

Rehearse and remember

Practice exam 1

VCE Chemistry

Units 1 & 2



Chemistry

Practice Examination 1

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	8	8	49	60
			Total 69	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

The currently accepted model of the atom has developed through history. The correct sequence of historical models is:

- A plum pudding → particle → shell → nuclear
- B particle → nuclear → plum pudding → shell
- C particle → plum pudding → nuclear → shell
- D particle → plum pudding → shell → nuclear

Question 2

An ion that contains 11 protons, 12 neutrons and 10 electrons will have a charge and mass number corresponding to:

	Mass number	Charge
A	11	-1
B	11	+1
C	23	-1
D	23	+1

Question 3

The ground state electronic configuration for an ion of sulfur, S^{2-} , is:

- A $1s^2 2s^2 2p^6 3s^2 3p^4$
- B $1s^2 2s^2 2p^6 3s^2 3p^5$
- C $1s^2 2s^2 2p^6 3s^2 3p^6$
- D $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2$

Question 4

Elements are placed into groups on the periodic table according to each element's:

- A mass number
- B atomic number
- C number of occupied electron shells
- D number of electrons in the outer shell.

Question 5

The 2p subshell has:

- A 2 orbitals and can hold up to 6 electrons
- B 3 orbitals and can hold up to 6 electrons
- C 2 orbitals and can hold up to 2 electrons
- D 3 orbitals and can hold up to 9 electrons.

Question 6

Which pair of elements are chemically the most similar to each other?

- A Li, Be
- B Cl, Ar
- C N, P
- D Ne, Na

Question 7

The total number of atoms in 3.50 g of ethane (C₂H₄) is:

- A 0.125
- B 0.750
- C 7.53×10^{22}
- D 4.52×10^{23}

Question 8

Ammonium nitrate (NH₄NO₃) is a common ingredient in plant fertilisers. The mass of nitrogen, in grams, in a 150 g sachet of one brand of fertiliser is:

- A 17.5
- B 26.3
- C 35.0
- D 52.5

Question 9

The mass of one molecule of hydrogen peroxide (H₂O₂), in grams, is:

- A 34.0
- B $\frac{34.0}{6.02 \times 10^{23}}$
- C $\frac{6.02 \times 10^{23}}{34.0}$
- D $23 \times 6.02 \times 10^{23}$

Question 10

The empirical formula of a particular molecular compound is best defined as the:

- A simplest whole number ratio of each element present
- B simplest whole number ratio of each ion present
- C actual number and type of each element present
- D simplest whole number ratio, by mass, of each element present.

Question 11

Which of the following substances does not contain freely moving charged particles when in solid form?

- A graphite
- B copper
- C sodium chloride
- D aluminium

Question 12

The correct formula of sodium sulfate is:

- A NaS
- B Na₂S
- C Na₂SO₄
- D NaSO₄

Question 13

Which of the following statements about ionic bonding **is not** correct?

- A An ionic lattice contains both cations and anions in fixed positions
- B Ionic bonding involves the sharing of electrons between two different atoms.
- C Compounds that contain ionic bonding have high melting temperatures.
- D Compounds that contain ionic bonding are able to conduct electricity when molten.

Question 14

Atom P has five electrons in its outer shell and atom Q has seven electrons in its outer shell. The most likely empirical formula for a compound consisting of atoms P and Q is:

- A P₂Q
- B PQ₂
- C P₃Q
- D PQ₃

Question 15

The number of lone pairs of electrons in a molecule of oxygen is:

- A 2
- B 4
- C 6
- D 8

Question 16

The name of a hydrocarbon with the formula C₃H₈ could be:

- A propane
- B 1-propane
- C 1-propene
- D propene

Question 17

Which of the following statements regarding polyethene is **not correct**?

- A The low-density form of polyethene is highly branched.
- B The low-density form of polyethene has a low melting temperature.
- C A molecule of polyethene has a lower mass than the combined mass of its constituent ethene molecules.
- D The high-density form of polyethene consists of many polyethene chains packed closely together.

Question 18

Which of the following gives the correct shape for each of the molecules listed?

	Linear	V-shaped	Tetrahedral
A	HF	H ₂ S	CH ₄
B	H ₂	CO ₂	NH ₃
C	CO ₂	H ₂ O	NH ₃
D	H ₂ O	NH ₃	CH ₄

Question 19

A mass spectrometer can be used to identify the presence of isotopes in a compound. Isotopes are best defined as atoms:

- A that have a higher number of protons than electrons
- B that have a higher number of protons than neutrons
- C with the same number of protons and a different number of neutrons
- D with the same number of neutrons and a different number of protons.

