

FORMULA OF COMPOUNDS AND IONS

1 Give the formula of a compound that contains

(i) only boron and oxygen, [1]

(ii) only lithium and nitrogen. [1]

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MARKING SCHEME:

(i)	B_2O_3 ;	1
(ii)	Li_3N ;	1

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2 Give the formula of
gallium(III) chloride,

gallium(III) sulfate.

[2]

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MARKING SCHEME:

GaCl ₃ ; Ga ₂ (SO ₄) ₃ ;	1 1	2
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3

(a) Hydrocarbons are compounds which contain hydrogen and carbon only.

- 10 cm³ of a gaseous hydrocarbon, C_xH_y, are burned in 100 cm³ of oxygen, which is an excess of oxygen.
- After cooling to room temperature and pressure, there is 25 cm³ of unreacted oxygen, 50 cm³ of carbon dioxide and some liquid water.

All volumes are measured under the same conditions of temperature and pressure.

(i) What is meant by an excess of oxygen?

..... [1]

(ii) What was the volume of oxygen that reacted with the hydrocarbon?

..... [1]

(iii) Complete the table below to express the smallest whole number ratio of

volume of hydrocarbon reacted : volume of oxygen reacted : volume of carbon dioxide produced

	volume of hydrocarbon reacted	volume of oxygen reacted	volume of carbon dioxide produced
smallest whole number ratio of volumes			

[1]

(iv) Use your answer to (a)(iii) to find the mole ratio in the equation below. Complete the equation and deduce the formula of the hydrocarbon.



formula of hydrocarbon = [2]

MARKING SCHEME:

(a)(i)	more than enough to react (with all the hydrocarbon); OR (some) oxygen remaining;	1
(a)(ii)	75 cm ³ ;	1
(a)(iii)	2 : 15 : 10;	1
(a)(iv)	2 : 15 : 10 : 10; C ₅ H ₁₀ ;	2 1 1

4 (a) (i) Write the formula of the compound formed from fluorine and magnesium.

..... [1]

(ii) Write the formula of the compound formed from Sr^{2+} and P^{3-} .

..... [1]

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MARKING SCHEME:

(a)	MgF ₂	1
	Sr ₃ P ₂	1

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- 5** (a) Magnesium sulfate crystals are hydrated. Another student heated some hydrated magnesium sulfate crystals in a crucible and obtained the following results.

mass of hydrated magnesium sulfate crystals = 4.92 g

mass of water removed = 2.52 g

- (i) Calculate the number of moles of water removed.

moles of water = mol [1]

- (ii) Calculate the number of moles of anhydrous magnesium sulfate remaining in the crucible. The M_r of anhydrous magnesium sulfate is 120.

moles of anhydrous magnesium sulfate = mol [1]

- (iii) Calculate the ratio of moles of anhydrous magnesium sulfate : moles of water. Give your answer as whole numbers.

ratio = : [1]

- (iv) Suggest the formula of hydrated magnesium sulfate crystals.

formula of hydrated magnesium sulfate crystals = [2]

MARKING SCHEME:

(i)	moles of water = $2.52 / 18 = 0.14$ (mol)	1
(ii)	moles of anhydrous magnesium sulfate = 0.02 (mol)	1
(iii)	ratio = $0.02 / 0.02 : 0.14 / 0.02 = 1 : 7$	1
(iv)	MgSO ₄ ·7H ₂ O M1 MgSO ₄ M2 rest of the formula correct	2