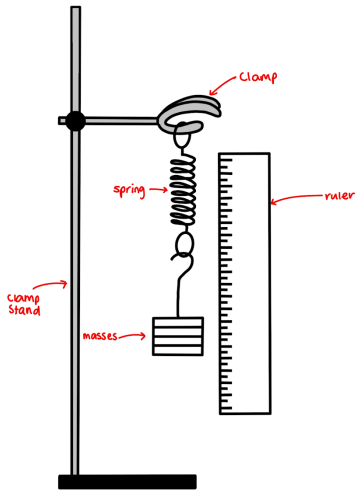
OCR (B) Physics GCSE

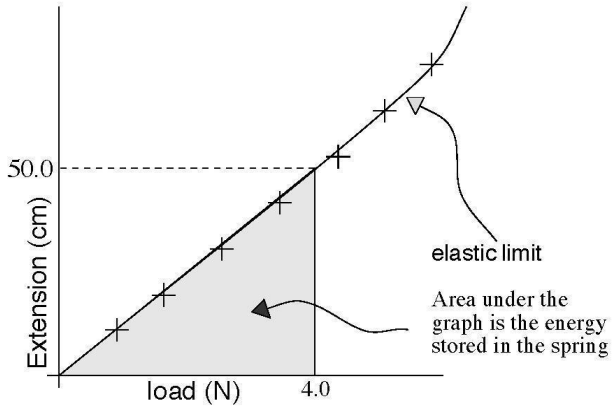
PAG 2: Forces

Investigating the effect of forces on springs

Investigating the relationship between force and extension



1. Set up the apparatus as shown above: attach the spring to the clamp-stand and place a ruler next to it
2. Measure the **original length** of the spring using the **ruler**
3. Successively **add weights** (for example, 1N weights) to the end of the spring
4. Measure the **extension, x**, as the difference between the stretched and original length
5. For each extension **record the force**, F, using **F = mg** where…
    a. mass, m (kg), can be read off the manufacturer's label on the masses
    b. g = gravitational field strength (N/kg) = 9.81 ≈ 10 (on Earth)
6. Take **repeated readings** of extension, **discard any anomalies** and find the **mean** value of x
7. Plot a graph of average **force against extension** and draw a line of best fit
8. Calculate the **gradient** of the straight-line portion of the graph. Then use this to calculate the **spring constant, k,** as k = 1/gradient



Calculating mass

1. For the above apparatus, remove the mass holder and attach the unknown object to the end of the spring
2. Measure the **extension**, x
3. Find the **mass** of the object using the equation:

$$mg = kx$$

4. where k is the **spring constant** (found from f-x graph), and g is the gravitational field strength.