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

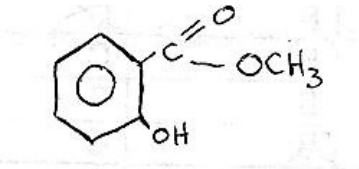
	Mark	**Out of**
Part One		10
Part Two		20
Part Three		10
Total		40

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

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

1. Which one of the following sets of formulae contains only the molecular formulae of saturated chain hydrocarbons?
   a) C_2H_6, C_4H_8, C_6H_{10}
   b) C_2H_6, C_4H_{10}, C_6H_{12}
   c) C_2H_6, C_5H_{12}, C_8H_{18}
   d) C_2H_6, C_6H_6, C_6H_{14}
   e) C_2H_4, CH_3CHO, CH_3COOH

2. Methyl salicylate, which is commonly found in rubbing liniments, has the formula shown below:



   Which functional groups are present in methyl salicylate?
   a) One alcohol and one ester
   b) One alcohol and one ketone
   c) One acid and one ketone
   d) One acid and one aldehye
   e) One ether, one ketone and one alcohol

3. Which of the following compounds does NOT exhibit geometrical (cis-trans) isomerism?
   a) $CH_3CH_2CH=CCl_2$
   b) $CH_3ClC=CClCH_3$
   c) $CHCl=CHCl$
   d) $CH_3CH=CHCH_3$
   e) $CH_3CH_2ClC=CCICH_3$

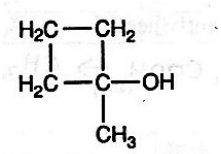
4. Hexane will not dissolve in water because:
   a) There is no chemical reaction between hexane and water.
   b) Hexane cannot form hydrogen bonds with water.
   c) The intermolecular forces within the two liquids are weak.
   d) The hexane molecule is larger than the water molecule.
   e) Hexane and water are made of different chemical elements.

5. The correct order of increasing boiling points for the substances propane, ethanol, 1, 1-dichloropropane, methane is:
   a) Propane < ethanol < 1, 1-dichloropropane < methane
   b) Methane < ethanol < 1, 1-dichloropropane < propane
   c) Methane < propane < ethanol < 1, 1-dichloropropane
   d) Methane < propane < 1, 1-dichloropropane < ethanol

6. Which statement is FALSE concerning the compound with the structure $CH_3CH_2CH_2COOH$?
   a) Its name is propanoic acid
   b) It can be formed by dichromate oxidisation of a primary alcohol
   c) It is a weaker acid than hydrochloric acid
   d) It reacts with propanol to form propyl butanoate

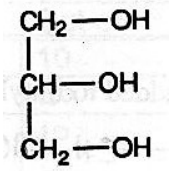
7. Which one of the following procedures would enable you to distinguish between 1- butanol and 2-methyl-2-propanol?
    a) Shaking the compound with acetic acid (ethanoic acid) and observing whether the two liquids mix.
    b) Shaking the compound with ethanol and observing whether the two liquids mix.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

8. Which of the following are tertiary alcohols?

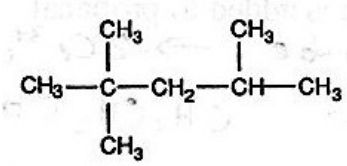
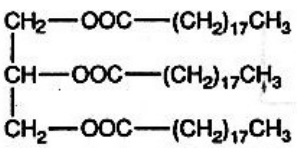
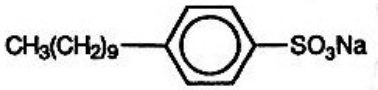
I 

III $CH_3CH_2CH_2OH$

II $(CH_3)_3COH$

IV 

    a) I and II only
    b) I, II and IV only
    c) II and IV only
    d) II, III and IV only
    e) All four alcohols

9. Which of the following would act as a detergent?
    a)  'iso-octane'
    b) $HO(CH_2)_{18}OH$
    c) 
    d) 
    e) $Na_2CO_3,10H_2O$ 'washing soda'

10. Which of the following compounds can be oxidised to form a ketone?
    a) CH_3OH
    b) CH_3CH_2OH
    c) $CH_3CH_2CH_2OH$
    d) $CH_3CH_2CHOHCH_3$
    e) $(CH_3)_3COH$

