

# Rehearse and remember

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## Practice exam 2

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### VCE Chemistry

### Units 1 & 2

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# Chemistry

## Practice Examination 2

**Reading time:** 15 minutes

**Writing time:** 1 hour 30 minutes

Section	Number of questions	Number of questions to be answered	Number of marks	Suggested times (minutes)
A	20	20	20	30
B	6	6	52	60
			Total 72	90

### Disclaimer

This is a practice examination. It represents Pearson Australia's view only of what would be useful preparation material for the externally assessed examination.

## Section A – Multiple-choice questions

### Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

**The chemistry data book should be used with this exam.**

#### Question 1

Which of the following statements about water is **not** correct?

- A Water is able to dissolve many substances because it is a polar molecule.
- B Water expands on freezing because of the way each water molecule bonds to surrounding water molecules.
- C Water is able to conduct electricity because it contains a small number of free-moving electrons.
- D Water is a good coolant because of its high latent heat values.

#### Question 2

Which of the equations below best represents ethanol dissolving in water?

- A  $\text{C}_2\text{H}_5\text{OH}(\text{l}) \xrightarrow{\text{H}_2\text{O}(\text{l})} \text{C}_2\text{H}_5\text{OH}(\text{aq})$
- B  $\text{C}_2\text{H}_5\text{OH}(\text{l}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{C}_2\text{H}_5\text{O}^-(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$
- C  $\text{C}_2\text{H}_5\text{OH}(\text{s}) \xrightarrow{\text{H}_2\text{O}(\text{l})} \text{C}_2\text{H}_5\text{OH}(\text{l})$
- D  $\text{C}_2\text{H}_5\text{OH}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{C}_2\text{H}_5\text{OH}(\text{aq})$

#### Question 3

Which of the following describes the types of bonds broken in the solute and formed with water when hydrogen chloride dissolves?

	Bonds broken	Bonds formed
A	covalent	hydrogen and dipole–dipole
B	dipole–dipole	covalent and dipole–dipole
C	dipole–dipole	hydrogen and dipole–dipole
D	covalent	covalent and dipole–dipole

#### Question 4

Which of the following solutions would have the highest pH?

- A lemon juice
- B 1.0 M hydrochloric acid
- C 1.0 M sodium hydroxide
- D 1.0 M ammonium ions

**Question 5**

Which of the following represents a dilute solution of a strong acid?

- A 0.10 M HNO<sub>3</sub>
- B 8.0 M CH<sub>3</sub>COOH
- C 0.01 M CH<sub>3</sub>COOH
- D 6.0 M HNO<sub>3</sub>

**Question 6**

Which of the following is the conjugate base of H<sub>2</sub>PO<sub>4</sub><sup>-</sup>?

- A H<sub>3</sub>PO<sub>4</sub>
- B HPO<sub>4</sub><sup>2-</sup>
- C H<sub>2</sub>O
- D OH<sup>-</sup>

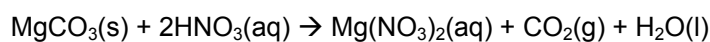
**Question 7**

The mass, in grams, of Na<sub>2</sub>CO<sub>3</sub> required to be dissolved in water to make 300 mL of 0.150 M solution is:

- A 0.045
- B 2.30
- C 4.77
- D 15.9

**Question 8**

A 5.0 g sample of magnesium carbonate reacts with an excess amount of nitric acid according to the equation:



The mass, in grams, of carbon dioxide formed is:

- A 0.059
- B 1.3
- C 2.6
- D 5.0

**Question 9**

The pH of a 0.0100 M solution of HNO<sub>3</sub> is:

- A 1
- B 2
- C 11
- D 12

**Question 10**

The number of chloride ions present in 30 g of CaCl<sub>2</sub> is closest to:

- A 0.270
- B  $1.63 \times 10^{23}$
- C  $3.25 \times 10^{23}$
- D  $4.88 \times 10^{23}$

### Question 11

Which of the species below is the strongest oxidant?

