

NAME \_\_\_\_\_ INDEX NUMBER \_\_\_\_\_

SCHOOL \_\_\_\_\_ DATE \_\_\_\_\_

## ORGANIC CHEMISTRY

1. 1989 Q22

What are the products of the complete combustion of hydrocarbons?

(2 marks)

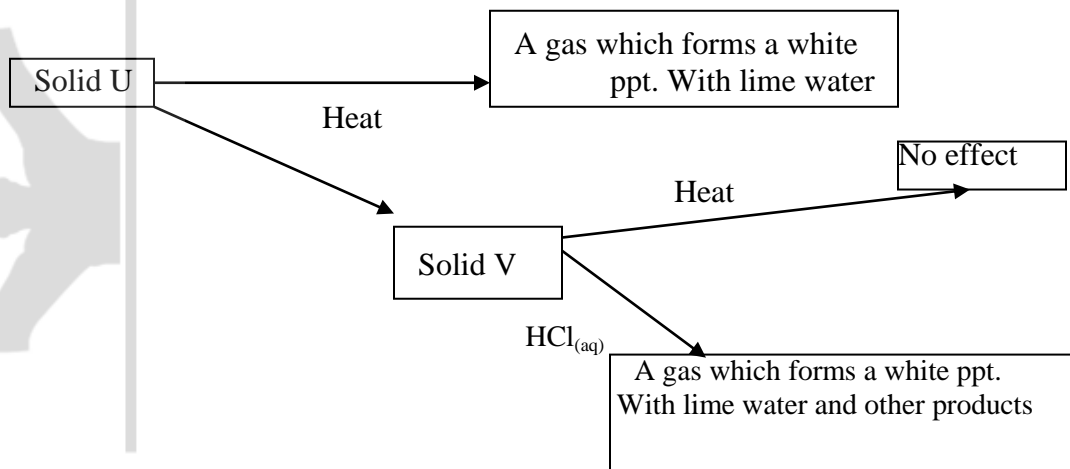
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2. 1989 Q10

Propanol reacts with concentrated sulphuric acid to form an alkene. Draw the structural form of alkenes.

3. 1989 Q25

Use the flow chart below to answer the question that follows:



Identify solid U and V

An organic compound W gives off hydrogen gas when reacted with sodium metal. When W reacted with a carboxylic acid in the presence of a few drops of concentrated sulphuric acid, a sweet smelling compound is formed. To what class of organic compounds does W belong? (1 mark).

4. 1990 Q13

Describe one chemical test you would use to distinguish between the two compounds represented by the formulae  $C_4H_{10}$  and  $C_4H_8$ .

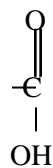
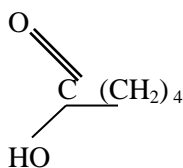
5. 1990 P1A Que 24

When ethane gas ( $C_2H_4$ ) is compressed in a steel vessel at high Temperature a white waxy solid of high boiling point is formed. How would the relative molecular mass of ethene gas compare with that of the solid formed? Explain your answer.

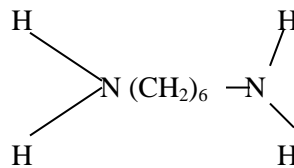
6. 1991 P1A Que 4

Nylon fibers the linkage.  $\begin{array}{c} - & - & C & - & N \\ & & || & & | \\ & & O & & H \end{array}$  in their structure. Given that the structure of the two

Monomers that form nylon are



and



Write an equation to show how the two monomers combine to form nylon.

(1 mark)



i) Write the formulae of the organic compound P and S (2 marks)

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.....

ii) Name the type of reaction, the reagent (s) and conditions, for the reactions in the following steps.

I. STEP I Type Reagent (2 marks)

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II. STEP II. Type Reagents (2 marks)

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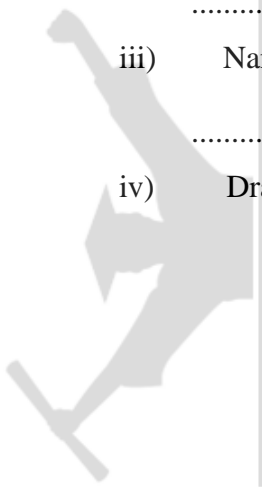
III. STEP III. Type Reagents (2 marks)

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iii) Name reagent R (1 mark)

.....

