

HSC STYLE HOMEWORK

NAME:

SEMINAR DAY & TIME:

Preliminary Chemistry

WATER I

General Instructions

- Reading time – 5 minutes
- Working time – 1.5 hours
- Write using black or blue pen
- Draw diagrams in pencil
- Board-approved calculators may be used
- Approved data sheets and periodic tables may be used
- All necessary working should be shown in every question

Total marks – 50

Section I Pages 2-5

12 Marks

- Attempt all questions
- Choose A or B or C or D
- Allow about 20 minutes for this part

Section II Pages 6-11

38 Marks

- Attempt all questions
- Write on the lines provided
- Allow about 1 hour and 10 minutes for this part

Section I**12 marks****Attempt Questions 1–12****Allow about 20 minutes for this part**

- 1 What is the correct order for increasing abundance of water in each sphere of the planet?
- (A) atmosphere, lithosphere, biosphere, hydrosphere
 - (B) atmosphere, biosphere, lithosphere, hydrosphere
 - (C) lithosphere, atmosphere, biosphere, hydrosphere
 - (D) lithosphere, biosphere, lithosphere, hydrosphere
- 2 Solid water can be found in;
- I) Lithosphere
 - II) Biosphere
 - III) Hydrosphere
 - IV) Atmosphere
- (A) I and IV
 - (B) I, II and III
 - (C) I, III and IV
 - (D) None of the above
- 3 Water is an important reactant for organisms in which of the following reaction?
- (A) Photosynthesis
 - (B) Respiration
 - (C) Both (A) and (B)
 - (D) None of the above

- 4 A student is presented with the following information about 3 substances (X, Y and Z) with similar molecular weight.

Substance	Polarity	Shape
X	Polar	Asymmetric molecule
Y	Non-polar	Symmetrical molecule
Z	Polar	Crystal lattice

Through estimation, which of the following lists the substances correctly by increasing melting point?

- (A) Z; X; Y
(B) X; Y; Z
(C) Y; X; Z
(D) Z; Y; X
- 5 Water has a higher boiling point than hydrogen sulfide because;
- (A) The O-H covalent bonds in water are stronger than the S-H ones hydrogen sulfide
(B) Water is a heavier molecule than hydrogen sulfide
(C) There are stronger intermolecular forces in water than in hydrogen sulfide
(D) Water is a polar molecule whereas hydrogen sulfide is not
- 6 Which of the following are intramolecular forces?
- I) Covalent bonding
II) Dipole-dipole interactions
III) Dispersion forces
IV) Hydrogen bonding
- (A) I and III
(B) II, III and IV
(C) I only
(D) III and IV

- 7 Dispersion forces are found in
- (A) All molecules
 - (B) Non-polar molecules only
 - (C) Polar molecules only
 - (D) Polar molecules containing hydrogen bonds
- 8 Which of the following molecules is polar?
- (A) CCl_4
 - (B) $BeCl_2$
 - (C) HCl
 - (D) Cl_2
- 9 Which of these atoms is the most electronegative?
- (A) Oxygen
 - (B) Carbon
 - (C) Neon
 - (D) Sulfur
- 10 Which of the following is the main reason for the existence of dispersion forces?
- (A) The attraction between electrons and neutrons
 - (B) The uneven distribution of electrons throughout molecules
 - (C) The difference in electronegativity between neighbouring atoms
 - (D) Covalent bonding

- 11** Which of the following statements is true?
- (A) Van Der Waals forces is another name for dipole-dipole interactions
 - (B) Hydrogen bonds are not bonds
 - (C) Dispersion forces in symmetrical molecules cancel each other out
 - (D) None of the above
- 12** Which of the following properties of water explains its role in weathering?
- (A) Its high heat capacity
 - (B) Its polarity
 - (C) Its electronegativity
 - (D) None of the above

End of Section I

Section II**38 marks****Attempt Questions 13-16****Allow about 1 hour and 10 minutes for this part**

13 The polar nature of water is what gives it many of its unique properties.

(a) Define electronegativity **(2 marks)**

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(b) Explain how polar bonding arises **(3 marks)**

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(c) Identify what is common to all molecules that exhibit net dipoles. **(1 mark)**

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(d) Explain how dipole-dipole interactions arise

(2 marks)

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(e) Draw the Lewis electron diagrams of water, methane and ammonia. Indicate the charges on the atoms and the net dipoles, if any. **(6 marks)**

14 A student was given 3 chemicals; water, ammonia and hydrogen sulfide.

(a) Identify what intermolecular forces are present in each of the chemicals. **(3 marks)**

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(b) The student consults a S.I. data book to discover the following information:

