HL Paper 1

At which temperature, in K, assuming constant pressure, is the volume of a fixed mass of gas at 127 °C doubled?

A. 200 K

B. 254 K

C. 400 K

D. 800 K

$300\ \mathrm{cm}^3$ of water is added to a solution of $200\ \mathrm{cm}^3$ of $0.5\ \mathrm{mol\,dm}^{-3}$ sodium chloride. What is the concentration of sodium chloride in the new solution?

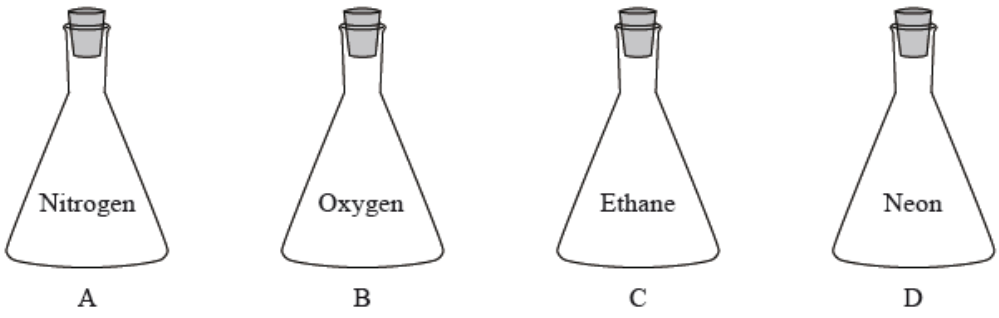
A. $0.05\ \mathrm{mol\,dm}^{-3}$

B. $0.1\ \mathrm{mol\,dm}^{-3}$

C. $0.2\ \mathrm{mol\,dm}^{-3}$

D. $0.3\ \mathrm{mol\,dm}^{-3}$

Four identical containers under the same conditions are filled with gases as shown below. Which container and contents will have the highest mass?



What is the pressure, in Pa, inside a 1.0 m^3 cylinder containing 10 kg of H_2 (g) at 25 °C?

R = 8.31 J K^{-1} mol^{-1}; $pV = nRT$

A. $\frac{1\times10^4\times8.31\times25}{1.0\times10^3}$

B. $\frac{5\times10^2\times8.31\times298}{1.0}$

C. $\frac{1\times8.31\times25}{1.0\times10^3}$

D. $\frac{5\times10^3\times8.31\times298}{1.0}$

A compound with M_r = 102 contains 58.8 % carbon, 9.80 % hydrogen and 31 % oxygen by mass.

What is its molecular formula?

A_r: C = 12.0; H = 1.0; O = 16.0

A. $C_2H_{14}O_4$

B. $C_3H_4O_4$

C. $C_5H_{10}O_2$

D. $C_6H_{14}O$

Which solution neutralizes 50.0 cm^3 of 0.120 mol dm^{-3} NaOH (aq)?

A. 12.5 cm^3 of 0.080 mol dm^{-3} H_3PO_4

B. 25.0 cm^3 of 0.120 mol dm^{-3} CH_3COOH

C. 25.0 cm^3 of 0.120 mol dm^{-3} H_2SO_4

D. 50.0 cm^3 of 0.060 mol dm^{-3} HNO_3

What mass, in g, of hydrogen is formed when 3 mol of aluminium react with excess hydrochloric acid according to the following equation?

$$2Al(s) + 6HCl(aq) \rightarrow 2AlCl_3(aq) + 3H_2(g)$$

A. 3.0

B. 4.5

C. 6.0

D. 9.0

Which coefficients would balance this equation?

$$\_\_\ MnO_2 + \_\_\ HCl \rightarrow \_\_\ MnCl_2 + \_\_\ Cl_2 + \_\_\ H_2O$$

	MnO_2	HCl	$MnCl_2$	Cl_2	H_2O
A.	1	2	1	1	1
B.	1	3	1	1	1
C.	1	4	1	1	2
D.	1	4	1	2	2

4.0 g of solid sodium hydroxide is added to $0.10\ \mathrm{dm^3}$ of $1.0\ \mathrm{mol\ dm^{-3}}$ aqueous sulfuric acid.

$$2\mathrm{NaOH(s)} + \mathrm{H_2SO_4(aq)} \rightarrow \mathrm{Na_2SO_4(aq)} + 2\mathrm{H_2O(l)}$$

Which statement is correct?

