**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** |
| Tthe 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) = $\frac{12.01}{44.01}$ x m(CO2)  = 0.876 g ✓ | m(H) = $\frac{2.016}{18.016}$ 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**