iv) Draw the structural formula of T and give its name. (2 marks)



v). I. Name compound U

(1 mark)

II. If the relative molecular mass of U is 42.000 determine the value of n(C=12, H=1)

(2 marks)

b) State why  $C_2H_4$  burns with a more smoky flame than  $C_2H_6$

(1 mark)

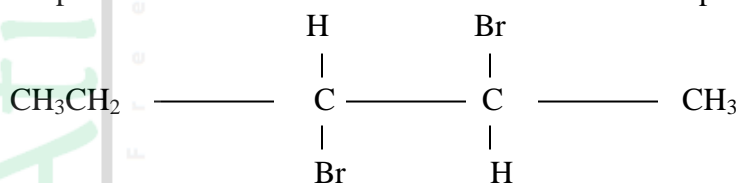
9. 1992 Q8

Write an equation for the reaction that occurs when butene is reacted with hydrogen gas in the presence of a nickel catalyst.

(2 marks)

10. 1992 P1A Que 11

A compound Y reacts with bromine to form another compound, whose formula is

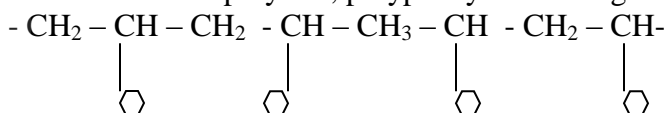


What is the formula and name of compound Y?

(1 mark)

11. 1992 P1A Que 13

Part of the structure of polymer, polyphenylethene is given below.



a) Draw the general structure of polyphenylethene.

(1 mark)

b) Draw the formula of the monomer from which it is made.

(1 mark)

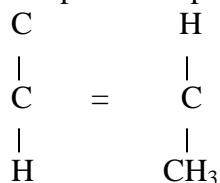
12. 1992 PP1A Que 23

Explain why at room temperature hexane is a liquid while methane is a gas. (1 mark)

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13. 1993 PP1A Que 20

(a) Write an equation represented polymerization of 1 – chloropropene.



(2 marks)

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(b) Name the polymer formed in (i) above.

(1 mark)

.....

14. 1993 P1A Que 25

(a) Study the table below and answer the questions that follows.

Formula of hydrocarbon	Boiling points (K)
C <sub>2</sub> H <sub>4</sub>	169.4
C <sub>3</sub> H <sub>6</sub>	225.5
C <sub>4</sub> H <sub>8</sub>	266.9
C <sub>5</sub> H <sub>10</sub>	303.0
C <sub>6</sub> H <sub>12</sub>	336.5

i) What name is given to a series of organic compounds like the ones in the table above? (1 mark)

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ii) To what class of organic compounds do the above hydrocarbons belong? (1 mark)

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iii) Select one hydrocarbon that would be a gas at room temperature (298K) given a reason for your answer. (1 mark)

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iv) Give the formula of the seventh number of the above series. (1 mark)

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v) What is the relationship between the boiling point and the relative molecular masses of the hydrocarbons in the table above? Explain your answer. (2 marks)

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b) What would be observed if a few drops of acidified potassium permanganate was reacted with any of the above hydrocarbons? Explain. (2 marks)

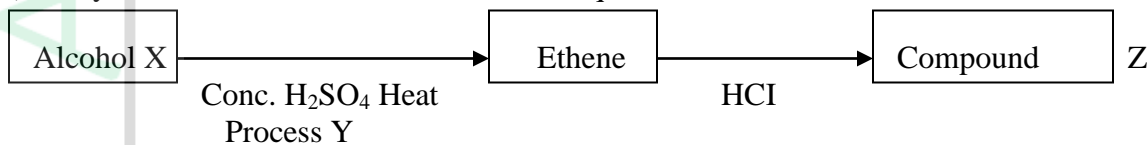
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c) Study the flow chart below and answer the questions that follows.



i). Write the formula of Alcohol X, Z Compound Z/name process Y: (3 marks)

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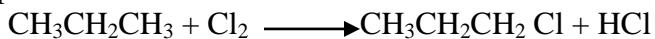
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15. 1994 P1A Que 12

Propane and Chlorine react as shown below:



(a) Name the type of reaction that takes place. (1 mark)

(b) State the condition under which this reaction takes place. (1 mark)

16. 1994 P1A Que 21

(a) Name one substance used for vulcanization of rubber. (1 mark)

(b) Why is it necessary to vulcanize natural rubber before use? (1 mark)

17. 1994 P1A Que 24

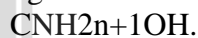
$\text{R COO}^- \text{Na}^+$  and  $\text{RC}_6\text{H}_5\text{SOO}_3\text{Na}^+$  represent two cleaning agents where R is a long hydrocarbon chain.

