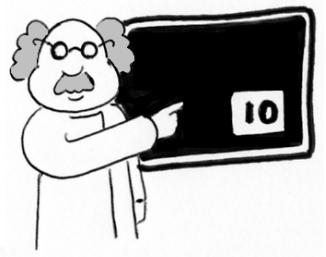


STARTER FOR 10...

0.2.1. Rearranging equations

1. The amount of substance in moles (n) in a solution can be calculated when the concentration given in mol/dm^3 (c) and volume (v) in cm^3 are known by using the equation:

$$n = \frac{cv}{1000}$$

a. Rearrange this equation making c the subject of the equation. (1 mark)

b. Rearrange this equation making v the subject of the equation. (1 mark)

2. The density of a substance can be calculated from its mass (m) and volume (v) using the equation:

$$d = \frac{m}{v}$$

a. Rearrange this equation so that the mass of a substance can be calculated given its density and volume. (1 mark)

Chemists most commonly work with masses expressed in grams and volumes in cm^3. However, the SI unit for density is kg/m^3.

b. Write an expression for the calculation of density in the SI unit of kg/m^3 when the mass (m) of the substance is given in g and the volume (v) of the substance is given in cm^3. (2 marks)

3. The de Broglie relationship relates the wavelength of a moving particle (λ) with its momentum (p) through Planck's constant (h):

$$\lambda = \frac{h}{p}$$

a. Rearrange this equation to make momentum (p) the subject of the formula. (1 mark)

Momentum can be calculated from mass and velocity using the following equation.

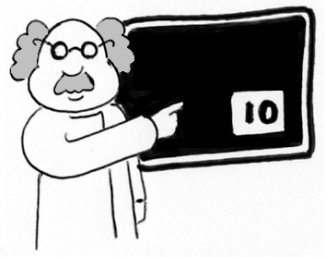
$$p = mv$$

b. Using this equation and the de Broglie relationship, deduce the equation for the velocity of the particle. (2 marks)

4. The kinetic energy (KE) of a particle in a time of flight mass spectrometer can be calculated using the following equation.

$$KE = \frac{1}{2}mv^2$$

Rearrange this equation to make v the subject of the equation. (2 marks)



STARTER FOR 10...

0. TRANSITION SKILLS Answers

0.2 Basic mathematical competencies

0.2.1. Rearranging equations

1.

a. $c = \frac{1000n}{v}$ *(1 mark)*

b. $v = \frac{1000n}{c}$ *(1 mark)*

2.

a. $m = d \times v$ *(1 mark)*

b. $d = \frac{m \times 10^{-3}}{v \times 10^{-6}} = \frac{m}{v \times 10^{-3}}$

1 mark for both parts of the fraction correct, 1 mark for cancelling down the × 10^{-6} to × 10^{-3}. *(2 marks)*

3.

a. $p = \frac{h}{\lambda}$ *(1 mark)*

b. $v = \frac{h}{\lambda m}$

1 mark for substitution of p = mv into the first equation and 1 mark for successful rearrangement.

(2 marks)

4.

$v = \sqrt{\frac{KE}{0.5m}}$ or $v = \sqrt{\frac{2KE}{m}}$

1 mark for first rearrangement moving 0.5 m underneath the KE, 1 mark for dealing with the v^2 by addition of the square root. *(2 marks)*

0.2.2. BODMAS

1. a. 28

b. 40

c. 8

d. 45

e. 6

f. 40