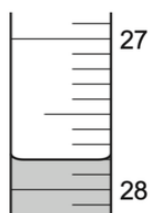
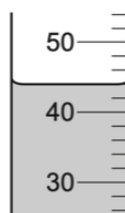


Calculation

1. The diagrams show liquids in a burette and a measuring cylinder.



burette



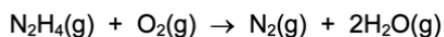
measuring cylinder

Which row shows the correct readings for the burette and the measuring cylinder?

	burette	measuring cylinder
A	27.8	42
B	27.8	44
C	28.2	42
D	28.2	44

2. The gas hydrazine has the molecular formula N_2H_4 .

Hydrazine burns in air to form nitrogen gas and steam.



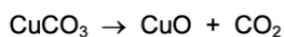
Which statements are correct?

- 1 1 mole of hydrazine gives 72 dm^3 of gaseous products when it reacts with oxygen at room temperature and pressure.
- 2 The empirical formula of hydrazine is NH_2 .
- 3 The total number of atoms in 1 mole of hydrazine is $6 \times$ the Avogadro constant.
- 4 The volume of 1 mole of hydrazine at room temperature and pressure is $6 \times 24 \text{ dm}^3$.

A 1, 2 and 3 **B** 1 and 2 only **C** 2, 3 and 4 **D** 3 and 4 only

3. Copper(II) carbonate is broken down by heating to form copper(II) oxide and carbon dioxide gas.

The equation for the reaction is shown.



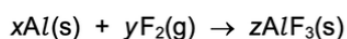
31.0g of copper(II) carbonate are heated until all of the contents of the test-tube have turned from green to black.

The yield of copper(II) oxide formed is 17.5g.

What is the percentage yield?

A 19.02% **B** 21.88% **C** 56.50% **D** 87.50%

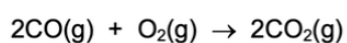
4. Aluminium reacts with fluorine.



Which values of x, y and z balance the equation?

	x	y	z
A	1	2	1
B	2	3	2
C	3	2	3
D	4	3	4

5. Carbon monoxide burns in oxygen to produce carbon dioxide.



Which mass of carbon dioxide is produced from 14 g of carbon monoxide?

- A** 22 g **B** 28 g **C** 44 g **D** 88 g

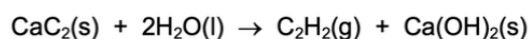
6. Which equations are balanced?

- 1 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
- 2 $ZnCO_3 + 2HCl \rightarrow ZnCl_2 + CO_2 + 2H_2O$
- 3 $Mg(NO_3)_2 + NaOH \rightarrow Mg(OH)_2 + 2NaNO_3$
- 4 $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$

- A** 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

7. Calcium carbide, CaC_2 , reacts with water to form ethyne, C_2H_2 , and calcium hydroxide.

The equation for the reaction is shown.



Which volume of ethyne is produced when 6 g of water react completely with calcium carbide?

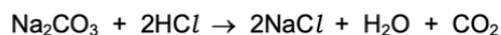
- A** 4 dm³ **B** 8 dm³ **C** 36 dm³ **D** 72 dm³

8. Aqueous iron(III) sulfate and aqueous sodium hydroxide react to give a precipitate of iron(III) hydroxide and a solution of sodium sulfate.

What is the balanced equation for this reaction?

- A** $Fe_2(SO_4)_3(aq) + 2NaOH(aq) \rightarrow Fe(OH)_3(s) + Na_2SO_4(aq)$
B $Fe_2(SO_4)_3(aq) + 3NaOH(aq) \rightarrow Fe(OH)_3(s) + 3Na_2SO_4(aq)$
C $Fe_2(SO_4)_3(aq) + 6NaOH(aq) \rightarrow 2Fe(OH)_3(s) + 3Na_2SO_4(aq)$
D $2Fe_2(SO_4)_3(aq) + 6NaOH(aq) \rightarrow 4Fe(OH)_3(s) + 6Na_2SO_4(aq)$

9. The equation for the reaction between sodium carbonate and dilute hydrochloric acid is shown.



What is the maximum volume of carbon dioxide produced when 26.5 g of sodium carbonate react with dilute hydrochloric acid?

- A** 6 dm³ **B** 12 dm³ **C** 18 dm³ **D** 24 dm³

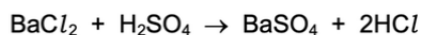
10. A student put 25.0 cm³ of dilute hydrochloric acid into a conical flask.

