1. Which of the following are isomers of pentane?

I. 2-methylpentane

II. methylbutane

III. dimethylpropane

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

(Total 1 mark)

2. Alkenes are important starting materials for a variety of products.

(a) State and explain the trend of the boiling points of the first five members of the alkene homologous series.

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(3)

(b) Describe **two** features of a homologous series.

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(2)

(Total 5 marks)

3. Describe a chemical test that could be used to distinguish between pent-1-ene and pentane.

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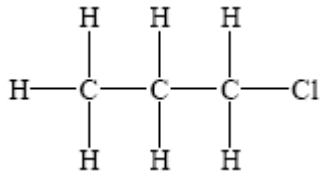
(Total 2 marks)

4. State and explain whether the following molecules are primary, secondary or tertiary halogenoalkanes.

E:



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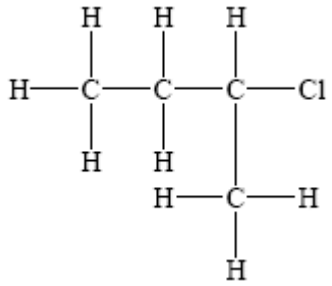

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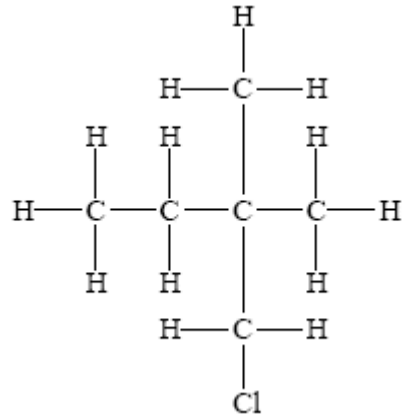

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(Total 4 marks)

5. Which of the structures below is an aldehyde?

A. $CH_3CH_2CH_2CH_2OH$

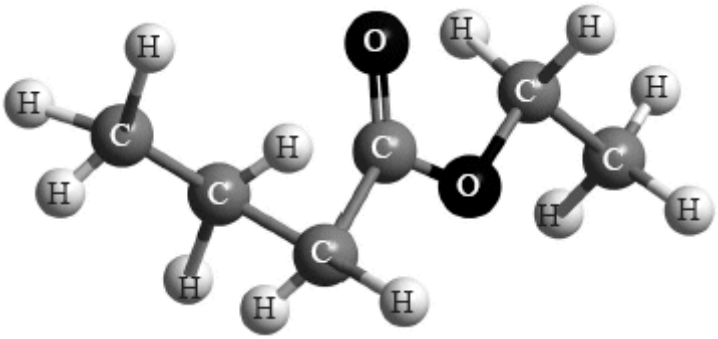
B. $CH_3CH_2COCH_3$

C. $CH_3CH_2COOCH_3$

D. $CH_3CH_2CH_2CHO$

(Total 1 mark)

6. Which reactants could be used to form the compound below?



A. Butanoic acid and ethanol

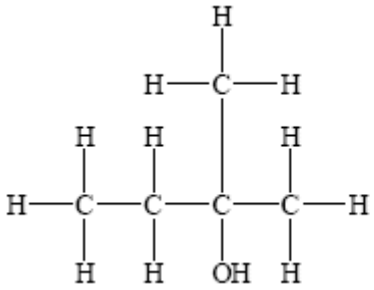
B. Propanoic acid and ethanol

C. Ethanoic acid and propan-1-ol

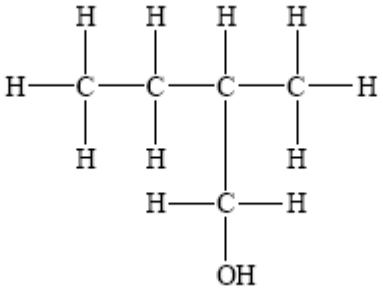
D. Ethanoic acid and butan-1-ol

(Total 1 mark)

