

## Atomic Theory: Assignment I

1. The structure of matter is described in terms of models. Choose two models of the atom and describe the way in which the models are useful. In each case point out the limitations of the model.
2. Describe three key experiments which contributed to the development of the modern theory of the atom. Point out the precise importance of each experiment.
3. Describe the contributions of the following scientists to our knowledge of atomic structure:
  - i) J.J. Thomson
  - ii) R.A. Millikan
  - iii) James Chawick
4. What is meant by the term "fundamental particle"?
5. Compare the properties of the following:  
 $\alpha$  -particle,  $\beta$  -particle,  $\gamma$  -ray, cathode rays, protons, neutrons, electrons
6. Describe briefly how in mass spectrometer....
  - a) the atoms are converted into ions
  - b) the ions of different mass are separated
  - c) the ions are detected
7. Using the atomic emission spectrum of hydrogen...
  - i) Explain why the spectrum is composed of lines rather than being continuous.
  - ii) What does each line indicate?
  - iii) Explain why the lines become progressively closer to each other.
8. The element Q has the electronic configuration  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$ .
  - a) Write down the atomic number of Q.
  - b) Q occurs naturally as a mixture of  $^{69}\text{Q}$  and  $^{71}\text{Q}$ . Explain the significance of the numbers 69 and 71, and say what these two components in the natural element are called.
  - c) If  $^{69}\text{Q}$  and  $^{71}\text{Q}$  occur in the proportions 60% and 40% respectively, calculate the relative atomic mass of Q.