(a) Write the formula of the salts that would be formed when each of these cleansing agents is added to water containing calcium ions. (1 mark)

(b) Explain how the solubility of the two calcium salts in (a) above effect the cleansing properties of each of the cleaning agents.. (2 marks)

18. 1994 P1A Que 25

The general formula for a homologous series of organic compounds is



(a) Give the name and structural formula of the fourth member of this series. (1 mark)



(b) Write an equation for the complete combustion of the fourth member of this series (1 mark)

19. 1995 P1A Que 5

(a) Name one natural fiber. (1 mark)

(b) Give one advantage of synthetic fibers over natural fibers. (1 mark)

20. 1995 P1A Que 16

Study the table below and answer the questions that follow

Alkane	Formula	Heat of combustion ( $\Delta_c$ )kJmol <sup>-1</sup>
Methane	CH <sub>4</sub>	-890
Ethane	C <sub>2</sub> H <sub>6</sub>	-1560
Propane	C <sub>3</sub> H <sub>8</sub>	-2220
Butene	C <sub>4</sub> H <sub>10</sub>	

(a) Predict the heat of combustion of butane and write it on the space provided in the table above. (1 mark)

(b) What does the sign  $\Delta$  of Hc value indicate about combustion of alkanes (1 mark)

21. 1995 P1A Que 27

A compound C<sub>4</sub>H<sub>10</sub>O, is oxidized by excess acidified potassium permanganate to form another compound, C<sub>4</sub>H<sub>8</sub>O<sub>2</sub>. The same compound C<sub>4</sub>H<sub>10</sub>O reacts with potassium to produce hydrogen gas.

(a) Draw the structural formula and name compound C<sub>4</sub>H<sub>10</sub>O (1 mark)

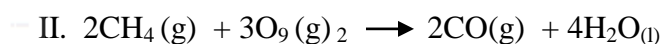
(b) Write an equation for the reaction between potassium and compound  $C_4H_{10}O$   
(1 mark)

22. 1996 P1A Que 9

Explain how sample of  $CH_3CH_2CH_2OH$ , could be distinguished from a sample of  $CH_3COOH$  by means of a chemical reaction. (2 marks)

23. 1996 P1A Que 13

Methane reacts with oxygen as shown by equations I and II below

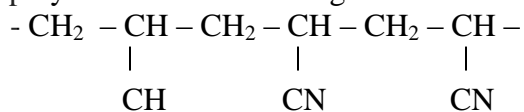


Which one of the two reactions represents the complete combustion of methane?

Explain. (2 marks)

24. 1996 P1A Que 25.

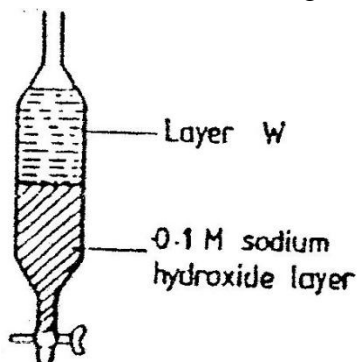
A polymer has the following structure:



A sample of this polymer is found to have a molecular mass of 5164. Determine the number of monomers in the polymer. (H = 1.0, C = 12.0, N = 14.0) (3 marks)

25. 1996 P1A Que 28

A mixture of pentane and pentanoic acid was shaken with 0.1M Sodium hydroxide solution and let to separate as shown in the diagram below:

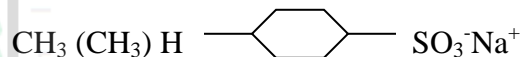


Name the main component in layer W. Give a reason for the answer (2marks)

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26. 1996 P1A Que 10

A compound whose structure is shown below is found in a detergent.



With reference to the structure, explain how the detergent removes grease during washing. (2 marks)

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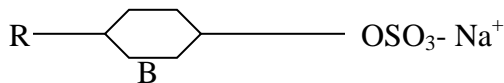
27. 1997 P 1A Que 3

Complete the table below by inserting the missing information in the spaces provided.