The student added 2.5 g of solid sodium carbonate and measured the change in temperature of the mixture.

Which apparatus does the student need to use to obtain the most accurate results?

- A** balance, measuring cylinder, thermometer
B balance, pipette, stopwatch
C balance, pipette, thermometer
D burette, pipette, thermometer

11. The equation for the reaction between barium chloride solution and dilute sulfuric acid is shown.



Which row shows the state symbols for this equation?

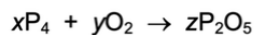
	BaCl ₂	H ₂ SO ₄	BaSO ₄	2HCl
A	(aq)	(aq)	(s)	(aq)
B	(aq)	(l)	(s)	(aq)
C	(l)	(aq)	(s)	(l)
D	(aq)	(l)	(aq)	(l)

12. A compound is analysed and found to contain 85.7% carbon and 14.3% hydrogen.

What is its empirical formula?

- A** CH **B** CH₂ **C** C₂H₄ **D** C₆H

13. The equation for the reaction between phosphorus and oxygen is shown.



Which values of x, y and z balance the equation?

	x	y	z
A	1	5	2
B	1	10	2
C	2	5	2
D	2	10	1

14. The relative molecular mass of an alcohol is 88.

Its percentage composition by mass is: C, 54.5%; H, 9.1%; O, 36.4%.

Which row shows the empirical formula and molecular formula for this alcohol?

	empirical formula	molecular formula
A	C ₂ H ₄ O	C ₂ H ₄ O
B	C ₂ H ₄ O	C ₄ H ₈ O ₂
C	C ₄ H ₈ O ₂	C ₄ H ₈ O ₂
D	C ₄ H ₈ O ₂	C ₂ H ₄ O

15. A compound contains 34.5% calcium, 24.1% silicon and 41.4% oxygen by mass.

What is its empirical formula?

A Ca₂SiO₃ **B** CaSiO₃ **C** CaSi₂O₃ **D** CaSiO₆

16. Which quantities of chemicals will react exactly with no reactants left over?

- A** 12 g of carbon and 12 g of oxygen
- B** 12 g of carbon and 48 g of oxygen
- C** 12 g of magnesium and 16 g of oxygen
- D** 24 g of magnesium and 16 g of oxygen

17. A compound, X, contains 40.0% carbon, 6.7% hydrogen and 53.3% oxygen by mass.

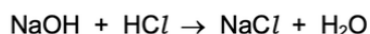
The relative molecular mass, M_r , of X is 60.

What is the molecular formula of X?

A CH₂O **B** CH₄O **C** C₂H₄O **D** C₂H₄O₂

18. 25 cm³ of 0.1 mol/dm³ hydrochloric acid exactly neutralise 20 cm³ of aqueous sodium hydroxide.

The equation for this reaction is:



What is the concentration of the sodium hydroxide solution?

- A** 0.080 mol/dm³
- B** 0.800 mol/dm³
- C** 0.125 mol/dm³
- D** 1.25 mol/dm³

19. A sample of 16.0 g of a metal oxide, MO, is reduced to 12.8 g of the metal, M.

What is the relative atomic mass, A_r , of M?

A 32 **B** 64 **C** 80 **D** 128

20. The equation for the reaction between calcium carbonate and hydrochloric acid is shown.



How many moles of calcium carbonate will give 24 cm^3 of carbon dioxide when reacted with an excess of the acid?

- A 1 mol B 0.1 mol C 0.01 mol D 0.001 mol

21. Analysis of a compound formed between magnesium and nitrogen showed it contained 14.4 g of magnesium and 5.6 g of nitrogen.

What is the empirical formula of the compound?

- A Mg_2N_3 B Mg_3N_2 C Mg_4N_6 D Mg_6N_4

22. An excess of zinc is added to 100 cm^3 of 1.0 mol/dm^3 hydrochloric acid.

The equation for the reaction is:



What is the maximum volume of hydrogen evolved at room temperature and pressure?

- A 1.2 dm^3 B 2.0 dm^3 C 2.4 dm^3 D 24 dm^3

23. Benzene is a liquid with molecular formula C_6H_6 .

Ethene is a gas with molecular formula C_2H_4 .

Which statement is correct?

- A 1 mole of benzene and 1 mole of ethene contain the same number of atoms.
B 1 mole of benzene and 1 mole of ethene both have a volume of 24 dm^3 at room temperature and pressure.
C Both benzene and ethene have the same empirical formula.
D The number of carbon atoms in 0.5 moles of ethene is equal to the Avogadro constant.