A. Neither reactant is in excess.

B. 0.10 mol $\mathrm{Na_2SO_4}$ is formed.

C. Excess $\mathrm{H_2SO_4}$ remains in solution.

D. Excess NaOH remains in solution.

What are the coefficients of $\mathrm{H_2SO_4(aq)}$ and $\mathrm{H_3PO_4(aq)}$ when the following equation is balanced using the smallest possible whole numbers?

$$\_\_\ \mathrm{Ca_3(PO_4)_2(s)} + \_\_\ \mathrm{H_2SO_4(aq)} \rightarrow \_\_\ \mathrm{CaSO_3(s)} + \_\_\ \mathrm{H_3PO_4(aq)}$$

	Coefficient of $\mathrm{H_2SO_4(aq)}$	Coefficient of $\mathrm{H_3PO_4(aq)}$
A.	1	2
B.	2	3
C.	3	1
D.	3	2

What volume of carbon dioxide, in $\mathrm{dm^3}$ under standard conditions, is formed when 7.00 g of ethene $(\mathrm{C_2H_4},\ M_\mathrm{r} = 28.1)$ undergoes complete combustion?

A. $\frac{22.4 \times 28.1}{7.00}$

B. $\frac{22.4 \times 7.00}{28.1}$

C. $\frac{2 \times 22.4 \times 28.1}{7.00}$

D. $\frac{2 \times 22.4 \times 7.00}{28.1}$

Under which conditions does $\mathrm{CH_4}$ have the same number of molecules as $100\ \mathrm{cm^3}$ of $\mathrm{O_2}$ at 27 °C and $1.0 \times 10^5\ \mathrm{Pa}$?

	Volume / cm^3	Temperature / °C	Pressure / 10^5 Pa
A.	50	54	1.0
B.	50	327	1.0
C.	100	54	2.0
D.	100	327	2.0

7.102 g of **Na_2SO_4 (*M* = 142.04 g mol^{-1})** is dissolved in water to prepare $0.5000\ \mathrm{dm^3}$ of solution. What is the concentration of $\mathrm{Na_2SO_4}$ in $\mathrm{mol\,dm^{-3}}$?

A. 2.500×10^{-2}

B. 1.000×10^{-1}

C. 1.000×10

D. 1.000×10^{2}

Which expression gives the sum of all the coefficients for the general equation for the complete combustion of hydrocarbons?

$$\_\_\ \mathrm{C}_x\mathrm{H}_y(\mathrm{g}) + \_\_\ \mathrm{O_2(g)} \rightarrow \_\_\ \mathrm{CO_2(g)} + \_\_\ \mathrm{H_2O(l)}$$

A. $1 + x + \frac{y}{4}$

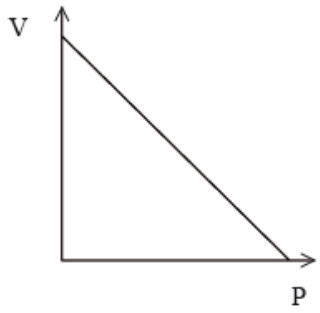
B. $1 + x + \frac{y}{2}$

C. $1 + 2x + \frac{3y}{4}$

D. $1 + 2x + \frac{3y}{2}$

Which graph represents the relationship between volume and pressure for a fixed mass of gas at constant temperature?

A.



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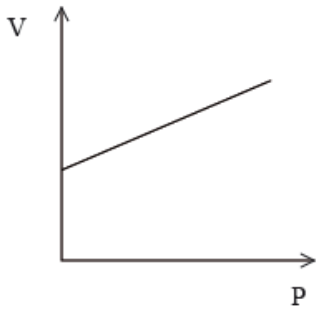

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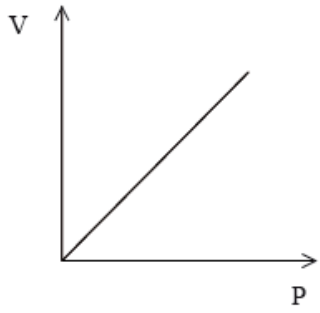

D.