**Year 12 Chemistry Topic Test #3 (Organic) - 2012**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Mark = \_\_\_\_\_ / 55

# Part 1: Multiple Choice Section 5 marks

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

1. How many hydrogen atoms are there in a molecule of 3,3-dimethyl octanoic acid?

A. 20

B. 16

C. 18

D. 19

2. Which of the following is least likely to be an oxidation product of propan-1-ol?

A. CH3COCH3

B. CH3CH2CHO

1. CH3CH2COOH
2. CO2

3. A sweet smellng organic compound X of formula C5H10O2 forms an alcohol and an acid when boiled with hydrochloric acid. One of these compounds forms a ketone when treated with acidified potassium dichromate solution.

Which of the following could be compound X?

A. (CH3)2CHCOOCH3

B. CH3CH2COOCH2CH3

C. CH3(CH2)3COOH

D. CH3COOCH(CH3)2

4. Which one of the following procedures would enable you to distinguish between

butanoic acid and 2-methylbutan-2-ol?

A. Shaking the compound with bromine water and observing a colour change.

B. Warming the compound with an acidified solution of sodium dichromate and

observing a colour change.

C. Shaking the compound with ethanol and observing whether the two liquids mix.

D. Add sodium carbonate crystals and observe a gas given off

5. A student determined the following properties of an organic compound, X.

* X contains carbon, hydrogen and oxygen
* X is neutral to moist litmus paper
* On reaction with acidified potassium permanganate solution, the product turned moist litmus paper red.

Which of the following could be compound X?

A. propanone

B. propan-1-ol

C. propan-2-ol

D. propanoic acid

**End of Part 1**

**Part 2: Short Answer Section 50 marks**

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

1. Write fully balanced equations for any reactions that occur in the following procedures. If no

reaction occurs, write ‘no reaction’. Write the name of any organic product formed.

(a) The combustion of octane in excess oxygen.

*Equation:* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) Propan-1-ol is added to methanoic acid in the presence of concentrated sulfuric acid.

*Equation:* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Name of organic product:* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(2+2+1 = 5 marks)

2. Complete the table below by naming a reactant that will react with the reactant in column 1 to give the product in column 3.

|  |  |  |
| --- | --- | --- |
| *Reactant 1* | *Reactant 2* | *Product formed* |
| ethene |  | ethanol |
| propene |  | 2-chloropropane |
| ethanol |  | ethyl propanoate |
| butanoic acid |  | 1-propylbutanoate |

(4 marks)

3. Give the order of the boiling points of these chemicals, numbering them 1 to 6, with 6 being the highest value.

|  |  |
| --- | --- |
| *Compounds* | *Order of boiling points*  *(1 – 6)* |
| butan-1-ol |  |
| methylpropane |  |
| butanoic acid |  |
| butan-2-ol |  |
| butane |  |
| butanal |  |

(6 marks)

4. Use the following condensed structural formulae to answer the questions that follow:

**A** CH3CH2CH2CH2CH2OH

**B** CH3CH(OH)CH2CH2CH3

**C** CH3CH(OH)CH(CH3)CH3

**D** CH3C(CH3)2CH2OH

**E** CH3C(OH)CH2CH3

|

CH3

Choose which compounds (**A**, **B**, **C**, **D** or **E**) which will give each of the following reactions (there may be more than one answer in each case)

(a) Which compound(s) react with a warm solution containing sulfuric

acid and potassium dichromate to produce a carboxylic acid. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) Which compound(s) react with a warm solution containing sulfuric

acid and potassium dichromate to produce a ketone. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(c) Which compound(s) would show no visible signs of a reaction

with a warm solution containing sulfuric acid and

potassium dichromate. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(d) Write the structure and name for the oxidation product of **C** with acidified potassium

permanganate.

*structure* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *name* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(e) Write the equation for the reaction between **D** and methanoic acid in the presence of

concentrated sulfuric acid.

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

(f) Class alcohols **C** and **E** as primary (1o), secondary (2o) or tertiary (3o)

|  |  |
| --- | --- |
| *Alcohols* | *Class* |
| C |  |
| E |  |

(11 marks)

5. Write IUPAC names for the following compounds.

|  |  |
| --- | --- |
| *Compounds* | *Names* |
| CH3CH2COOCH3 |  |
| (CH3)3CH |  |
| CH3CH(CH3)CH2CH2COCH3 |  |

(3 marks)

6. Draw a piece of polymer using but-1-ene as the monomer; show 3 repeating units.

|  |
| --- |
|  |

(2 marks)

7. An organic compound X has an empirical formula C2H4O.

0.0278 mol of this compound has a mass 2.45 g.

(a) What is the molecular formula of compound X? Show all working.

(b) Compound X has several isomers.

(i) Isomer 1 is a sweet smelling liquid which was prepared using propan-2-ol as one

of its reactants. Give structure of isomer 1.

*structure* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(ii) Isomer 2 is also a sweet smelling liquid but ethanoic acid was used in its

preparation. Give structure and name of isomer 2.

*structure* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*name* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(iii) Isomer 3 gives off a gas when added to solid sodium carbonate.

Give structure and name of isomer 3.

*structure* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*name* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(3 + 5 = 8 marks)

8. Two **α-amino acids** are shown below

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

(a) A chemical is said to be amphoteric if it can react with an acid and a base.

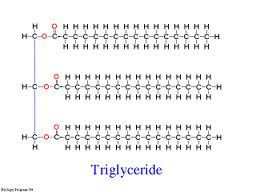
Glycine can be classed as an amphoteric chemical.

Using equations illustrate the amphoteric property of glycine

(b) Draw a piece of condensation polymer between glycine and alanine molecules

(4 + 2 = 6 marks)

9. Here is the structure of a typical saturated triglyceride fat;

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(a) What is the important functional group in this molecule? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) An important reaction of such fats and oils is hydrolysis by reaction with sodium hydroxide

solution. Draw the two main organic products of this hydrolysis.

|  |  |
| --- | --- |
| *Product 1* | *Product 2* |
|  |  |

(1,2,2=5 marks)

**End of Test**