Name: _____
HR: _____
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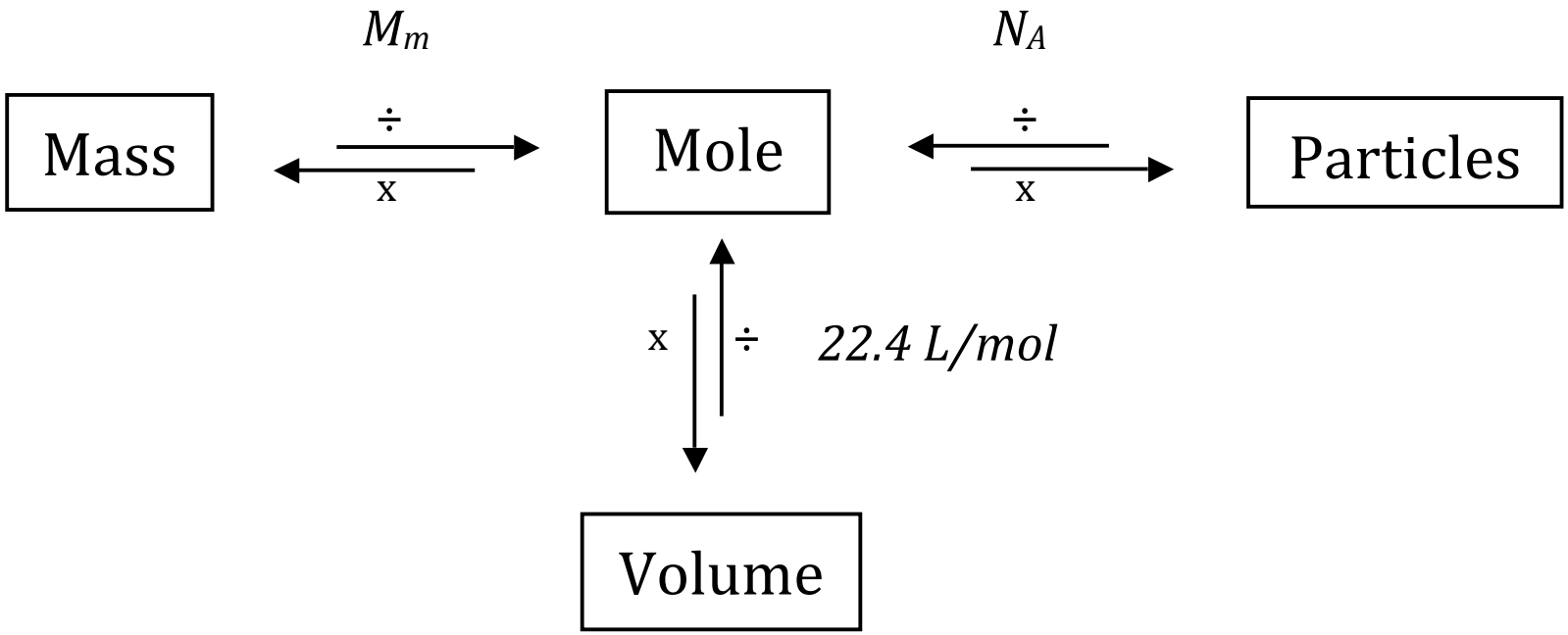
DP Physics

Converting Moles



N_A = Avogadro's Constant = 6.02×10^{23}
M_m = Molar mass of the element; unique to each element

Sample Problems

1) May '07, Standard Level, Paper 2, Timezone 1, Question B3

(b) (i) The density of copper is $8.93\times10^{3}\,\text{kg}\,\text{m}^{-3}$ and its molar mass is 64 g. Deduce that the number of moles of copper in a volume of $1.0\,\text{m}^{3}$ is 1.4×10^{5}. *[2]*

(ii) Estimate the number of conduction electrons in $1.0\,\text{m}^{3}$ of copper.

2) May '03, Standard Level, Paper 2, Question A3

(b) The internal volume of a gas cylinder is $2.0\times10^{-2}\,\text{m}^{3}$. An ideal gas is pumped into the cylinder until the pressure becomes 20 MPa at a temperature of 17 °C.

Determine

(i) the number of moles of gas in the cylinder. *[2]*

(ii) the number of gas atoms in the cylinder. *[2]*

(b) (i) the mass of $1.0\,m^3$ is $8.93\ \ 10^3$ kg;

and therefore number of moles is $\frac{8.93\ \ 10^6}{64}$;

$1.4\ \ 10^5$ mol (*no marks for answer*) *[2]*

(ii) $1.4\ \ 10^5\ \ 6.02\ \ 10^{23}\ \ 8.4\ \ 10^{28}$; *[1]*

(b) (i) $pV = nRT$

$20\times10^6\times2\times10^{-2} = n\times8.3\times290$;

$n = 170$ (166); ***[2]***

(ii) number $= n\times N_A$;

number $= 166\times6.02\times10^{23} = 1.0\times10^{26}$; ***[2]***