24. Sodium hydrogencarbonate undergoes thermal decomposition as shown.



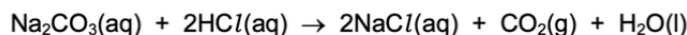
What is the maximum mass of sodium carbonate that can be made from 0.100 moles of sodium hydrogencarbonate?

- A 4.15 g B 5.30 g C 10.6 g D 21.2 g

25. Which sample contains the greatest number of molecules?

- A 4 g of hydrogen
B 18 g of water
C 24 dm^3 of oxygen
D 66 g of carbon dioxide

26. Sodium carbonate solution reacts with dilute hydrochloric acid. The equation for the reaction is shown.

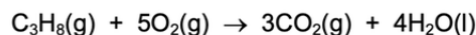


Excess sodium carbonate is added to 10.0 cm³ of 0.10 mol/dm³ hydrochloric acid.

Which volume of carbon dioxide gas is made?

- A 12 cm³ B 24 cm³ C 12 000 cm³ D 24 000 cm³

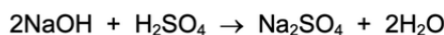
27. The equation shows the complete combustion of propane.



Which statement is correct?

- A 10 cm³ of propane cannot burn if less than 50 cm³ of oxygen is present.
B 10 cm³ of propane would produce 40 cm³ of liquid water.
C 100 cm³ of oxygen would be sufficient to react completely with 20 cm³ of propane.
D This reaction would result in an increase in the volume of gas.
28. Sodium hydroxide reacts with sulfuric acid.

The equation for the reaction is shown.



Which volume of 0.4 mol/dm³ sodium hydroxide reacts with 50.0 cm³ of 0.1 mol/dm³ sulfuric acid?

- A 12.5 cm³ B 25.0 cm³ C 50.0 cm³ D 100.0 cm³
29. What is the relative molecular mass, M_r , of butanol?
- A 15 B 37 C 74 D 148

30. The chemical formulae of two substances, W and X, are given.



Which statements are correct?

- 1 W and X contain the same amount of oxygen.
 - 2 W contains three times as much silicon as X.
 - 3 X contains twice as much aluminium as W.
- A 1 and 2 B 1 and 3 C 2 and 3 D 1, 2 and 3

31. What is the concentration of a solution containing 1.0g of sodium hydroxide in 250cm³ of solution?

- A 0.025 mol/dm³
- B 0.10 mol/dm³
- C 0.25 mol/dm³
- D 1.0 mol/dm³

32. Aluminium oxide has the formula Al₂O₃.

Which statement about aluminium oxide is correct?

- A 2g of aluminium atoms are combined with 3g of oxygen atoms.
- B 2g of aluminium atoms are combined with 3g of oxygen molecules.
- C Aluminium oxide has a relative molecular mass of 102.
- D Pure aluminium oxide contains a higher mass of oxygen than of aluminium.

33. (a) A compound, X, contains 55.85% carbon, 6.97% hydrogen and 37.18% oxygen.

(i) How does this prove that compound X contains only carbon, hydrogen and oxygen?

..... [1]

(ii) Use the above percentages to calculate the empirical formula of compound X.

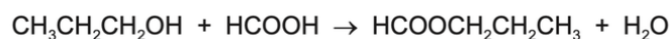
..... [2]

(iii) The M_r of X is 86.

What is its molecular formula?

..... [2]

34. (d) Propanol reacts with methanoic acid to form the ester propyl methanoate.



4.0g of methanoic acid was reacted with 6.0g of propanol.

(i) Calculate the M_r of methanoic acid = [1]

(ii) Calculate the M_r of propanol = [1]

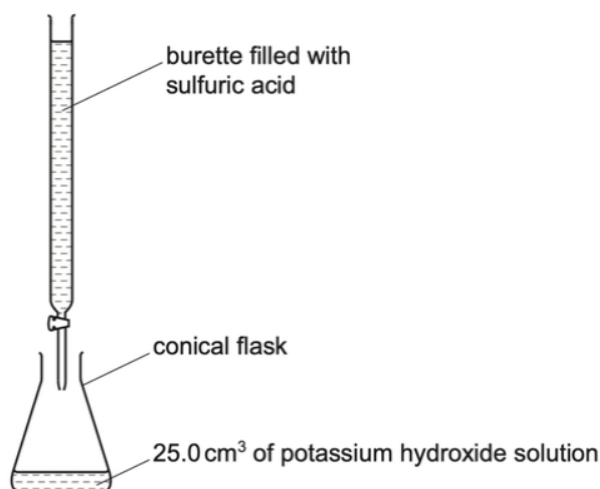
(iii) Determine which one is the limiting reagent. Show your reasoning.