Name of polymer	Name of monomer	One use of the polymer
Polystyrene	_____	_____
_____	Vinyl chloride (Chloroethane)	_____

28. 1997 P1A Que 5

The structure shown below represent two cleaning agents, A and B.



Which cleansing agent would be more suitable for washing in water containing magnesium sulphate? Give a reason. (2 marks)

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29. 1997 1A Que 12

Name and draw the structure of the compound formed when methane reacts with excess chlorine in the presence of U.V light. (2 marks)

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30. 1998 PP1A Que 14

(a) Draw the structural formula of ethanol and propanoic acid (2 marks)

(b) Give the name of the organic compound formed when ethanol and propanoic acid react in the presence of concentrated sulphuric acid (1 mark)

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31. 1999 PP 1A Que 9

State the observation that would be made when a piece of sodium metal is placed in samples of pentane and pentanol. (2 marks)

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32. 1999 PP1A Que 16

Under certain conditions, carbon dioxide reacts with water to form methanol (CH<sub>3</sub>OH) and oxygen as shown below.



What would be the effect on the yield of methanol if the temperature of the reaction mixture is increase? Explain. (2 marks)

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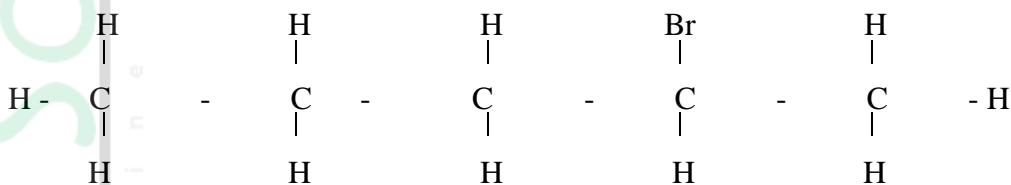
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33. 1999 P1A Que 22

Compound L reacts with hydrogen bromide gas to give another compound whose structure is



(a) Give the structural formula and name of compound L. (2 marks)

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(b) Write an equation for the reaction which takes place between ethyne and excess chloride gas. (1 mark)

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34. 1999 P1A Que 24

One of the fuels associated with crude oil is natural gas. Name the main constituent of natural gas and write an equation for its complete combustion. (2 marks)

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35. 1999 P1A Que 28

Bromine reacts with ethane as shown below



(a) What condition is necessary for this reaction to occur? (1 mark)

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(b) Identify the bonds which are broken and those that are formed. (2 marks)

36. **2000 P 1A Que 9**

A hydrocarbon P was found to decolourise bromine water. On complete combustion of 2 moles of P, 6 moles of carbon dioxide and 6 moles of water were formed.

(a) Write the structural formula of P. (1 mark)

(b) Give the name of P. (1 mark)

(c) Name one industrial source of P (1 mark)

37. **2000 PA Que 20**

Pentane and ethanol are miscible. Describe how water could be used to separate a mixture of pentane and ethanol. (2 marks)

38. **2001 P1A Que 18**

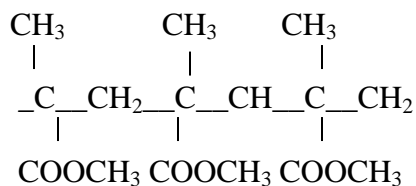
In the presence of U.V light, ethane gas undergoes substitution reaction with chlorine .

(a) What is meant by the term Substitution reaction? (2 marks)

(b) Give the structural formula and the name of the organic product formed when equal volumes of ethane and chlorine react together. (2 marks)

39. 2002 P1A QUESTION 17

The structure below represents a portion of a polymer.



Give:

a) The name of the polymer

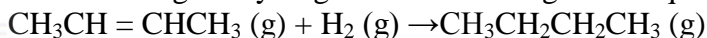
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b) One industrial use of the polymer

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40. 2002 Q 25

But -2-ene undergoes hydrogenation according to the equation given below



(a) Name the product formed when but -2 - ene reacts with hydrogen gas

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(b) State one industrial use of hydrogenation

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41. 2002 Q1a (P2)

(a) What method can be used to separate a mixture of ethanol and propanol?

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42. 2003 Q8

(a) What is meant by heat of vaporization

(3 marks)

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(b) The boiling points of ethanol, propanol and butanol are  $78^{\circ}\text{C}$ ,  $97.2^{\circ}$  and  $117^{\circ}\text{C}$ . Explain this trend (1 mark)

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43. 2003 Q23

An organic compound with the formula  $C_4H_{10}O$  reacts with potassium metal to give hydrogen gas and white solid

a) Write the structural formula of the compound

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b) To which homologous series does the compound belong?

