

## **5. SPREADSHEET MODELS**

### **1. Investigating motion using a spreadsheet** (Textbook pgs 141, 161, 433)

Use the spreadsheet [motion.xls](#) to investigate motion in a straight line in air or in a viscous fluid. See p 432-3 for more about spreadsheets. For each spreadsheet, display a graph of displacement v time by highlighting the columns representing displacement and time and using the chart facility of the spreadsheet (eg. 'ChartWizard' ).

**The spreadsheet** offers choices as follows;-

1. For constant acceleration from zero initial speed , key in a value for acceleration  $\alpha$  ( + or - ) and key in  $b = 0$  and  $c = 0$ .
2. For vertical motion due to gravity , key in the value of  $\alpha = - 9.8 \text{ m s}^{-2}$  for the acceleration and  $b = 0$  and  $c = 0$
3. For vertical motion from rest in a viscous fluid , key in the value of  $\alpha = - 9.8 \text{ m s}^{-2}$  for the acceleration, and a value for  $b < 0$  and  $c = 0$

### **2. A model of capacitor discharge using a spreadsheet** (Textbook p216)

Use the spreadsheet [exponential decay.xls](#) (sheet 1) to see how exponential decay occurs when a quantity ( in this case the charge on a capacitor ) decreases such that it goes down by a fixed percentage in equal intervals of time. The linked chart facility can be used to display the decrease of the quantity with time.

### **3. Computer models of radioactive decay** (Textbook p334)

Use the spreadsheet [exponential decay.xls](#) (sheet 2) to see how exponential decay occurs when a quantity ( in this case the number of undecayed nuclei) decreases such that it goes down by a fixed percentage in equal intervals of time. The linked chart facility can be used to display the decrease of the quantity with time.

### **4. Modelling oscillating motion using a spreadsheet** (Textbook p419)

Use the spreadsheet [motion.xls](#) to investigate motion for different types of motion. See p 432-3 for more about spreadsheets. For each spreadsheet, display a graph of displacement v time by highlighting the columns representing displacement and time and using the chart facility of the spreadsheet (eg. 'ChartWizard' ).

**The spreadsheet** offers choices to investigate oscillating motion as follows :-

1. For undamped simple harmonic motion , key in  $\alpha = 0$  ,  $b = 0$  and  $c < 0$  . Note that the time period  $T = 2\pi / c^{1/2}$  as  $c = (2\pi f)^2$  where f is the frequency of the motion.
2. For damped simple harmonic motion , key in as above + a negative value for b.

For all the above choices, the time interval dt must be keyed in. Note that the shorter the time interval, the more exact the results become.