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

_____

b) propanol is mixed with butanoic acid and gently heated

_____

c) water is added to butyl ethanoate

_____

d) bromine water is added to ethene

_____

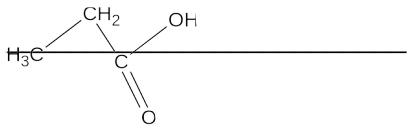
e) a solution of potassium dichromate is added to propanal

_____

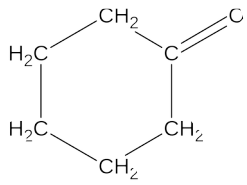
(10 marks)

2. Name the following structures

a)

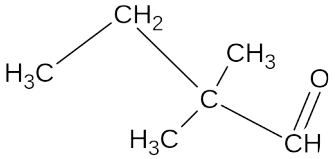


b)



_____

c)



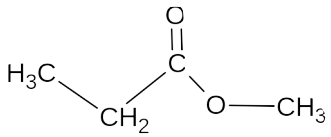
_____

_____

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.

(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^{o}C and 100kPa.
   When a further 1.200g of the compound is vapourised the vapour produced is found to be 664.8mL at 127^{o}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
$CH_3CH_2OH_{(aq)} + 3O_{2(g)} \rightarrow 2\,CO_{2(g)} + 3H_2O_{(l)}$

b) propanol is mixed with butanoic acid and gently heated
$CH_3CH_2CH_2OH_{(aq)} + CH_3CH_2CH_2COOH_{(aq)} \rightarrow CH_3CH_2CH_2COOCH_2CH_2CH_{3(aq)} + H_2O_{(l)}$

c) $H_2O_{(l)} + CH_3COOCH_2CH_2CH_2CH_{3(aq)} \rightarrow CH_3COOH_{(aq)} + CH_3CH_2CH_2CH_2OH_{(aq)}$

d) $Br_2(aq) + CH_2CH_2 \rightarrow CH_2BrCH_2Br$

e) $Cr_2O_7^{2-}{}_{(aq)} + 14H^+{}_{(aq)} + 6e^- \rightarrow 2Cr^{3+}{}_{(aq)} + 7H_2O_{(l)}$
$CH_3CH_2CHO + H_2O \rightarrow CH_3CH_2COOH + 2H^+ + 2e^-$) x 3
_____
$3CH_3CH_2CHO + 8H^+{}_{(aq)} + Cr_2O_7^{2-}{}_{(aq)} \rightarrow 2Cr^{3+}{}_{(aq)} + 3CH_3CH_2COOH + 4H_2O_{(l)}$

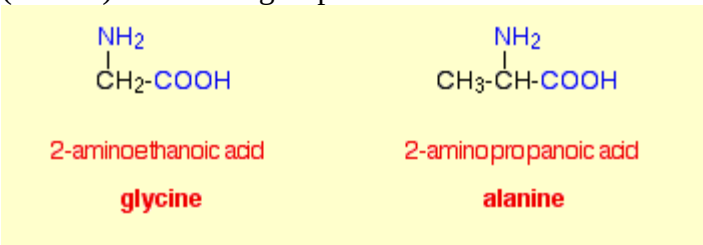
2. a) propanoic acid
b) cyclohexanone
c) 2,2-dimethylbutanal
d) methyl propanoate

(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_2O

(4 marks)

4. an alpha amino acid is a molecule that has the amino (NH2) and carboxylic acid (COOH) functional groups attached to the same carbon atom



(2 marks)

Part Three: Calculations

1. a) $CHO + O_2 \rightarrow CO_2 + H_2O$

1.200g v= 1.994L 1.440g

	C	**H**	**O**
mass	0.7200g 	2.016/18.016) x 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

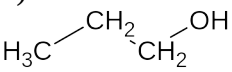
Therefore empirical formula is C_3H_8O

b) PV =nRT
(100)(0.6648) = n(8.315)(400)
n= 0.019988

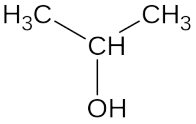
n= mass/mass 1 mole
mass 1 mole = 1.200/0.019988 = 60

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

c)



1-propanol



2-propanol (2 marks)