

Name \_\_\_\_\_

# SYDNEY BOYS HIGH SCHOOL



## HSC CHEMISTRY ASSESSMENT TASK

### PRODUCTION OF MATERIALS

### THE ACIDIC ENVIRONMENT

APRIL 2004

Time allowed - 1 hour

Total marks: 42

#### **Instructions**

All answers and working to be shown

**Section A - (1 mark each)**

1. Polyvinyl chloride (PVC) is an important polymer. Select the correct response about PVC.
- (A) PVC is a condensation polymer that is used for food wraps.
  - (B) PVC is a condensation polymer used for piping and guttering.
  - (C) PVC is an addition polymer that is used for electrical insulation, guttering and flooring.
  - (D) PVC is an addition polymer that is commonly used for foam drinking cups, foam packing and food packaging.

2. An ester has the chemical formula  $CH_3CH_2COOCH_2CH_2CH_2CH_3$ . The name of this ester is:

- (A) propyl butanoate
- (B) ethyl butanoate
- (C) butyl propanoate
- (D) butyl ethanoate.

3. The equation shows the bombardment of U-235 with a neutron which initiates a fission reaction.

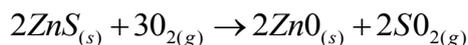


Which of the following correctly identifies specie X?

- (A) Pa-91                      (B) Np-93                      (C) Kr-36                      (D) Kr-86
4. 25ml of a 0.125 M solution of HCl is pipetted into a 500 ml volumetric flask. The volume is made up to 500 ml with distilled water. What is the pH of the diluted solution?
- (A) 0.9                      (B) 2.2                      (C) 2.7                      (D) 3.6
5. The addition of water to ethylene requires a catalyst. Name the catalyst and the product of the addition reaction.
- (A) phosphoric acid; ethanol
  - (B) yeast; ethane
  - (C) sulfuric acid; 1,2-ethanediol
  - (D) platinum; ethanol
6. Acetic acid, sulfuric acid and dihydrogen phosphate ions can all act as Bronsted-Lowry acids. The names of their respective conjugate bases are:
- (A) acetate ion; sulfate ion; phosphoric acid
  - (B) acetate ion; hydrogen sulfate ion; hydrogen phosphate ion
  - (C) hydrogen acetate ion; sulfate ion; hydrogen phosphate ion
  - (D) acetate ion; sulfate ion; trihydrogen phosphate ion.

**Section A** (continued)

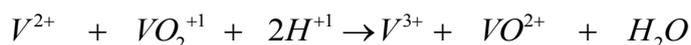
7. The extraction of copper from its sulfide ore produces sulfur dioxide as a by-product, as illustrated in the following equation.



What volume of sulfur dioxide gas will be produced at

25°C and 100 kPa if 3.2 g of Zinc sulfide is reacted?

- (A) 368 ml      (B) 410 ml      (C) 735 ml      (D) 813 ml
8. An important industrial source of ethylene is:
- (A) cracking of various petroleum fractions  
(B) grain fermentation  
(C) bacterial decomposition of cellulose  
(D) dehydration of ethanol
9. The following oxidation/reduction cell which is currently under development acts as a galvanic cell during the reaction,



which of the species below is the oxidant in this reaction?

- (A)  $V^{3+}$       (B)  $VO_2^{+1}$       (C)  $H^{+1}$       (D)  $V^{2+}$
10. Which of the following applies to neutralisation reactions?
- (A) Electron transfer, endothermic  
(B) Proton transfer, endothermic  
(C) Electron transfer, exothermic  
(D) Proton transfer, exothermic
11. How is a condensation polymer formed?
- (A) By water condensing to a liquid  
(B) By adding together monomer molecules without the loss of any atoms.  
(C) By the addition of a small molecule when pairs of monomer molecules join together.  
(D) By the elimination of a small molecule when pairs of monomer molecules join together.

12. The reaction below is an example of an exothermic equilibrium reaction.



Which of the following would result in the greatest increase in the solubility of carbon dioxide in water?

- (A) Increasing the carbon dioxide concentration  
(B) Increasing the amount of water  
(C) Addition of a suitable catalyst  
(D) Decreasing the temperature

**SECTION A (12 marks)****ANSWERS**

<b>1</b>				
<b>2</b>				
<b>3</b>				
<b>4</b>				
<b>5</b>				
<b>6</b>				
<b>7</b>				
<b>8</b>				
<b>9</b>				
<b>10</b>				
<b>11</b>				
<b>12</b>				

**SECTION B (30 marks)**

Marks

13. An acid, HX, is prepared by dissolving 0.1 moles of it in enough water to make 1 litre of solution. A pH meter shows that the solution pH is 3.5.

(A) Calculate the  $[H_3O^{+1}]$  for the solution. 1

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(B) Explain whether HX is a weak or strong acid. 2

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(C) The salt, NaX, is dissolved in water. Predict whether the solution is acidic, neutral or basic, using an appropriate equation to justify your prediction. 2

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16. The pH of human blood is maintained at about 7.4 by various buffers. One of the most important of these is the dihydrogen phosphate/hydrogen phosphate ( $\text{H}_2\text{PO}_4^-/\text{HPO}_4^{2-}$ ) equilibrium.

(A) Write an equation for this equilibrium. 1

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(B) With reference to this equation, explain how a solution containing this buffer could resist a change in pH if a small amount of acid were added to it. 3

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17. The accuracy of acid-base titrations depends on several factors. These include the primary standard used, how the glassware is prepared and how the equivalence point is determined.

(A) Explain why sodium hydroxide is not used as a primary standard. 1

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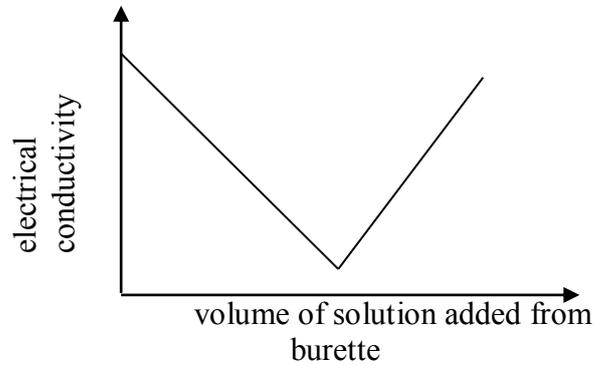
(B) Anhydrous sodium carbonate can be used as a primary standard. How can we ensure that the sodium carbonate remains anhydrous? 1

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(C) During a titration, a conical flask is prepared by rinsing it with distilled water. While this flask is still wet, a clean dry pipette is used to transfer 20 ml of a standard solution into it. Will the accuracy of the titration be affected? Explain your answer. 2

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- (D) Although an indicator can be used to determine the equivalence point of an acid-base titration, an alternative method is to monitor the electrical conductivity of the reaction mixture during the titration. The following graph shows the variation in electrical conductivity during such a titration.



Explain why the electrical conductivity:

- (i) starts at a maximum but then decrease to a minimum value. 1

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- (ii) does not reach a zero value. 1

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- (iii) starts to increase again after the minimum value. 1

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Please turn over

