

PART C Chemistry

- 37 The colours of three indicators are shown.

<i>indicator</i>	<i>colour at</i>		<i>pH at which colour change takes place</i>
	<i>low pH</i>	<i>high pH</i>	
methyl orange	red	yellow	4.0
bromothymol blue	yellow	blue	6.5
phenolphthalein	colourless	pink	9.0

Equal volumes of these three indicators were mixed and the mixture was added to a solution of pH 5.0.

What colour would be seen?

- A blue
 - B green
 - C orange
 - D purple
 - E yellow
- 38 When concentrated aqueous sodium chloride solution is electrolysed using inert electrodes a reaction occurs at each electrode.

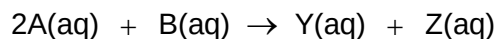
Which is the correct combination of elements actually produced at the electrodes in this electrolysis?

- A positive electrode = chlorine; negative electrode = hydrogen
- B positive electrode = chlorine; negative electrode = sodium
- C positive electrode = oxygen; negative electrode = hydrogen
- D positive electrode = oxygen; negative electrode = sodium
- E positive electrode = sodium; negative electrode = chlorine

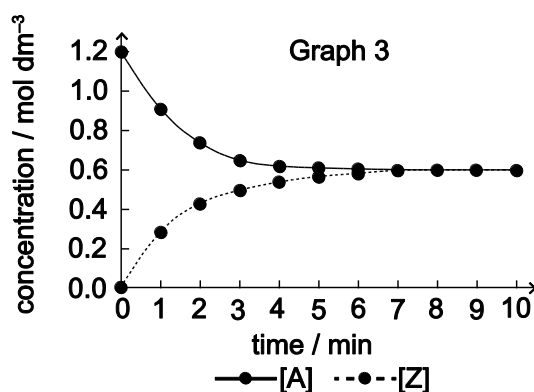
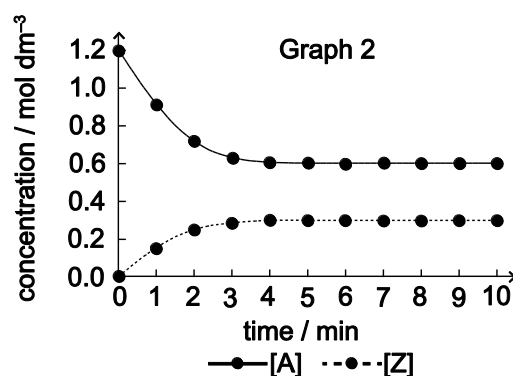
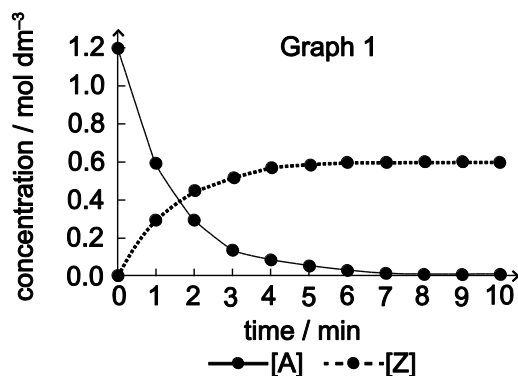
39 Which substance (A–E) in the table could have a giant covalent structure?

<i>substance</i>	<i>melting point / °C</i>	<i>boiling point / °C</i>	<i>electrical conductivity</i>	
			<i>when solid</i>	<i>when molten</i>
A	1700	2200	none	none
B	800	1470	none	good
C	98	880	good	good
D	– 20	58	none	none
E	– 39	357	good	good

- 40 Chemicals A and B react to form products Y and Z. The reaction goes to completion. The equation for the reaction is:



Equimolar samples of A and B were mixed and the concentrations of A and Z were measured over time. Which of the following graphs could represent this reaction?



- A Graph 1 only
- B Graph 2 only
- C Graph 3 only
- D Graphs 1 and 2 only
- E Graphs 2 and 3 only

- 41** An oxide of iron has the formula Fe_3O_4 and contains both Fe^{2+} and Fe^{3+} ions.

Which one of the following is the fraction of iron ions that are in the Fe^{2+} state?

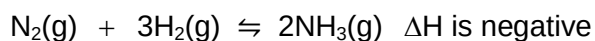
- A** $\frac{1}{4}$
- B** $\frac{1}{3}$
- C** $\frac{1}{2}$
- D** $\frac{2}{3}$
- E** $\frac{3}{4}$

- 42** An element has a mass number of 40 and an atomic number of 20.

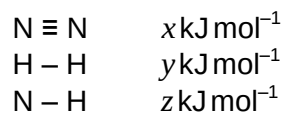
Which statement(s) about this element is/are correct?

- 1** Its atomic nucleus has a relative mass of 20.
 - 2** It is a noble gas.
 - 3** It would form a negative ion.
 - 4** It is in group 2 of the periodic table.
 - 5** It is a non-metallic element.
-
- A** 1, 2 and 3 only
 - B** 1, 3 and 4 only
 - C** 1, 4 and 5 only
 - D** 2, 3 and 5 only
 - E** 4 only
 - F** 5 only

- 43 The reaction between nitrogen and hydrogen to form ammonia is exothermic.