Chemical	Boiling Point ($^{\circ}\text{C}$)
Water	100
Ammonia	-33.3
Hydrogen Sulfide	-60.3

Account for the difference in boiling point between ammonia and water. **(3 marks)**

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- (c) Methane has a similar molecular weight to water yet has a much lower boiling point of -161.5°C . Explain why water has a higher boiling point than methane. **(2 marks)**

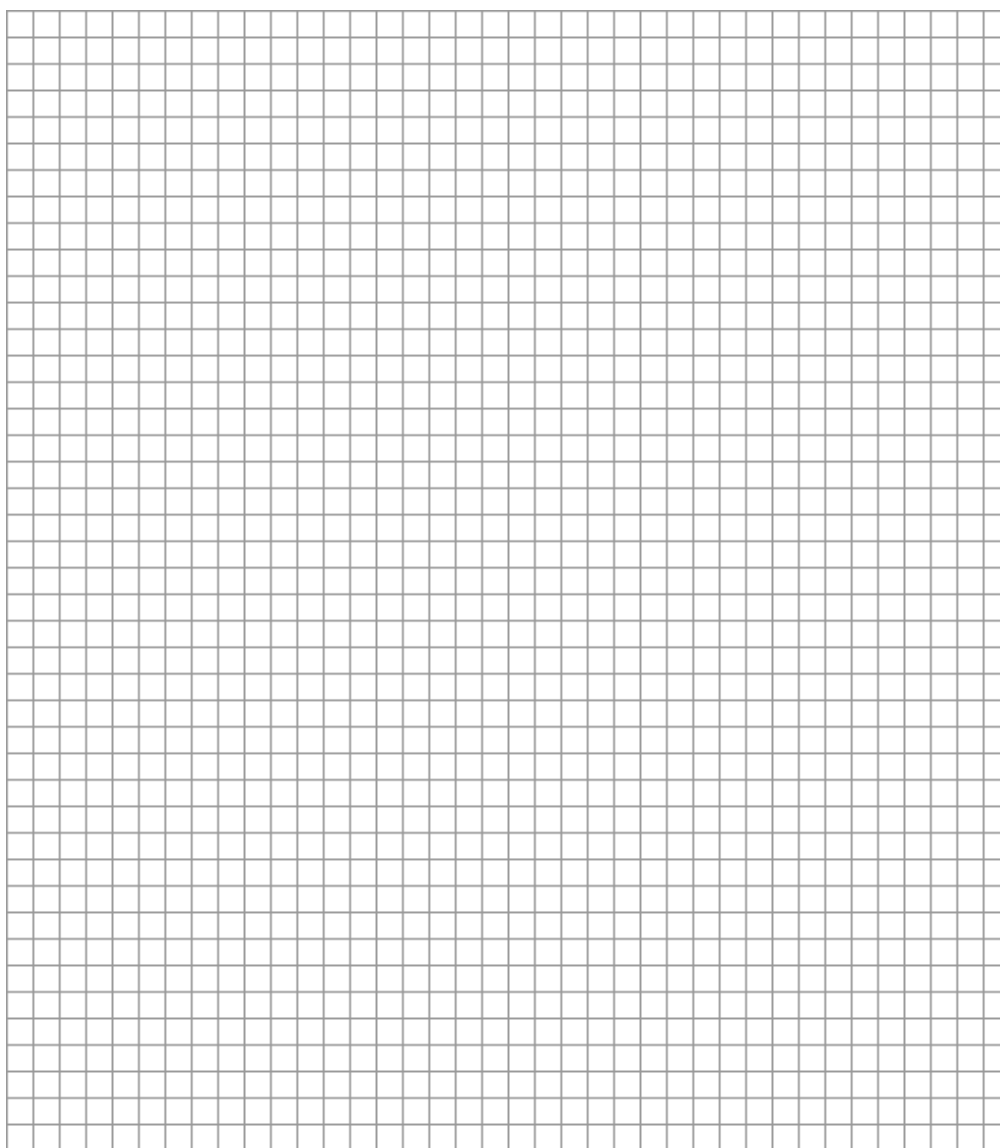
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- (d) Graph the boiling points of water, ammonia, hydrogen sulfide and methane **(5 marks)**



15 Water is an extremely important solvent and has many applications in different areas.

(a) Define the terms solvent, solute, solution and dissolution.

(4 marks)

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(b) Describe the importance of each different state of water

(3 marks)

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16 The planet Earth can be summarised into 4 spheres; biosphere, lithosphere, atmosphere and hydrosphere.

(a) Compare the state, percentage and distribution of water in the biosphere, lithosphere, hydrosphere and atmosphere. **(4 marks)**

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End of paper