- A  $\text{Ag}^+$
- B  $\text{Br}^-$
- C  $\text{Mg}^{2+}$
- D Ca

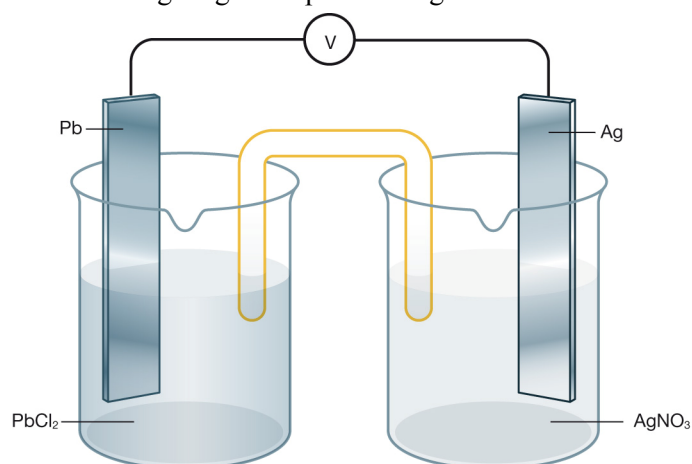
### Question 12

Which one of the following metals would you predict to react spontaneously with lead ions but not zinc ions?

- A Cu
- B Sn
- C Al
- D Mg

Questions 13 and 14 refer to the following information.

The following diagram represents a galvanic cell.



### Question 13

Which one of the following correctly describes the cathode, anode and direction of electron flow when the wires are connected at 25°C?

	<b>Cathode</b>	<b>Anode</b>	<b>Direction of electron flow</b>
A	Pb	Ag	left to right
B	Pb	Ag	right to left
C	Ag	Pb	right to left
D	Ag	Pb	left to right

### Question 14

When the circuit is made complete, 3.00 g of lead, Pb, is consumed. The mass of silver produced is:

- A 0.781 g
- B 1.56 g
- C 3.00 g
- D 3.12 g

**Question 15**

The following issues may be considered to be potential problems for the inhabitants of Earth.

- I Too much heat is trapped at the Earth's surface.
- II The ozone layer is depleted.
- III More UV light is allowed to the Earth's surface.

Which of the above is/are the result of the enhanced greenhouse effect?

- A I only
- B II and III only
- C I and III only
- D I, II and III

**Question 16**

The process in the nitrogen cycle that **does not** involve the activity of bacteria in the soil is:

- A ammonium ions from excreted waste are converted to nitrate ions
- B nitrogen in the atmosphere is converted to soluble ions in the soil
- C soluble ions are converted to nitrogen which is returned to the atmosphere
- D nitrogen in the atmosphere is converted to nitrogen oxides.

**Question 17**

A 1.5 L glass jar contains gas at a pressure of 3.50 atm. If the contents of the jar are transferred to a 3.0 L container and the temperature kept constant, the pressure of the gas, in atm, will be:

- A 1.29
- B 1.75
- C 3.50
- D 7.00

**Question 18**

A balloon is blown up to a volume of 1.65 L on a cold day when the temperature is 14°C. The next day the temperature is 22°C. If the pressure of the balloon remains constant, the volume, in litres, of the balloon the next day will be:

- A 1.05
- B 1.65
- C 1.70
- D 2.59

**Question 19**

The temperature, in °C, of 16.0 g of oxygen gas that occupies 16.0 L at a pressure of 1.00 atm is:

- A -78.0
- B 117
- C 195
- D 390

**Question 20**

Which of the following gases will occupy the largest volume at STP?

- A 7.0 g of H<sub>2</sub>
- B 7.0 g of N<sub>2</sub>
- C 7.0 g of O<sub>2</sub>
- D 7.0 g of F<sub>2</sub>

**END OF SECTION A**

## Section B – Short-answer questions

### Instructions for Section B

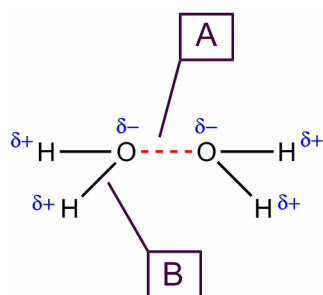
Answer all questions in the spaces provided.

To obtain full marks for your responses you should:

- give simplified answers with an appropriate number of significant figures to all numerical questions
- show all working in your answers to numerical questions
- make sure chemical equations are balanced and that the formulas for individual substances include an indication of state.

### Question 1

Water is abundant in the environment. Two molecules of water are represented in the following diagram.