.....
.....
..... [2]

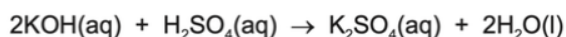
(iv) Calculate the maximum yield in grams of propyl methanoate, $M_r = 88$.

..... [1]

35. Two salts can be made from potassium hydroxide and sulfuric acid. They are potassium sulfate, K_2SO_4 , and the acid salt potassium hydrogen sulfate, $KHSO_4$. They are both made by titration.



- (a) 25.0 cm³ of potassium hydroxide, concentration 2.53 mol/dm³, was neutralised by 28.2 cm³ of dilute sulfuric acid.



Calculate the concentration of the sulfuric acid.

number of moles of KOH used =

number of moles of H₂SO₄ needed to neutralise the KOH =

concentration of dilute sulfuric acid = mol/dm³

[3]

36. (c) The equation for the decomposition of copper(II) nitrate is given below.



- (ii) Copper(II) nitrate forms a series of hydrates with the formula $Cu(NO_3)_2 \cdot xH_2O$. All these hydrates decompose to form copper(II) oxide. 1 mole of $Cu(NO_3)_2 \cdot xH_2O$ forms 1 mole of CuO.

What is meant by 1 mole of a substance?

.....
 [2]

- (iii) 7.26 g of a hydrate, $Cu(NO_3)_2 \cdot xH_2O$, formed 2.4 g copper(II) oxide.

number of moles of CuO formed =

number of moles of $Cu(NO_3)_2 \cdot xH_2O$ in 7.26 g =

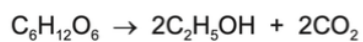
mass of 1 mole of $Cu(NO_3)_2 \cdot xH_2O$ = g

mass of 1 mole of $Cu(NO_3)_2$ is 188 g

the value of x in this hydrate =

[4]

37. Ethanol is manufactured from glucose, $C_6H_{12}O_6$, by fermentation according to the following equation.



(b) In an experiment, 30.0 g of glucose was fermented.

(i) Calculate the number of moles of glucose in 30.0 g.

..... mol [2]

(ii) Calculate the maximum mass of ethanol that could be obtained from 30.0 g of glucose.

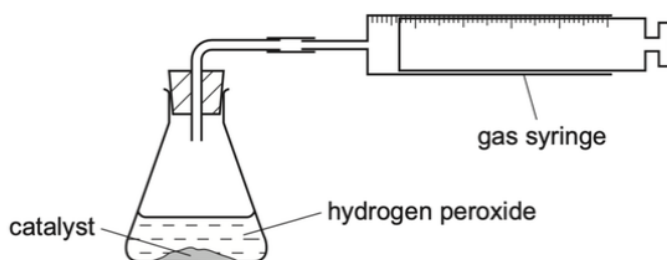
..... g [2]

(iii) Calculate the volume of carbon dioxide at room temperature and pressure that can be obtained from 30.0 g of glucose.

..... dm^3 [1]

38. A student studies the rate of decomposition of hydrogen peroxide using the apparatus shown. The student uses 20 cm³ of 0.1 mol/dm³ hydrogen peroxide and 1.0 g of manganese(IV) oxide.

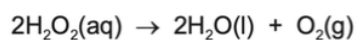
The student measures the volume of oxygen given off at regular time intervals until the reaction stops. A graph of the results is shown.



- (c) (i) Calculate the number of moles of hydrogen peroxide used in this experiment.

..... mol [1]

- (ii) Use your answer to (c)(i) and the equation to calculate the number of moles of oxygen produced in the reaction.



..... mol [1]

- (iii) Calculate the volume (at r.t.p.) of oxygen produced.

..... dm³ [1]

- (iv) What would be the effect on the volume of oxygen produced if the mass of catalyst was increased?

..... [1]

- (v) Deduce the volume of oxygen that would be produced if 20 cm³ of 0.2 mol/dm³ hydrogen peroxide was used instead of 20 cm³ of 0.1 mol/dm³ hydrogen peroxide.

..... dm³ [1]

39. (a) Sodium nitrate is a white crystalline solid. When heated it melts and the following reaction occurs.



A 3.40 g sample of sodium nitrate is heated.

