**Year 12 Chemistry Topic Test #3 - 2011**

Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Mark = \_\_\_\_\_ / 57

# Part 1: Multiple Choice Section 10 marks

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

1. Which of the following exhibits geometrical isomerism?

A. trifluoroethene

B. 1-chloro-2-bromoethane

C. methylpropene

D. pent-2-ene

1. Which of the following is a tertiary alcohol?

A. cyclobutanol

B. 2-methylcyclobutanol

C. 1-methylcyclopentanol

D. dimethylpropan-1-ol

1. Addition of hydrogen chloride to propene can produce which of the following substances?

I. 1-chloropropane

II. 2-chloropropane

III. 1,2-dichloropropane

IV. 2-chloropropene

A. I and II

B. I, II and III

C. II only

D. II and III

1. The oxidation of butan-2-ol with acidified potassium permanganate will produce?

A. butanoic acid

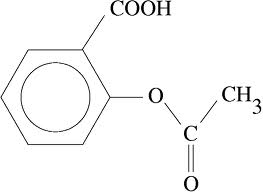
B. butanal

C. butanone

D. no reaction

**The following two questions are about aspirin;**

5. Aspirin contains the following substance:



Which of the following functional groups does aspirin contain?

I. aldehyde

II. ketone

III. carboxylic acid

IV. ester

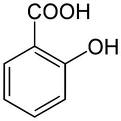
A. II and III

B. III and IV

C. I and II

D. all of them

6 Aspirin can be manufactured from salicylic acid, whose structure is given below:



To convert salicylic acid into aspirin, what other substance should it be reacted with?

A. ethanol

B. ethanoic acid

C. acidified potassium dichromate

D. sodium hydroxide solution

1. The empirical formula of 1,4-dimethylbenzene is:

A. C4H5

B. C6H10

C. C8H10

D. CH2

8. Which of the following is not an isomer of the other three?

A. butanoic acid

B. 2-propyl methanoate

C. butan-1,2-diol

D. methyl propanoate

## 9. Which of the following represents a soap?

A. CH3(CH2)16COOK

B. NaOH

C. CH3COONa

D. CH2OH

|

CHOH

|

CH2OH

10. Which of the following reactants are capable of forming a condensation

polymer under suitable conditions?

A. HOCH2CH2CH2CH2CH2CH2CH2COOH

H H

\ /

B. C=C

/ \

H C

H H

\ /

C. C=C

/ \

H C=O

I

O

\

CH3

D. HOOCCH2CH2CH2CH2CH2CH2CH2COOH

and

HOOCCH2CH2CH2COOH

# Part 2: Short Answer Section 47 marks

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

11. Name and draw full structural formula to represent the following substances;

|  |  |
| --- | --- |
| A saturated isomer of C4H8 |  |
| An alkene with 4 carbon  atoms that does not exhibit  geometric (cis/trans) isomerism |  |
| The product of reacting  cis-pent-2-ene with hydrogen |  |
| A structural isomer of  methyl methanoate that fizzes when added to sodium carbonate solution |  |
| An amine with 5 hydrogen atoms |  |
| The organic product formed when  one molecule of cyclohexane  reacts with one molecule of chlorine  in the presence of UV light |  |

(12 marks)

12. Complete the following table.

|  |  |  |
| --- | --- | --- |
| Molecule | Major type of intermolecular attraction  (choose from dispersion forces,  dipole-dipole or hydrogen bonding) | Boiling point ranking  (1 = highest, 5 = lowest) |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

(8 marks)

13. The structures of glycine and alanine are shown below:

|  |  |
| --- | --- |
|  |  |

(a) To which class of compounds do they both belong?

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

(1 mark)

(b) What is the main intermolecular force between alanine molecules?

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

(1 mark)

(c) A glycine molecule and an alanine molecule can react with each other in a

condensation reaction to form a new substance called a dipeptide.

Draw one of the two possible dipeptides that could be formed below.

|  |
| --- |
|  |

(3 marks)

14. There are four isomeric alcohols, all of which have the molecular formula, C4H10O.

Draw each of these alcohols, and draw their oxidation product(s) when reacted with

acidified potassium dichromate solution.

|  |  |
| --- | --- |
| Alcohol | Oxidation product(s) |
|  |  |
|  |  |
|  |  |
|  |  |

10 marks

15. 2.19 g of an organic compound X is completely burnt in excess oxygen, forming 3.21 g of

carbon dioxide and 1.32 g of water.

(a) Calculate the empirical formula of X.

(7 marks)

In a second experiment it was found that 0.473 g of X occupied 278 mL, measured at

200oC and 1.10 atm.

(b) Calculate the molecular formula of the compound.

(3 marks)

(c) Given that, at STP, X is a sweet smelling liquid, draw the structural formula of

X and name it.

