

40 Ethanol can be made by fermentation of sugar, using yeast.

This produces a mixture of ethanol and water.

How is ethanol separated from this mixture?

- A distilling the mixture using a fractionating column
- B filtering the mixture
- C heating to evaporate most of the water, and allowing the ethanol to crystallise
- D heating to evaporate the water

1

The Periodic Table of Elements

Group																	
I	II	Key										III	IV	V	VI	VII	VIII
		atomic number atomic symbol name relative atomic mass										1 H hydrogen 1					
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium (85)	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium —	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —
87 Fr francium —	88 Ra radium —	89–103 actinoids	104 Rf rutherfordium —	105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —	111 Rg roentgenium —	112 Cn copernicium —	113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesson —
lanthanoids		57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium —	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175	
actinoids		89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium —	94 Pu plutonium —	95 Am americium —	96 Cm curium —	97 Bk berkelium —	98 Cf californium —	99 Es einsteinium —	100 Fm fermium —	101 Md mendelevium —	102 No nobelium —	103 Lr lawrencium —	

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

- 3** A student prepares a sample of the insoluble salt barium sulfate, BaSO_4 .
The student adds aqueous sodium sulfate, $\text{Na}_2\text{SO}_4(\text{aq})$, to aqueous barium chloride, $\text{BaCl}_2(\text{aq})$.

The student carries out the following steps.

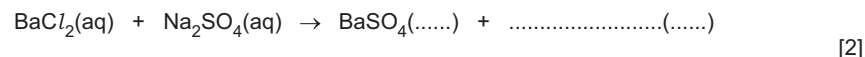
step 1 Dissolve 0.100 moles of solid BaCl_2 in 100cm^3 of distilled water in a beaker to form $\text{BaCl}_2(\text{aq})$.

step 2 Add an aqueous solution which contains 0.100 moles of $\text{Na}_2\text{SO}_4(\text{aq})$ to the beaker containing the $\text{BaCl}_2(\text{aq})$ from **step 1**.

step 3 Stir the mixture and then filter it.

step 4 Dry the solid left in the filter paper.

- (a) Complete the symbol equation for the reaction. Include state symbols.



[2]

- (b) Calculate the mass of solid BaCl_2 dissolved in **step 1**.

mass = g [2]

- (c) The concentration of $\text{Na}_2\text{SO}_4(\text{aq})$ in **step 2** is 1.25mol/dm^3 .

Calculate the volume, in cm^3 , of 1.25mol/dm^3 $\text{Na}_2\text{SO}_4(\text{aq})$ added in **step 2** which contains 0.100 moles of Na_2SO_4 .

volume = cm^3 [1]

- (d) State the colour of the solid formed in **step 2**.

..... [1]

- (e) The mixture is filtered in **step 3**.

State the general term given to a solid left in the filter paper after filtration.

..... [1]

- (f) The actual mass of dry BaSO_4 collected in **step 4** is greater than the expected mass. This is because the student should do an additional step between **step 3** and **step 4**.

Suggest what the student should do in this additional step, and explain why the actual mass collected is greater than the expected mass.

.....

 [2]

- (g) State the name of this method of salt preparation.

..... [1]

- (h) State the name of a different:

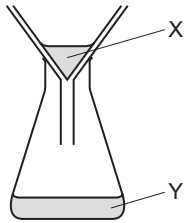
- barium salt that can be used in place of BaCl_2
- sulfate salt that can be used in place of Na_2SO_4
- barium salt that can be made by this method. [3]

[Total: 13]

- 39** Which method is used to obtain copper(II) sulfate crystals from an aqueous solution of copper(II) sulfate?

- A** chromatography
B condensation
C evaporation
D filtration

39 A mixture containing an aqueous salt and an insoluble salt is filtered.



Which row describes X and Y?

	X	Y
A	solute	pure water
B	solute	filtrate
C	residue	pure water
D	residue	filtrate

40 Pure ethanol has a melting point of −114 °C and a boiling point of 78 °C.

What are the melting and boiling points of a sample of ethanol with glucose dissolved in it?

	melting point/°C	boiling point/°C
A	−116	77
B	−116	79
C	−112	77
D	−112	79

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38 The steps used to separate a mixture of a soluble solid and an insoluble solid are listed.

- A solution is made by adding the mixture to a suitable1..... .
- The mixture is stirred and then poured through a filter funnel lined with filter paper.
- The insoluble solid is collected on the filter paper as the2..... .

Which words complete gaps 1 and 2?

	1	2
A	solute	filtrate
B	solute	residue
C	solvent	filtrate
D	solvent	residue

39 Which items of apparatus are used to separate a mixture of liquids with different boiling points?