Calculate the

- number of moles of NaNO_3 used,

..... mol

- number of moles of O_2 formed,

..... mol

- volume of O_2 formed, in dm^3 (measured at r.t.p.).

..... dm^3
[3]

40. (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]

4{. Dilute hydrochloric acid reacts with sodium carbonate solution.



(a) Explain why effervescence is seen during the reaction.

.....
..... [1]

(b) Dilute hydrochloric acid was titrated with sodium carbonate solution.

- 10.0 cm³ of 0.100 mol/dm³ hydrochloric acid were placed in a conical flask.
- A few drops of methyl orange indicator were added to the dilute hydrochloric acid.
- The mixture was titrated with sodium carbonate solution.
- 16.2 cm³ of sodium carbonate solution were required to react completely with the acid.

(i) What colour would the methyl orange indicator be in the hydrochloric acid?

..... [1]

(ii) Calculate how many moles of hydrochloric acid were used.

..... mol [1]

(iii) Use your answer to (b)(ii) and the equation for the reaction to calculate the number of moles of sodium carbonate that reacted.

..... mol [1]

(iv) Use your answer to (b)(iii) to calculate the concentration of the sodium carbonate solution in mol/dm³.

..... mol/dm³ [2]

(c) In another experiment, 0.020 mol of sodium carbonate were reacted with excess hydrochloric acid.

Calculate the maximum volume (at r.t.p.) of carbon dioxide gas that could be made in this reaction.

..... dm³ [3]

42. (e) Isoprene is a naturally occurring hydrocarbon.

(i) Explain how the name of isoprene suggests that it contains a C=C double bond.

..... [1]

(ii) A sample of isoprene had the following composition by mass: C, 88.24%; H, 11.76%.

Calculate the empirical formula of isoprene. Show all your working.

empirical formula = [3]

(iii) What additional information would be required to calculate the molecular formula of isoprene?

..... [1]

43. Chlorine, bromine and iodine are halogens.

(a) Chlorine can be made in the laboratory by heating manganese(IV) oxide with concentrated hydrochloric acid.



Calculate the volume of $8.00 \text{ mol/dm}^3 \text{ HCl}(\text{aq})$ needed to react with 3.48 g of MnO_2 .

• moles of MnO_2 used

..... mol

• moles of HCl needed

..... mol

• volume of HCl needed

..... cm^3
[4]

44. When lead(II) nitrate is heated, two gases are given off and solid lead(II) oxide remains. The equation for the reaction is shown.



- (a) Calculate the M_r of lead(II) nitrate.

..... [1]

- (b) 6.62 g of lead(II) nitrate are heated until there is no further change in mass.

- (i) Calculate the mass of lead(II) oxide produced.

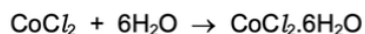
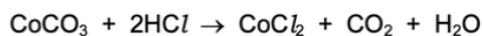
..... g [2]

- (ii) Calculate the volume of oxygen, O_2 , produced at room temperature and pressure (r.t.p.).

..... dm^3 [2]

45. (b) (i) 5.95 g of cobalt(II) carbonate were added to 40 cm³ of hydrochloric acid, concentration 2.0 mol/dm³.

Calculate the maximum yield of cobalt(II) chloride-6-water and show that the cobalt(II) carbonate was in excess.



maximum yield:

number of moles of HCl used =

number of moles of CoCl₂ formed =

number of moles of CoCl₂·6H₂O formed =

mass of one mole of CoCl₂·6H₂O = 238 g

maximum yield of CoCl₂·6H₂O =g

to show that cobalt(II) carbonate is in excess:

number of moles of HCl used = (use your value from above)

mass of one mole of CoCO₃ = 119 g

number of moles of CoCO₃ in 5.95 g of cobalt(II) carbonate = [5]

- (ii) Explain how these calculations show that cobalt(II) carbonate is in excess.

..... [1]

4b. Barium carbonate decomposes when heated.



(a) A student heated a 10.0g sample of barium carbonate until it was fully decomposed.

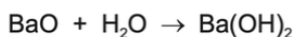
(i) Calculate the number of moles of barium carbonate the student used.

moles of barium carbonate = mol [2]

(ii) Calculate the volume of carbon dioxide gas produced at room temperature and pressure. Give your answer in dm^3 .

volume of carbon dioxide = dm^3 [1]

(b) The student added 2.00g of the barium oxide produced to water.