7. Which is the correct classification of these alcohols?



1



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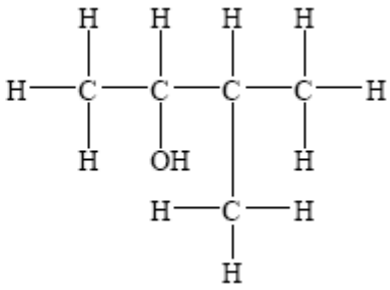
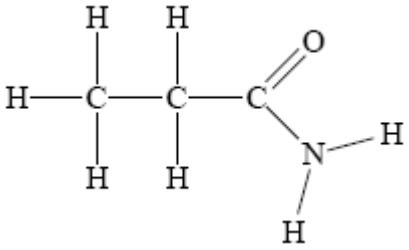


3

	1	2	3
A.	tertiary	secondary	primary
B.	tertiary	primary	secondary
C.	tertiary	tertiary	secondary
D.	secondary	primary	secondary

(Total 1 mark)

8. What is the IUPAC name of $CH_3CH_2CONH_2$?



A. Aminopropanal

B. Ethanamide

C. Propylamine

D. Propanamide

(Total 1 mark)

9. How many isomers can exist for a compound with the molecular formula $C_2H_2Cl_2$?

A. 1

B. 2

C. 3

D. 4

(Total 1 mark)

10. What is the IUPAC name for the following compound?

$$CH_3(CH_2)_2COOCH_3$$

A. Methyl butanoate

B. Butyl ethanoate

C. Butyl methanoate

D. Methyl propanoate

(Total 1 mark)

11. Which of the following substances are structural isomers of each other?

I. $CH_3(CH_2)_3CH_3$

II. $(CH_3)_2CHCH_3$

III. $CH_3CH(CH_3)CH_2CH_3$

A. I and II only

B. I and III only

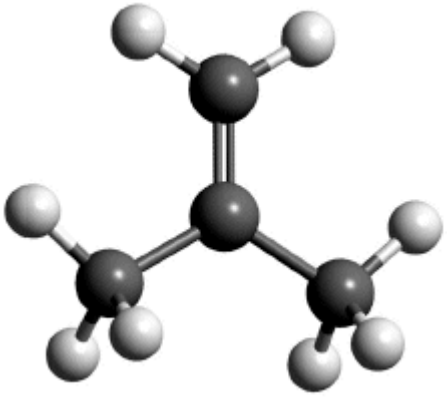
C. II and III only

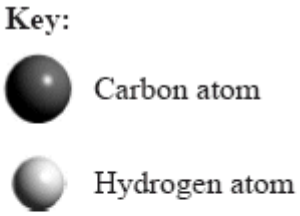
D. I, II and III

(Total 1 mark)

12. The alkenes are an example of a homologous series.

(a) State the name of the alkene shown.





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(1)

(b) Bromine water, $Br_2(aq)$, can be used to distinguish between the alkanes and the alkenes.

(i) Describe the colour change observed when the alkene shown in part (a) is added to bromine water.

.....

.....

(1)

(ii) Draw the structural formula and state the name of the product formed.

.....

(2)

(Total 4 marks)

13. Propan-1-ol has two structural isomers.

(i) Deduce the structural formula of each isomer.

(2)

(ii) Identify the isomer from part (i) which has the higher boiling point and explain your choice. Refer to both isomers in your explanation.

(2)

(Total 4 marks)

14. Which compound is an amide?

A. CH_3COOCH_3

B. CH_3CONH_2

C. CH_3NH_2

D. $CH_2(NH_2)COOH$

(Total 1 mark)

15. Three compounds with similar relative molecular masses are butane, propanal and propan-1-ol.

(i) List the three compounds in order of increasing boiling point (lowest first) and explain the differences in their boiling points.

(4)

(ii) Predict, with an explanation, which of the three compounds is **least** soluble or miscible in water.

(2)

(iii) When propan-1-ol is oxidized using a warm acidified solution of potassium dichromate(VI) two different organic products can be obtained. Deduce the name and structural formula for each of these two products.

(3)

(iv) Propan-2-ol is an isomer of propan-1-ol. Draw the structure of propan-2-ol.