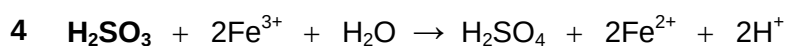
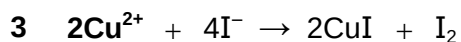
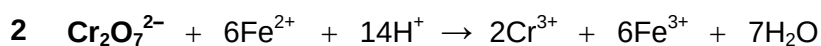
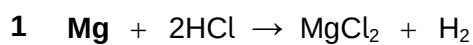


The bond energies in the three molecules are as shown.



Which statement can be deduced from this information?

- A $z > x + y$
- B $2z > x + y$
- C $2z > x + 3y$
- D $6z > x + y$
- E $6z > x + 3y$
- 44 In which two of the following equations is the **first reactant** an oxidising agent?



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

- 45** What volume of water vapour measured at room temperature and pressure would be produced from an ice cube of mass 6.00 g if it all evaporated?

(Ar: H = 1; O = 16, molar volume of a gas at room temperature and pressure = 24 dm³)

- A** 240 cm³
- B** 1800 cm³
- C** 4800 cm³
- D** 8000 cm³
- E** 24 000 cm³

- 46** A compound of iodine and oxygen contains 63.5 g of iodine and 20.0 g of oxygen.

Which one of the following is its empirical formula?

(Ar: I = 127; O = 16)

- A** IO
- B** IO₂
- C** I₂O
- D** I₂O₃
- E** I₂O₅
- F** I₅O₂

- 47** Listed are the electronic configurations for the atoms of different elements.

Which one represents the most reactive non-metal?

- A** 2, 4
- B** 2, 6
- C** 2, 7
- D** 2, 8, 1
- E** 2, 8, 6
- F** 2, 8, 7

- 48** Naturally occurring chlorine is a mixture of two isotopes with mass number 35 and 37. The isotope with mass number 35 is three times as common as the isotope with mass number 37.

Naturally occurring bromine is a mixture of two isotopes with mass numbers 79 and 81. They are present in equal amounts.

What fraction of the naturally occurring compound CH_2BrCl has a relative molecular mass of 128?

(A_r : H = 1; C = 12)

- A** $\frac{1}{8}$
B $\frac{1}{4}$
C $\frac{3}{8}$
D $\frac{1}{2}$
E $\frac{5}{8}$

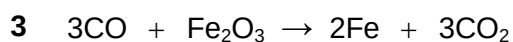
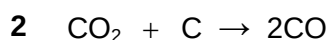
- 49** A mixture of equal parts of hexane (bp 68°C) and heptane (bp 98°C) is distilled using a fractionating column.

The temperature of the liquid in the flask and the temperature at the top of the fractionating column are measured.

Which one of the following shows the likely temperatures when the first drops of distillate are collected?

	<i>temperature in flask / $^\circ\text{C}$</i>	<i>temperature at top of column / $^\circ\text{C}$</i>
A	83	68
B	98	68
C	83	83
D	98	83
E	98	98

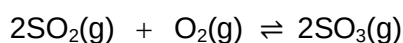
- 50** Carbon, in the form of coke, is used to reduce iron oxide in a blast furnace. The three stages are shown below:



If 12 g of carbon is used in stage 2 and all the carbon monoxide produced is used in stage 3, what mass of carbon dioxide is produced in stage 3?

(A_r : C = 12; O = 16)

- A** 17.8 g
- B** 35.6 g
- C** 44 g
- D** 88 g
- E** 132 g
- 51** The following exothermic, reversible reaction is used in the manufacture of sulfuric acid from sulfur dioxide and oxygen:



Which one of the following statements about this reaction is correct?

- A** Pressure has no effect on the position of equilibrium.
- B** Raising the temperature moves the equilibrium to the right.
- C** At equilibrium no sulfur dioxide is being changed into sulfur trioxide.
- D** The addition of a catalyst speeds up the forward reaction more than the backward reaction.
- E** Before equilibrium is reached, the rate of the forward reaction is greater than the rate of the backward reaction.

- 52** An impure sample of sodium hydroxide has a mass of 1.20 g. All the sodium hydroxide completely reacts with a minimum of 50.0 cm³ of 0.50 mol dm⁻³ hydrochloric acid.

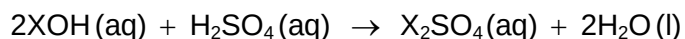
What is the percentage purity of the sodium hydroxide sample?

(A_r : H = 1; O = 16; Na = 23; Cl = 35.5)

- A** 37.5%
- B** 41.6%
- C** 72.7%
- D** 75.0%
- E** 83.3%
- F** 90.4%

- 53** A sample of an alkali XOH of mass 2.8 g was dissolved in water.

This solution was neutralised by 12.5 cm³ of sulfuric acid of concentration 2.0 mol dm⁻³.



What is the relative atomic mass of X?

(A_r : H = 1; O = 16; S = 32)

- A** 13
- B** 26
- C** 39
- D** 52
- E** 65
- F** 78

- 54** The equation summarises the reaction of copper and dilute nitric acid.



What values of **s** and **t** are needed to balance the equation?

	s	t
A	1	1
B	2	1
C	4	1
D	2	2
E	4	2