(2 marks)

**End of Test**

SVACS

**Year 12 Chemistry Topic Test #3 - 2011**

Name: **ANSWERS** Mark = \_\_\_\_\_ / **57**

# Part 1: Multiple Choice Section 10 marks

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

1. **D** 2. **C** 3. **A** 4. **C** 5. **B** 6. **B** 7. **A** 8. **C** 9. **A** 10. **A**

# Part 2: Short Answer Section 47 marks

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

11. Name and draw full structural formula to represent the following substances;

|  |  |  |
| --- | --- | --- |
| A saturated isomer of C4H8 |  | http://upload.wikimedia.org/wikipedia/commons/d/da/MethylCyclopropane.png |
| **cyclobutane** | **methylcyclopropane** |
| An alkene with 4 carbon  atoms that does not exhibit  geometric (cis/trans) isomerism |  |  |
| **methylpropene** | **1-butene** |
| The product of reacting  cis-pent-2-ene with hydrogen |  | |
| **pentane** | |
| A structural isomer of  methyl methanoate that fizzes when added to sodium carbonate solution |  | |
| **ethanoic acid** | |
| An amine with 5 hydrogen atoms | **http://www.websters-online-dictionary.org/images/wiki/wikipedia/en/thumb/3/34/Methylamine.png/100px-Methylamine.png** | |
| **methanamine** | |
| The organic product formed when  one molecule of cyclohexane  reacts with one molecule of chlorine  in the presence of UV light | **http://wtt-pro.nist.gov/images/542187.gif** | |
| **chlorocyclohexane** | |

**✓ each** (12 marks)

12. Complete the following table.

|  |  |  |
| --- | --- | --- |
| Molecule | Major type of intermolecular attraction  (choose from dispersion forces,  dipole-dipole or hydrogen bonding) | Boiling point ranking  (1 = highest, 5 = lowest) |
|  | **hydrogen bonding** | **2** |
|  | **dipole-dipole forces** | **3** |
|  | **hydrogen bonding** | **1** |
|  | **dispersion forces** | **4** |
|  | **dispersion forces** | **5** |

**✓ each** (8 marks)

13. The structures of glycine and alanine are shown below:

|  |  |
| --- | --- |
|  |  |

(a) To which class of compounds do they both belong?

**Amino acids ✓**

(1 mark)

(b) What is the main intermolecular force between alanine molecules?

**Hydrogen bonding ✓**

(1 mark)

(c) A glycine molecule and an alanine molecule can react with each other in a

condensation reaction to form a new substance called a dipeptide.

Draw one of the two possible dipeptides that could be formed below.

|  |  |
| --- | --- |
|  |  |

**✓✓✓**  (3 marks)

14. There are four isomeric alcohols, all of which have the molecular formula, C4H10O.

Draw each of these alcohols, and draw their oxidation product(s) when reacted with

acidified potassium dichromate solution.

|  |  |  |
| --- | --- | --- |
| Alcohol | Oxidation product(s) | |
| **CH3CH2CH2CH2OH**  (1-butanol) | **CH3CH2CH2CHO** | **CH3CH2CH2COOH** |
| **CH3CH2CHOHCH3**  (2-butanol) | **CH3CH2COCH3** | |
| **CH3CH(CH3)CH2OH**  (methyl-1-propanol) | **CH3CH(CH3)CHO** | **CH3CH(CH3)COOH** |
| **CH3CH(OH)(CH3)CH3**  (methyl-2-propanol) | **none** | |

**✓ each**  (10 marks)

15. 2.19 g of an organic compound X is completely burnt in excess oxygen, forming 3.21 g of

carbon dioxide and 1.32 g of water.

(a) Calculate the empirical formula of X.

|  |  |  |
| --- | --- | --- |
| **C** | **H** | **O** |
| m(C) = x m(CO2)= 0.876 g ✓ | m(H) = x m(H2O)= 0.148 g ✓ | **m(O) = 2.19 – m(C) – m(H)**  **= 1.166 g ✓** |
| **n(C) = 0.876 / 12.01**  **= 0.0729 ✓** | **n(H) = 0.148 / 1.008**  **= 0.1465 ✓** | **n(O) = 1.166 / 16**  **= 0.0729 ✓** |
| **0.0729** | | |
| **1** | **2** | **1** |

**∴ EF = CH2O ✓**

(7 marks)

In a second experiment it was found that 0.473 g of X occupied 278 mL (**= 0.278 L**),

measured at 200oC (**= 473.1 K**) and 1.10 atm ( **= 1.10/1 x 101.3 = 111.4 kPa**).

(b) Calculate the molecular formula of the compound.

**n = PV/RT = (111.4 x 0.278)/(8.315 x 473.1) = 0.00787 mol ✓**

**M = m/n = 0.473 / 0.00787 = 60.1 g mol–1 ✓**

**M/EFM = 60.1 / 30.026 ≈ 2**

**∴ MF = 2 x EF = C2H4O2 ✓**

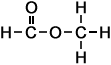
(3 marks)

(c) Given that, at STP, X is a sweet smelling liquid, draw the structural formula of

X and name it.

**∴ ester**

**methyl methanoate ✓**

 **✓**

(2 marks)

**End of Test**