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c) Write the equation for the reaction between the compound and potassium metal (1mark)

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44. 2003 Q7 (P2)

(a) Write the structural formula of:

(i) Methanol

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(ii) Methanoic acid (1mark)

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(b) Write the equation for the reaction between methanoic acid and aqueous sodium hydroxide (1mark)

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(c) (i) Name the product formed when methanol reacts with methanoic acid

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(ii) State one condition necessary for the reaction in (c) (i) above to take place

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(d) (i) Describe one chemical test that can be used to distinguish between hexane and hexane (2 marks)

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(ii) State one use of hexane (1mark)

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(iii) Hydrogen reacts with hexane to form hexane. Calculate the volume or hydrogen gas required to convert 42g of hexane to hexane at S.T.P (C=12.0, H=1.0, molar gas volume at S.T.P is = 22.4 litres) (4 marks)

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45. 2004 Q13

a) What is the name given to the smallest repeating unit of a polymer? (1mark)

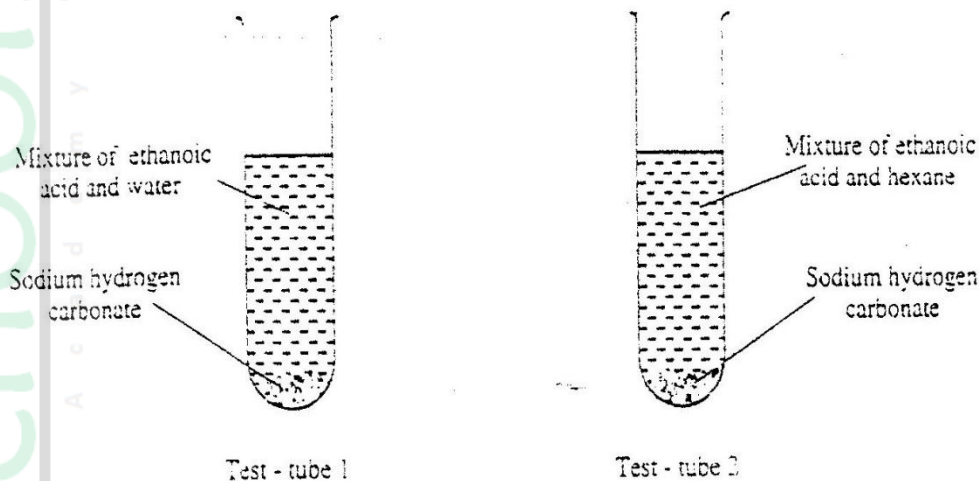
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b) Draw the structure of the smallest repeating unit of a polyvinyl chloride (1mark)



46. 2004 Q15

In an experiment, a student put equal volumes of mixtures of ethanoic acid in water and ethanoic acid in hexane in two test – tubes as shown below. In each test tube, equal amounts of solid sodium hydrogen carbonate were added.



- a) State the observation which was made in each test – tube (1mark)

Test tube 1

Test tube 2

- b) Explain the observation in (a) above (2marks)

47. 2005 Q1

Give the name and draw the structural formula of the compound formed when one mole of ethane reacts with one mole of chlorine gas.

48. 2006 Q

- (a) What is meant by isomerism? (1mark)

(b) Draw and name two isomers of butane.

(2 marks)

49. 2006 Q10c

Name the process which takes place when:

Propane gas molecules are converted into a giant molecule

(1 mark)

50. 2006 Q23

Explain why the boiling point of ethanol is higher than that of hexane.

(Relative molecular mass of ethanol is 46 while that of hexane is 86)

51. 2006 Q5 (P2)

a) What name is given to a compound that contains carbon and hydrogen only? (½ mark)

b) Hexane is a compound containing carbon and hydrogen.

