produce in terms of the number of peaks. Which peak would be the smallest? Explain. Assume the mass spectrum only includes peaks for the compound carbon dioxide and that  $z = +1$  in each case. (4)
4. Neon atoms are known to produce a mass spectrum that consists of three peaks at  $m/z$  values of 20, 21 and 22, with the relative abundance of the peaks found to be in the ratio 112:0.21:11.1. Assuming the  $z$  value of the species causing the peaks to be +1 in each case, calculate the average atomic mass of neon based on these data. (2)