Chemistry

This sample test paper has been prepared as part of the Pearson suite of resources for the Year 11, Unit 2, ATAR Chemistry Course prescribed by the Western Australian School Curriculum and Standards Authority.

Unit 2

Area of Study 7 Test

Chemistry in our water

Time allowed

Reading time: 5 minutes Working time: 45 minutes

Materials required

An approved non-programmable calculator.

Chemistry Data Booklet. This may be downloaded from the SCSA website.

Structure of this paper

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be answered | Suggested working time (minutes) | Marks available | Percentage  of total test |
| Section 1: Multiple choice | 7 | 7 | 10 | 14 | 31 |
| Section 2:  Short answer | 4 | 4 | 35 | 31 | 69 |
| Total | | | 45 | 45 | 100 |

Section 1: Multiple choice 31% (14 marks)

This section has 7 questions. Answer all questions by circling the correct option. Marks will not be

deducted for incorrect answers. No marks will be given if more than one answer is completed for

any question.

Suggested working time: 10 minutes

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

A Water molecules are polar and so water is a good solvent.

B Water has a high latent heat value and so is a good coolant.

C Water expands on freezing and so lakes are covered with a layer of ice in very cold climates.

D Water has a low specific heat capacity and so large bodies of water moderate temperatures on Earth.

2 Which one of the equations below best represents table sugar, C12H22O11, dissolving in water?

A C12H22O11(s) + H2O(l) → C12H23O11(aq) + OH−(aq)

B C12H22O11(s) + H2O(l) → C12H21O11−(aq) + H3O+(aq)

C C12H22O11(s)  C12H22O11(aq)

D C12H22O11(s)  C12H22O11(l)

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

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

4 Addition of which one of the following substances to an aqueous solution of copper(II) sulfate will notresult in the formation of a precipitate?

A BaCl2(aq)

B NH4Cl(aq)

C Na2CO3(aq)

D K2S(aq)

5 The solubility of ammonium chloride at 0°C is 28 g per 100 g water and at 70°C it is 85 g per 100 g water.

After dissolving 8.0 g of ammonium chloride in 25.0 g water at 70°C, a solution is then cooled to 0°C. What mass of ammonium chloride crystallises out, assuming a supersaturated solution does not form?

A None will crystallise.

B 1.0 g

C 7.0 g

D 8.0 g

6 Which one of the following solutions has the highest pH?

A lemon juice

B 1.0 mol L−1 hydrochloric acid

C 1.0 mol L−1 sodium hydroxide

D 1.0 mol L−1 barium hydroxide

7 Which one of the following aqueous solutions will have the highest electrical conductivity?

A 0.01 mol L−1 Na2SO4

B 0.01 mol L−1 NH4Cl

C 0.01 mol L−1 NaCl

D 0.01 mol L−1 H2CO3

End of section 1

Section 2: Short answer 69% (31 marks)

This section has 4 questions. Answer all questions. Write your answers in the space provided. When calculating numerical answers, show your working or reasoning clearly. Express numerical answers to the appropriate number of significant figures and include appropriate units where applicable.

Do not use abbreviations, such as ‘nr’ for ‘no reaction’, without first defining them.

Suggested working time: 35 minutes

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Question 8 (8 marks)

One of the important properties of water is that it is an excellent solvent.

a Describe the structural features of the water molecule and explain how these allow it to be a solvent for a variety of compounds. (4 marks)

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b Describe one way in which the solvent properties of water are important in a biological context. Your description needs to indicate the features of the biological substances you discuss that relate to water’s solvent properties. (2 marks)

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c Explain why pure water is not found in nature. (2 marks)

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Question 9 (9 marks)

Small amounts of solid magnesium chloride and liquid ethanol are dissolved in separate beakers of water.

a i Write an equation for the dissolving process of magnesium chloride in water. (1 mark)

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ii What attractive forces need to break in the solid magnesium chloride for it to dissolve?

(1 mark)

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iii What attractive forces are formed when magnesium chloride dissolves in water?

(1 mark)

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b i Write an equation for the dissolving process of ethanol, C2H5OH, in water. (1 mark)

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ii What attractive forces need to break in the liquid ethanol for it to dissolve? (1 mark)

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iii What attractive forces are formed when ethanol dissolves in water? (1 mark)

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c i Which solution would you expect to be the better conductor of electricity? (1 mark)

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ii Justify your answer to part i. (2 marks)

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Question 10 (10 marks)

a Write ionic equations for reactions between each of the following.

i solutions of barium nitrate and potassium sulfate (1 mark)

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ii hydrochloric acid and zinc powder (2 marks)

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iii dilute nitric acid and solid sodium carbonate (2 marks)

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iv sodium hydroxide solution and dilute sulfuric acid (1 mark)

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b Give full observations for the reactions between each of the following. Include the appearance of substances before and after reaction.

i Solutions of dilute hydrochloric acid and magnesium carbonate are mixed. (2 marks)

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ii Copper(II) sulfate solution is mixed with an excess of potassium carbonate solution.

(2 marks)

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Question 11 (4 marks)

If 12.75 mL of 0.188 mol L−1 sodium hydroxide solution is needed to precipitate all the lead from 25.0 mL of solution of lead(II) nitrate, calculate the mass of lead(II) ions in the solution. The balanced equation for the reaction is shown below.

2NaOH(aq) + Pb(NO3)2(aq) → 2NaNO3(aq) + Pb(OH)2(s)

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End of questions