(1)

(v) Identify the class of alcohols that propan-2-ol belongs to and state the name of the organic product formed when it is oxidized by an acidified solution of potassium dichromate(VI).

(2)

(Total 12 marks)

16. Identify the functional group present in $HCOCH_2CH_3$.

A. Ester

B. Ketone

C. Aldehyde

D. Alcohol

(Total 1 mark)

(ii) Predict, with an explanation, which of the three compounds is **least** soluble or miscible in water.

(2)

(iii) When propan-1-ol is oxidized using a warm acidified solution of potassium dichromate(VI) two different organic products can be obtained. Deduce the name and structural formula for each of these two products.

(3)

(iv) Propan-2-ol is an isomer of propan-1-ol. Draw the structure of propan-2-ol.

(1)

(v) Identify the class of alcohols that propan-2-ol belongs to and state the name of the organic product formed when it is oxidized by an acidified solution of potassium dichromate(VI).

(2)

(Total 12 marks)

17. Which is a tertiary halogenoalkane?

A. $CH_3CH_2CH_2Br$

B. $CH_3CH_2CH(CH_3)Cl$

C. $C(CH_3)_3Br$

D. $CH_3CHClCH_2CH_3$

(Total 1 mark)

(iii) When propan-1-ol is oxidized using a warm acidified solution of potassium dichromate(VI) two different organic products can be obtained. Deduce the name and structural formula for each of these two products.

(3)

(iv) Propan-2-ol is an isomer of propan-1-ol. Draw the structure of propan-2-ol.

(1)

(v) Identify the class of alcohols that propan-2-ol belongs to and state the name of the organic product formed when it is oxidized by an acidified solution of potassium dichromate(VI).

(2)

(Total 12 marks)

18. In some countries, ethanol is mixed with gasoline (petrol) to produce a fuel for cars called gasohol.

(i) Define the term *average bond enthalpy*.

(2)

(ii) Use the information from Table 10 of the Data Booklet to determine the standard enthalpy change for the complete combustion of ethanol.

$$CH_3CH_2OH(g) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(g)$$

(3)

(iii) The standard enthalpy change for the complete combustion of octane, C_8H_{18}, is -5471 kJ mol^{-1}. Calculate the amount of energy produced in kJ when 1 g of ethanol and 1 g of octane is burned completely in air.

(2)

(iv) Ethanol can be oxidized using acidified potassium dichromate, $K_2Cr_2O_7$, to form two different organic products.

$$CH_3CH_2OH \xrightarrow[H^+]{Cr_2O_7^{2-}} \mathbf{A} \xrightarrow[H^+]{Cr_2O_7^{2-}} \mathbf{B}$$

State the structural formulas of the organic products **A** and **B** and describe the conditions required to obtain a high yield of each of them.

(4)

(v) Deduce and explain whether ethanol or **A** has the higher boiling point.

(2)

(vi) Ethene can be converted into ethanol by direct hydration in the presence of a catalyst according to the following equation.

$$C_2H_4(g) + H_2O(g) \rightleftharpoons CH_3CH_2OH(g)$$

For this reaction identify the catalyst used and state **one** use of the ethanol formed other than as a fuel.

(2)

(Total 15 marks)

19. What is the IUPAC name of the compound $CH_3CH_2COOCH_2CH_3$?

A. Ethyl ethanoate

B. Propyl ethanoate

C. Ethyl propanoate

D. Pentyl propanoate

(Total 1 mark)

20. Ethene can be converted into ethanol by direct hydration in the presence of a catalyst according to the following equation.

$$C_2H_4(g) + H_2O(g) \rightleftharpoons CH_3CH_2OH(g)$$

For this reaction, identify the catalyst used and state **one** use of the ethanol formed other than as a fuel.

(Total 2 marks)

21. How many **structural** isomers exist with the formula $C_3H_5Cl_3$?

A. 3

B. 4

C. 5

D. 6

(Total 1 mark)

$CH_3CH_2OH(g)$

For this reaction, identify the catalyst used and state **one** use of the ethanol formed other than as a fuel.

(Total 2 marks)