15. Ideal Gases

15.1 The mole

Paper 4

Marking Scheme

Q1.

(a)(i)	number of particles per unit amount of substance	**B1**

Q2.

(c)	*Any three bulleted points from:* • both gases are ideal *Up to 2 points from:* • mass of one molecule of gas X is 3.3×10^{-27} kg • mass of one molecule of gas Y is 6.6×10^{-27} kg • mass of one molecule of gas Y is double mass of one molecule of gas X *Up to 2 points from:* • sample of X contains 0.27 mol / 1.6×10^{23} molecules • sample of Y contains 0.81 mol / 4.9×10^{23} molecules • sample of Y contains treble the amount of gas / number of molecules as sample of X *Up to 2 points from:* • mass of gas X is 5.4×10^{-4} kg • mass of gas Y is 3.2×10^{-3} kg • mass of gas Y is six times mass of gas X	**B3**

Q3.

(b)(ii)	mass $= 0.0424 / (1.27 \times 10^{25})$ $= 3.34 \times 10^{-27}$ kg	**A1**

Q4.

(b)(ii)	**1.** $pV = nRT$ **and** $T = (22 + 273)$ K	**C1**
	$n = (2.12 \times 10^{7} \times 1.84 \times 10^{-2}) / (8.31 \times 295)$ $= 159$ mol	**A1**
	2. mass $= 3.20 / (159 \times 6.02 \times 10^{23})$ **or** mass $= [2 \times (3/2) \times 1.38 \times 10^{-23} \times 295] / 605^{2}$	**C1**
	mass $= 3.34 \times 10^{-26}$ kg	**A1**
(c)	$A = (3.34 \times 10^{-26}) / (1.66 \times 10^{-27})$ $= 20$	**A1**