Transition skills - basic mathematical competencies answer sheet

Rearranging equations

1.

a. $c = \frac{100}{v}$

b. $v = \frac{1000n}{c}$

2.

a. $m = d \times v$

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}.

3.

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

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

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

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.

Quantity calculus

1. g cm–3
2. 2.mol dm–3
3. 3.g cm–3
4. 4.mol dm–3 s–1
5. 5.N m–2
6.
    a) mol2 dm–6
    b) mol–1 dm3 s–1
    c) kPa–0.5
    d) mol2 dm–6
    e) mol dm–3

Moles and mass

1. a. $32.0\ g \div 16.0\ g\ mol^{-1} = 2\ mol$
b. $175\ g \div 100.1\ g\ mol^{-1} = 1.75\ mol$
c. $0.2\ g \div 180.0\ g\ mol^{-1} = 0.0011\ mol$

2. a $20\ mol \times 180\ g\ mol^{-1} = 3\ 600\ g$
b $5.00 \times 10^{-3}\ mol \times 63.5\ g\ mol^{-1} = 0.318\ g$
c $42.0\ mol \times 249.6\ g\ mol^{-1} = 10\ 500\ g$

3. a. i. $3.09\ g \div 0.0250\ mol = 123.6\ g\ mol^{-1}$
ii. $CuCO_3$
b. molar mass of chromium carbonate = $4.26\ g \div 0.015\ mol = 284\ g\ mol^{-1}$
$Cr_2(CO_3)$

BONUS QUESTION

6.02×10^{23} p ÷ 7 500 000 000 people = 8.03×10^{13} p per person or 803 000 million pounds per person!

Moles and concentration

1. a. $1.5\ mol \div 0.25\ dm^3 = 6.0\ mol\ dm^{-3}$
b. $0.25\ dm^3 \times 0.0150\ mol\ dm^{-3} = 3.75 \times 10^{-3}\ mol$
c. $0.125\ mol \div 0.85\ mol\ dm^{-3} = 0.15\ dm^3$

2. a. $5.0\ g \div 84.0\ g\ mol^{-1} =$ <u>0.0595 mol</u>
$0.0595\ mol \div 0.100\ dm^3 =$ <u>$0.60\ mol\ dm^{-3}$</u>
b. $0.025\ dm^3 \times 3.8\ mol\ dm^{-3} =$ <u>0.095 mol</u>
$0.095\ mol \times 40.0\ g\ mol^{-1} =$ <u>3.8 g</u>
c. $2.5\ g \div 129.9\ g\ mol^{-1} =$ <u>0.0192 mol</u>
$0.0192\ mol \div 1.3\ mol\ dm^{-3} =$ <u>$0.015\ dm^3$</u>
$0148\ dm^3 =$ <u>$15\ cm^3$</u> (to 2 sig. fig.)