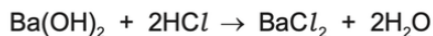


Calculate the mass of barium hydroxide that can be made from 2.00g of barium oxide. The M_r of $\text{Ba}(\text{OH})_2$ is 171.

mass of barium hydroxide = g [1]

(c) A 1.50g sample of barium hydroxide was dissolved in water. The total volume of the solution was 100 cm^3 .

A 25.0 cm^3 portion of the barium hydroxide solution was titrated against hydrochloric acid. The volume of hydrochloric acid required was 18.75 cm^3 .



(i) Calculate how many moles of barium hydroxide were in the 25.0 cm^3 portion used in the titration.

moles of barium hydroxide = mol [1]

(ii) Calculate the concentration of the hydrochloric acid used.

concentration of hydrochloric acid = mol/dm^3 [2]

47. (b) 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]

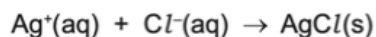
(iii) Calculate the ratio of moles of anhydrous magnesium sulfate : moles of water. Give your answer as whole numbers.

ratio = : [1]

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

formula of hydrated magnesium sulfate crystals = [2]

48. A sample of vanadium chloride was weighed and dissolved in water. An excess of aqueous silver nitrate, acidified with dilute nitric acid, was added. A precipitate of silver chloride was formed. The ionic equation for this reaction is shown.



The mass of silver chloride formed was 2.87 g.

(i) State the colour of the precipitate of silver chloride.

..... [1]

(ii) The relative formula mass of silver chloride, AgCl , is 143.5.

Calculate the number of moles in 2.87 g of AgCl .

moles of AgCl = mol [1]

(iii) Use your answer to (b)(ii) and the ionic equation to deduce the number of moles of chloride ions, Cl^- , that produced 2.87 g of AgCl .

moles of Cl^- = mol [1]

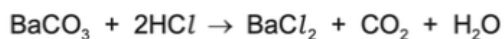
(iv) The amount of vanadium chloride in the sample was 0.01 moles.

Use this and your answer to (b)(iii) to deduce the **whole number** ratio of moles of vanadium chloride : moles of chloride ions.
Deduce the formula of vanadium chloride.

moles of vanadium chloride : moles of chloride ions :

formula of vanadium chloride [2]

4⁹. Barium carbonate reacts with dilute hydrochloric acid.



9.85 g of barium carbonate were added to 250 cm³ of 1.00 mol/dm³ hydrochloric acid. This is an excess of hydrochloric acid.

(i) Calculate how many moles of barium carbonate were used in this experiment.

moles of barium carbonate = mol [2]

(ii) Deduce how many moles of carbon dioxide were made when all the barium carbonate had reacted.

moles of carbon dioxide = mol [1]

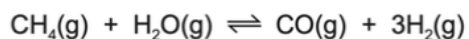
(iii) Calculate the volume of carbon dioxide formed in (c)(ii) at room temperature and pressure, in dm³.

volume of carbon dioxide = dm³ [1]

(iv) Calculate how many moles of hydrochloric acid there were **in excess**.

excess moles of hydrochloric acid = mol [2]

50. Hydrogen can be manufactured using a reversible reaction between methane and steam.



At 900 °C, in the presence of a nickel catalyst, the yield of hydrogen is 70%.

(i) What volume of hydrogen is produced from 100 cm³ of methane under these conditions?

..... cm³ [2]

Under different conditions, different yields of hydrogen are obtained.

(ii) If the pressure is increased, the yield of hydrogen becomes less than 70%.

Explain why, in terms of the position of the equilibrium.

.....
..... [1]

(iii) If the temperature is decreased, the yield of hydrogen decreases.

What does this information indicate about the reaction between methane and steam?

..... [1]

(iv) Why is a catalyst used in this reaction?

..... [1]

51. (b) 25 cm³ of a gaseous hydrocarbon, C_xH_y, were burnt in 150 cm³ of oxygen. This was an excess of oxygen.

After cooling, the volume of the gases remaining was 100 cm³. This consisted of 75 cm³ of carbon dioxide and 25 cm³ of unreacted oxygen. The water that was produced in the reaction was liquid.

All volumes were measured at the same 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?

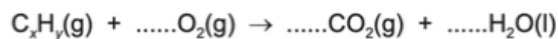
..... cm³ [1]

(iii) Complete the table to show the smallest whole number ratio of volumes.

	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 (b)(iii) to balance the chemical equation. Deduce the formula of the hydrocarbon.



formula of the hydrocarbon = [2]