Question 20

Which of the following groups contains only non-polar molecules?

- A H₂, HF, HCl, O₂
- B CO₂, CH₄, O₂, N₂
- C HF, O₂, H₂, N₂
- D N₂, CO₂, NH₃, CH₄

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

- a** The currently accepted model of the atom has developed historically through the contributions of a number of individuals. Give the name of one individual who has made a contribution to the development of the current model of the atom and describe the contribution made by that individual.

2 marks

- b** A particular atom of the element chlorine has a relative mass of 35.0.

- i** What is the number of protons in this atom? _____
- ii** What is the number of neutrons in this atom? _____
- iii** Explain why that particular atom of chlorine can have a relative mass of 35.0 when the relative mass of chlorine is given as 35.5 in data tables.

- iv** Write the electronic configuration, in terms of shells and subshells, for a chlorine atom in its ground state.

- v** Write the electronic configuration, in terms of shells and subshells, for a chlorine ion in its ground state.

1 + 1 + 2 + 1 + 1 = 6 marks

Total 8 marks

Question 2

- a** The widely used periodic table has also developed historically through the contributions of a number of individuals. Give the name of one individual who has made a contribution to the development to the modern periodic table and describe the contribution made by that individual.

2 marks

- b** Use the periodic table to write a correct symbol for each of the following:

- i** The element that is in group 2 (II) and period 4. _____
- ii** A noble gas with three occupied electron shells. _____
- iii** An element from group 14 (IV) that is a non-metal. _____
- iv** An element that has three occupied shells and is in the s-block. _____
- v** The element in period 2 that has the largest atomic radius. _____
- vi** The element in group 15 (V) that has the highest first ionisation energy. _____

1 + 1 + 1 + 1 + 1 + 1 = 6 marks

- c** Describe the trend in chemical reactivity of elements going down group 1 of the periodic table and give a brief explanation for this trend.

2 marks

Total 10 marks

Question 3

Consider the compound magnesium nitrate ($\text{Mg}(\text{NO}_3)_2$).

- a** Determine the percentage composition by mass of nitrogen in magnesium nitrate.

2 marks

b A given sample of magnesium nitrate contains 3.45 g of nitrogen.

i Determine the total mass of the sample.

ii Calculate the amount, in mol, of magnesium nitrate present in the sample.

iii Calculate the total number of ions present in the sample.

2 + 2 + 2 = 6 marks

Total 8 marks

Question 4

A 12.6 g sample of an unknown hydrocarbon is analysed and found to contain 10.8 g of carbon.

a Determine the empirical formula of the hydrocarbon.

2 marks

b The molar mass of the hydrocarbon is found to be 56 g mol^{-1} . Determine the molecular formula of the hydrocarbon.

2 marks

Total 4 marks

Question 5

Magnesium is a commonly used structural metal.

- a** Describe the structure of solid magnesium and the nature of the bonding between its particles. You should include a labelled diagram in your answer.

- b** Explain why magnesium is a good conductor of electricity.

3 marks

1 mark

- c** Explain why magnesium is malleable.

1 mark

- d** Give two ways in which the properties of a metal can be modified.

2 marks

Total 7 marks

Question 6

a Draw an electron dot diagram for a molecule of ammonia (NH₃).

b Draw the structure, showing the correct shape, of a molecule of ammonia, NH₃. Include any non-bond electron pairs. 1 mark

c Name and describe the type of bonding present within each ammonia molecule. 1 mark

d What type of bonding would occur between different ammonia molecules? Give a reason for your answer. 1 mark

2 marks
Total 5 marks

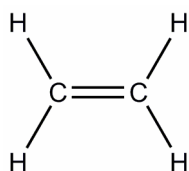
Question 7

a Draw the structure of 2,3-dimethylpentane.

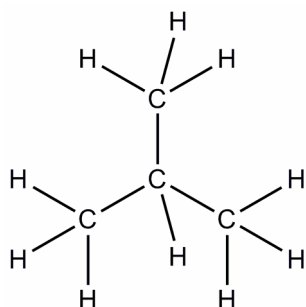
2 marks

b Name the structures below.

i



ii



1 + 1 = 2 marks

c Give the name and molecular formula of an alkane that has one carbon atom.

1 mark

Total 5 marks

Question 8

a Give a brief description of nanotechnology.

1 mark

b Describe one current application of nanotechnology.

1 mark

Total 2 marks

END OF SECTION B

Practice Exam 1

Section A – Multiple choice

Answer sheet

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

	A	B	C	D
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