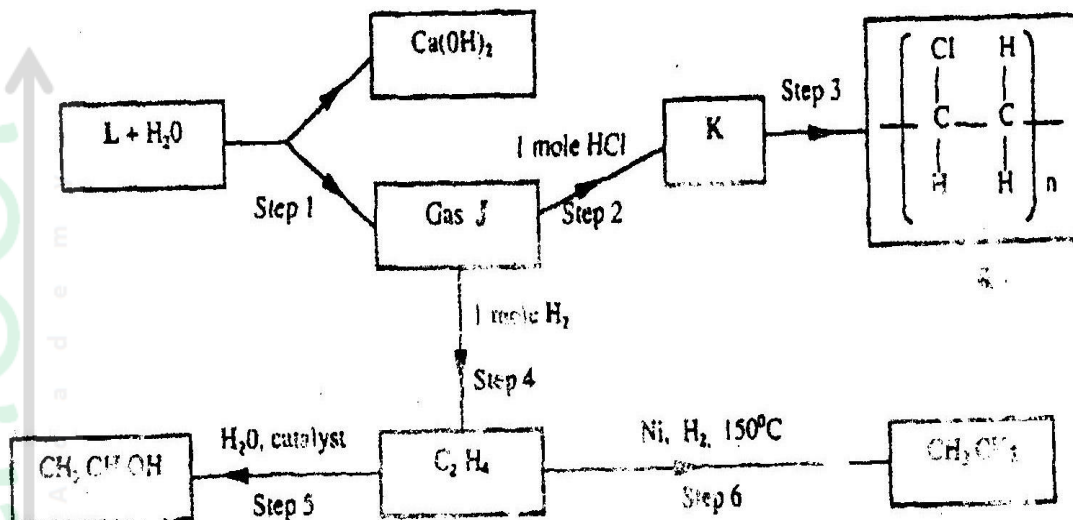
(i) What method is used to obtain hexane from crude oil?

(1mark)

(ii) State one use of hexane

(1mark)

c) Study the flow chart below and answer the questions that follow.



(i) Identify reagent L. (1mark)

(ii) Name the catalyst used in step 5. (1mark)

(iii) Draw the structural formula of gas J. (1mark)

(iv) What name is given to the process that takes place in step 5? (½mark)

d) (i) Write the equation for the reaction between aqueous sodium hydroxide and aqueous ethanoic acid. (1mark)

- (ii) Explain why the reaction between 1g of sodium carbonate and 2M hydrochloric acid is faster than the reaction between 1g of sodium carbonate and 2M ethanoic acid. (1 mark)

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52. 2007 Q13

- (a) Name the process that takes place when:

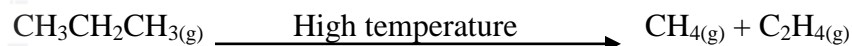
- (i) Crystals of zinc nitrate change into solution when exposed to air (1mark)

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- (ii) An alcohol reacts with an organic acid in the presence of a catalyst to form a sweet smelling compound. (1mark)

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- b) Propane can be changed into methane and ethane as shown in the equation below;



- Name the process undergone by propane. (1mark)

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53. 2007 Q23

The table below shows the relative molecular masses and the boiling points of pentane and propan-1-ol

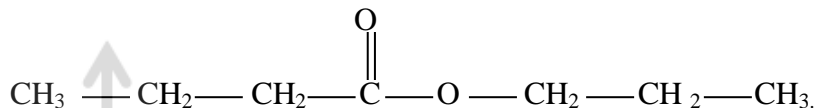
	Relative molecular mass	Boiling point(°C)
Pentane	72	36
Propan-1-ol	60	97

- Explain why the boiling point of propan-1-ol is higher than that of pentane. (2marks)

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54. 2008 Q6

The structure below represents a sweet smelling compound

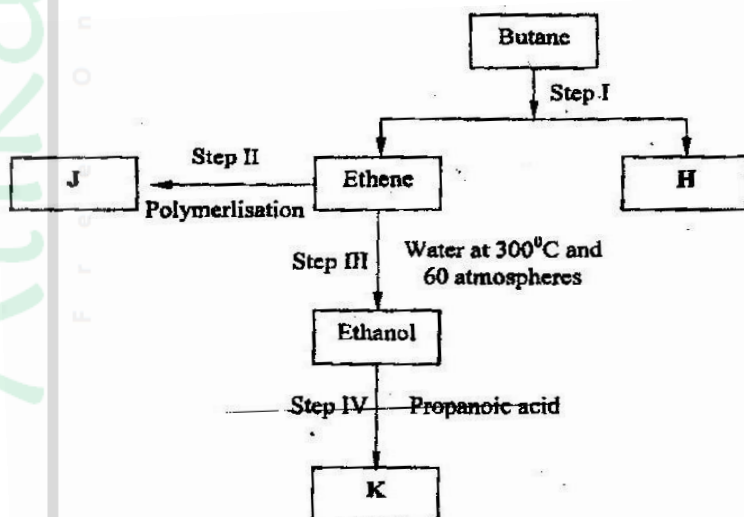


Give the names of the two organic compounds that can be used to prepare this compound in the laboratory. (2marks)

