



**Year 12 Chemistry**  
**In-class assignment: Organic 2010**

Name: \_\_\_\_\_

Please answer the multiple choice questions on the answer key provided below:

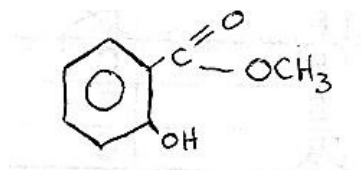
1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	
6	A	B	C	D	
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E
10	A	B	C	D	E

	<b>Mark</b>	<b>Out of</b>
<b>Part One</b>		10
<b>Part Two</b>		20
<b>Part Three</b>		10
<b>Total</b>		40

**Part One : Multiple Choice****(10 questions; 10 marks)**

Please answer these questions on the separate multiple choice answer sheet provided.

- Which one of the following sets of formulae contains only the molecular formulae of saturated chain hydrocarbons?
  - $C_2H_6$ ,  $C_4H_8$ ,  $C_6H_{10}$
  - $C_2H_6$ ,  $C_4H_{10}$ ,  $C_6H_{12}$
  - $C_2H_6$ ,  $C_5H_{12}$ ,  $C_8H_{18}$
  - $C_2H_6$ ,  $C_6H_6$ ,  $C_6H_{14}$
  - $C_2H_4$ ,  $CH_3CHO$ ,  $CH_3COOH$
- Methyl salicylate, which is commonly found in rubbing liniments, has the formula shown below:

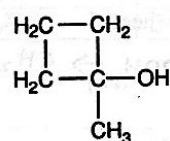


- Which functional groups are present in methyl salicylate?
- One alcohol and one ester
  - One alcohol and one ketone
  - One acid and one ketone
  - One acid and one aldehyde
  - One ether, one ketone and one alcohol
- Which of the following compounds does NOT exhibit geometrical (cis-trans) isomerism?
    - $CH_3CH_2CH=CCl_2$
    - $CH_3ClC=CClCH_3$
    - $CHCl=CHCl$
    - $CH_3CH=CHCH_3$
    - $CH_3CH_2ClC=CClCH_3$
  - Hexane will not dissolve in water because:
    - There is no chemical reaction between hexane and water.
    - Hexane cannot form hydrogen bonds with water.
    - The intermolecular forces within the two liquids are weak.
    - The hexane molecule is larger than the water molecule.
    - Hexane and water are made of different chemical elements.
  - The correct order of increasing boiling points for the substances propane, ethanol, 1, 1-dichloropropane, methane is:
    - Propane < ethanol < 1, 1-dichloropropane < methane
    - Methane < ethanol < 1, 1-dichloropropane < propane
    - Methane < propane < ethanol < 1, 1-dichloropropane
    - Methane < propane < 1, 1-dichloropropane < ethanol
  - Which statement is FALSE concerning the compound with the structure  $CH_3CH_2CH_2COOH$ ?
    - Its name is propanoic acid
    - It can be formed by dichromate oxidation of a primary alcohol
    - It is a weaker acid than hydrochloric acid
    - It reacts with propanol to form propyl butanoate

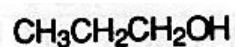
7. Which one of the following procedures would enable you to distinguish between 1-butanol and 2-methyl-2-propanol?
- Shaking the compound with acetic acid (ethanoic acid) and observing whether the two liquids mix.
  - Shaking the compound with ethanol and observing whether the two liquids mix.
  - Shaking the compound with bromine water and observing whether the orange is decolourised.
  - Warming the compound with a solution containing sodium dichromate and sulfuric acid and observing whether the orange colour changes to deep green.
  - None of the above, because both compounds are alcohols.

8. Which of the following are tertiary alcohols?

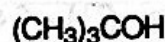
I



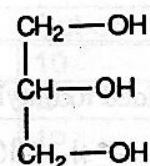
III



II

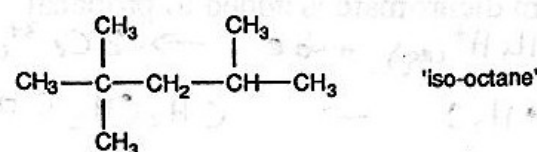


IV



- I and II only
  - I, II and IV only
  - II and IV only
  - II, III and IV only
  - All four alcohols
9. Which of the following would act as a detergent?

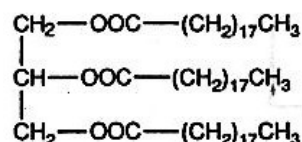
a)



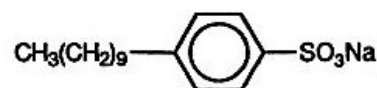
b)



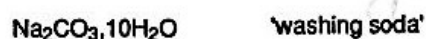
c)



d)



e)



10. Which of the following compounds can be oxidised to form a ketone?

- a)  $\text{CH}_3\text{OH}$
- b)  $\text{CH}_3\text{CH}_2\text{OH}$
- c)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- d)  $\text{CH}_3\text{CH}_2\text{CHOHCH}_3$
- e)  $(\text{CH}_3)_3\text{COH}$

**Part Two: Written****(3 questions; 18 marks)**

1. Write balanced ionic equations for the following reactions (if a reaction does occur)

a) ethanol is burnt in air

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b) propanol is mixed with butanoic acid and gently heated

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c) water is added to butyl ethanoate

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d) bromine water is added to ethene

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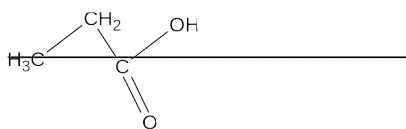
e) a solution of potassium dichromate is added to propanal

