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

Name:_____ Mark = _____ / 57

Part 1: Multiple Choice Section **10 marks**

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1. Which of the following exhibits geometrical isomerism?

   A. trifluoroethene
   B. 1-chloro-2-bromoethane
   C. methylpropene
   D. pent-2-ene

2. Which of the following is a tertiary alcohol?

   A. cyclobutanol
   B. 2-methylcyclobutanol
   C. 1-methylcyclopentanol
   D. dimethylpropan-1-ol

3. 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

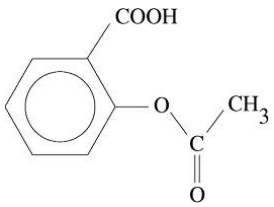
   A. I and II
   B. I, II and III
   C. II only
   D. II and III

4. 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:

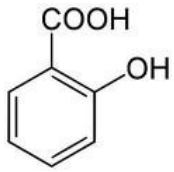


Which of the following functional groups does aspirin contain?

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

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

A. C_4H_5
B. C_6H_{10}
C. C_8H_{10}
D. CH_2

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. $CH_3(CH_2)_{16}COOK$

B. NaOH

C. CH_3COONa

D. CH_2OH
|
CHOH
|
CH_2OH

10. Which of the following reactants are capable of forming a condensation polymer under suitable conditions?

A. $HOCH_2CH_2CH_2CH_2CH_2CH_2CH_2COOH$

B.
H H
\ /
C=C
/ \
H Cℓ

C.
H H
\ /
C=C
/ \
H C=O
I
O
\
CH_3

D. $HOOCCH_2CH_2CH_2CH_2CH_2CH_2CH_2COOH$

and

$HOOCCH_2CH_2CH_2COOH$

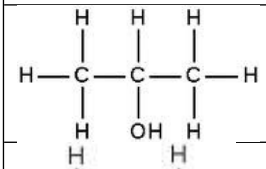
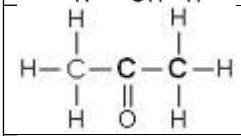
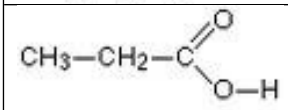
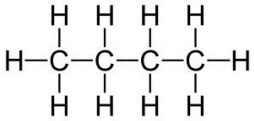
Part 2: Short Answer Section **47 marks**

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

A saturated isomer of C_4H_8	
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	

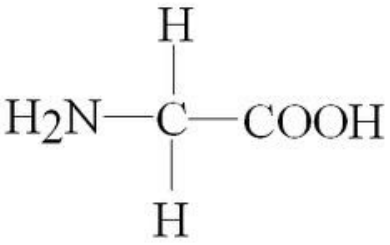
(12 marks)

12. Complete the following table.

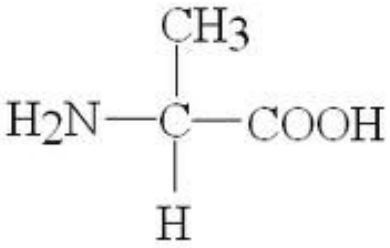
Molecule	Major type of intermolecular attraction (choose from dispersion forces, dipole-dipole or hydrogen bonding)	Boiling point ranking (1 = highest, 5 = lowest)
		
		
		
		

(8 marks)

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



glycine



alanine

(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, $C_4H_{10}O$.

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 200^{o}C 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**

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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**

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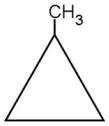
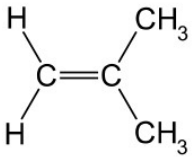
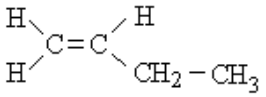
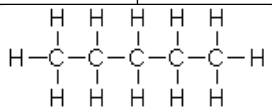
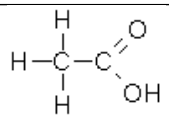
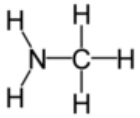
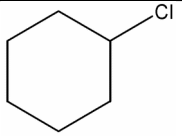
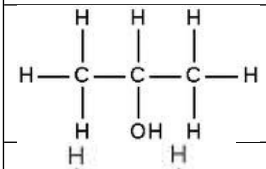
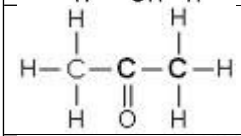
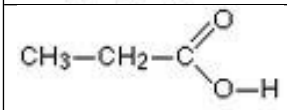
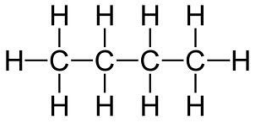
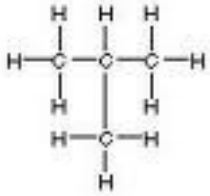
11. Name and draw full structural formula to represent the following substances;

A saturated isomer of C_4H_8		
	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		
	methanamine	
The organic product formed when one molecule of cyclohexane reacts with one molecule of chlorine in the presence of UV light		
	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)

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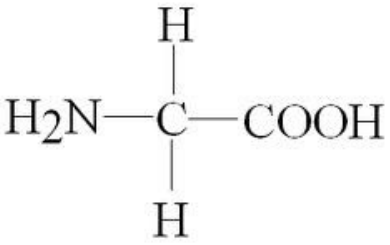
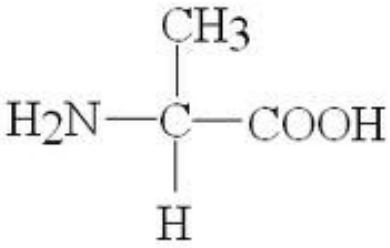


glycine



alanine

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

Amino acids ✓

(1 mark)

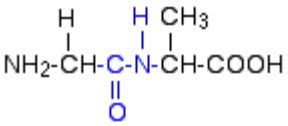
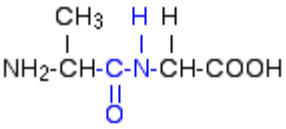
(b) What is the main intermolecular force between alanine molecules?

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, $C_4H_{10}O$.

Draw each of these alcohols, and draw their oxidation product(s) when reacted with acidified potassium dichromate solution.

Alcohol	Oxidation product(s)	
$CH_3CH_2CH_2CH_2OH$ (1-butanol)	**$CH_3CH_2CH_2CHO$**	**$CH_3CH_2CH_2COOH$**
$CH_3CH_2CHOHCH_3$ (2-butanol)	**$CH_3CH_2COCH_3$**	
$CH_3CH(CH_3)CH_2OH$ (methyl-1-propanol)	**$CH_3CH(CH_3)CHO$**	**$CH_3CH(CH_3)COOH$**
$CH_3CH(OH)(CH_3)CH_3$ (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(CO_2)	**m(H) = $\frac{2.016}{18.016}$ x m(H_2O)**	**m(O) = 2.19 – m(C) – m(H)**
= 0.876 g ✓	**= 0.148 g** ✓	**= 1.166 g** ✓
n(C) = 0.876 / 12.01	**n(H) = 0.148 / 1.008**	**n(O) = 1.166 / 16**
= 0.0729 ✓	**= 0.1465** ✓	**= 0.0729** ✓
1	**2**	**1**

0.0729

∴ EF = CH_2O ✓

(7 marks)

In a second experiment it was found that 0.473 g of X occupied 278 mL (**= 0.278 L**), measured at 200°C (**= 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

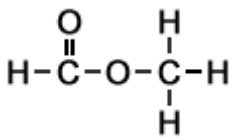
∴ MF = 2 x EF = $C_2H_4O_2$ ✓

(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