**a** Give the name of the bond type represented by each of the labels on the diagram indicated by:

**i** label A \_\_\_\_\_

**ii** label B \_\_\_\_\_

1 + 1 = 2 marks

**b** Briefly explain the following properties of water.

**i** Water has a relatively high melting temperature compared to other molecular compounds of the same size.

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**ii** Water expands on freezing.

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1 + 1 = 2 marks

c 5.00 g of table salt (NaCl) is dissolved in water and the solution made up to 200 mL with water.

i Write a chemical equation to represent this process.

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ii Draw a labelled diagram to show the arrangement of water molecules around the dissolved sodium ions and chloride ions.

iii Calculate the molar concentration of the solution.

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1 + 3 + 2 = 6 marks

Total 10 marks

## Question 2

Untreated water undergoes a series of treatment steps before it can be used as drinking water.

a Flocculation is one step in the process. Flocculation is an example of a precipitation reaction.

i Give a brief definition of a precipitation reaction.

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ii Give a chemical equation that represents an example of a precipitation reaction.

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iii Give one type of impurity that is removed from untreated water by the process of flocculation.

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1 + 2 + 1 = 4 marks



- b** Give the name of one other treatment step in the process of water purification and briefly describe its purpose.

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2 marks

Total 6 marks

**Question 3**

- a** Calculate the pH of the following solutions:

**i** 0.100 M  $\text{Ca}(\text{OH})_2$

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**ii** A 100 mL solution in which 1.35 g of gaseous hydrogen chloride has been dissolved.

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3 + 3 = 6 marks

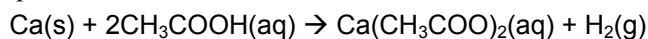
- b** Write a balanced chemical equation for the reaction between aqueous hydrochloric acid and sodium carbonate in which bubbles are observed.

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2 marks

- c 15.0 g of Ca is added to a solution containing 15.0 g of ethanoic acid and allowed to react according to the equation:



- i Calculate the mass, in grams, of  $\text{Ca(CH}_3\text{COO)}_2$  produced.

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- ii Calculate the volume, in litres, of  $\text{H}_2$  produced, at  $15^\circ\text{C}$  and 1.5 atm pressure.

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4 + 3 = 7 marks

Total 15 marks

#### Question 4

A small sample of zinc is added to a solution of hydrochloric acid. Some zinc chloride and hydrogen gas is produced.

- a Write a half equation for the reduction reaction.

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1 mark

- b Write a half equation for the oxidation reaction.

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1 mark

- c Write a balanced full equation for the reaction.

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2 marks

**d** Identify the oxidant and reductant in this reaction.

Oxidant \_\_\_\_\_

Reductant \_\_\_\_\_

2 marks

Total 6 marks

**Question 5**

During your studies this semester, you will have examined the laboratory and industrial production of one gas of significance to the quality of the atmosphere.

**a** Give the name and two properties of the gas you studied.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2 marks

**b** Describe the laboratory preparation of this gas. Include an appropriate equation in your answer.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2 marks

**c** State two of the principles of green chemistry.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2 marks

**d** A reduction in the quality of the atmosphere can have significant consequences for the Earth's inhabitants. One such problem is acid rain.

**i** Use an equation to describe the production of acid rain from a gas in the atmosphere.

\_\_\_\_\_  
\_\_\_\_\_

**ii** Outline one effect of acid rain on plants or animals.

\_\_\_\_\_  
\_\_\_\_\_

1 + 1 = 2 marks

Total 8 marks

**Question 6**

**a** Use kinetic molecular theory to explain the following observations.

**i** An aerosol can that is heated may explode.

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**ii** Gases expand to fill any container.

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2 + 1 = 3 marks

**b** The Hazelwood power station in the Latrobe Valley uses about 250 000 tonnes of coal each week (1 tonne =  $10^6$  g). The coal used in the power station contains about 25.0% carbon. Calculate the volume of carbon dioxide, in litres, released each week by the power station at STP that is due to the burning of coal.

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4 marks

Total 7 marks

**END OF SECTION B**

# Practice Exam 2

## Section A – Multiple choice

### Answer sheet

Fill in the answer sheet by putting a cross in the correct box.

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
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9				
10				
11				
12				
13				
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