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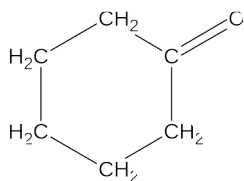
(10 marks)

2. Name the following structures

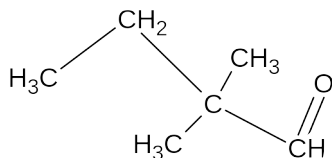
a)



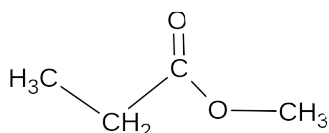
b)



c)



d)



(4 marks)

3. Rank the following substances in order of increasing solubility in water and give a reason for your ranking: ethanol, pentanol, ethanal and ethane.

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(4 marks)

4. What is an alpha amino acid? Draw a labelled structure to illustrate your answer.

(2 marks)

**Part Three: Calculations****(1 question; 10 marks)**

1. An unknown organic compound Z contains only the elements carbon, hydrogen and oxygen. When 1.200g of Z is completely burned in an excess of oxygen the products are found to be 1.440g of water and 1.994L of carbon dioxide measured at 127°C and 100kPa. When a further 1.200g of the compound is vapourised the vapour produced is found to be 664.8mL at 127°C and 100kPa.

a) Determine the empirical formula of Z

(5 marks)

b) Determine the molar mass and hence the molecular formula of Z.

(3 marks)

c) Given that Z will react with sodium metal to produce hydrogen gas, draw and name two possible structures for Z.

(2 marks)

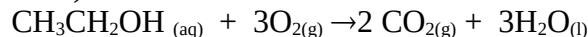
**Year 12 Chemistry**  
**In-class assignment: Organic 2006 – ANSWERS**

**Multiple Choice**

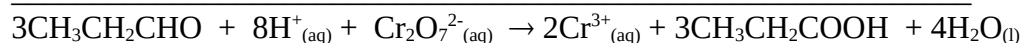
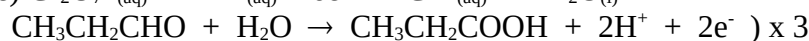
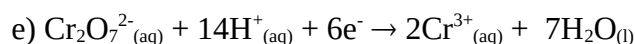
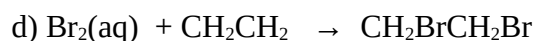
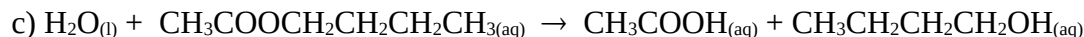
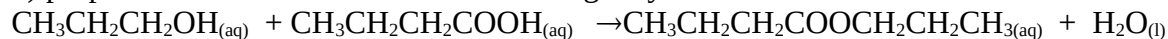
1. c    2. a    3. a    4. b    5. d    6. a    7. d    8. a    9. d    10. d

**Part Two**

1. a) ethanol burnt in air



b) propanol is mixed with butanoic acid and gently heated



2. a) propanoic acid

b) cyclohexanone

c) 2,2-dimethylbutanal

d) methyl propanoate

(4 marks)

3 ♥ ethane – has only dispersion forces

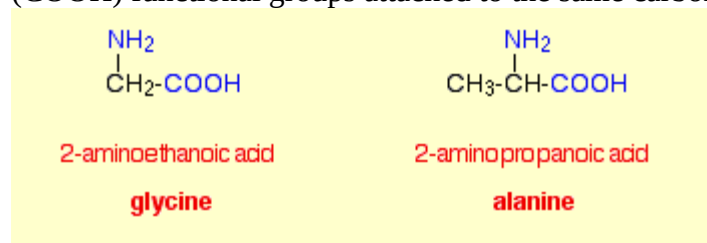
♥ ethanal – is polar due to carbonyl group, possible some weaker H-bonding between lone pairs of electrons on its carbonyl group and the positive charge on the water molecule

♥ pentanol – has H- bonding but longer non-polar hydrocarbon chain lessens magnitude of solute –solvent interaction

♥ ethanol – has H-bonding and can have solute-solvent H-bonding with H<sub>2</sub>O

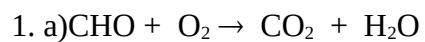
(4 marks)

4. an alpha amino acid is a molecule that has the amino (NH<sub>2</sub>) and carboxylic acid (COOH) functional groups attached to the same carbon atom




(2 marks)



**Part Three: Calculations**

1.200g                  v= 1.994L    1.440g

	<b>C</b>	<b>H</b>	<b>O</b>
mass	0.7200g 	$2.016/18.016 \times 1.440$ =0.1611	$1.200-(0.7200+0.1611)$ =0.3189
moles	$PV = nRT$ $(100)(1.994) = n(8.315)$ (400) n= 0.05995	$0.1611/ 1.008$ = 0.15986	$0.3189/16$ = 0.0199
ratio	$0.05995/0.0199$ = 3	$0.15986/0.0199$ = 8	$0.0199/0.0199$ =1

Therefore empirical formula is  $\text{C}_3\text{H}_8\text{O}$

b)  $PV = nRT$

$(100)(0.6648) = n(8.315)(400)$

$n = 0.019988$

$n = \text{mass} / \text{mass 1 mole}$

$\text{mass 1 mole} = 1.200 / 0.019988 = 60$

EF mass is also 60 so the molecular formula is the same as the empirical formula  
(3 marks)

c)