55. 2008 Q5

(a) Alkanes, alkenes and alkynes can be obtained from crude oil. Draw the structure of the second member of the alkyne homologous series. (1mark)

b) Study the flow chart below and answer the questions that follow



i) State the conditions for the reaction in step 1 to occur (1 mark)

ii) Identify substance II (1 mark)

iii) Give:

I. One advantage of the continued use of substance such as J (1 mark)

II The name of the process that takes place in step III (1 mark)

III The name and the formula of substance K (2marks)

iv) The relative molecular mass of J is 16,800. Calculate the number of monomers that make up J.

c) The table below give the formula of four compounds L, M, N and P

Compound	Formula
L	$C_2H_6O$
M	$C_3H_6$
N	$C_3H_6O_2$
P	$C_3H_8$

Giving a reason in each case, select the letter which represents a compound that:

(i) Decolorizes bromine in the absence of UV light (2 marks)

(ii) Gives effervescence when reacted with aqueous sodium carbonate (2 marks)

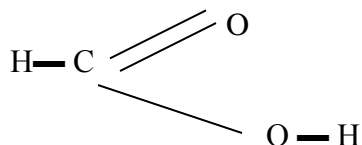
56. 2009 Q14

(a) Draw and name the structure of the compound formed when one mole of ethyne reacts with one mole of hydrogen bromide. (2 marks)

(b) Draw the structures of the alkynes whose molecular formula is  $C_4H_6$  (2 marks)

57. 2009 Q17

The structure of methanoic acid is



What is the total number of electrons used for bonding in a molecule of methanoic acid? Give reasons.

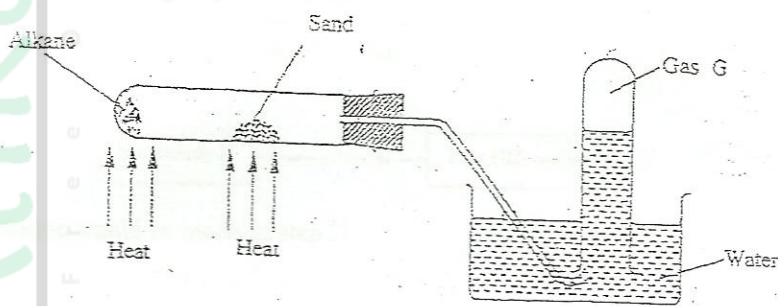
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58. 2009 Q19

The figure below represents the set up that was used to crack an alkane.



(a) What was the purpose of the sand?

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(b) After some time, a colourless gas G was collected in the test-tube. Describe a chemical test and the observation that would be made in order to identify the class of compounds to which gas G belongs (2 marks)

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59. 2009 Q24

The boiling points of some compounds of hydrogen with some elements in groups 4 and 6 of the periodic table are given below.

Compound	Boiling point(°C)	Compound	Boiling point(°C)
CH <sub>4</sub>	-164.0	H <sub>2</sub> O	100.0
SiH <sub>4</sub>	-112.0	H <sub>2</sub> S	-61.0

(a) Which of the compounds CH<sub>4</sub> and SiH<sub>4</sub> has the stronger intermolecular forces?

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(b) Explain why the boiling point of H<sub>2</sub>O and H<sub>2</sub>S show different trends from that of CH<sub>4</sub> and SiH<sub>4</sub>

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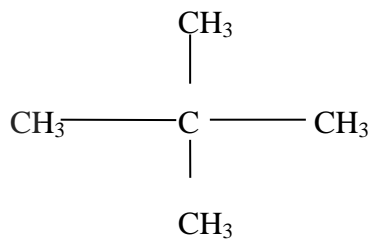
60. 2010 Q4

Draw the structure and give the name of the three alkanes having molecular formula C<sub>5</sub>H<sub>10</sub> (3 marks)

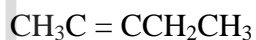
61. 2010 Q2 (P2)

a) Give the name of the following compounds:

i)

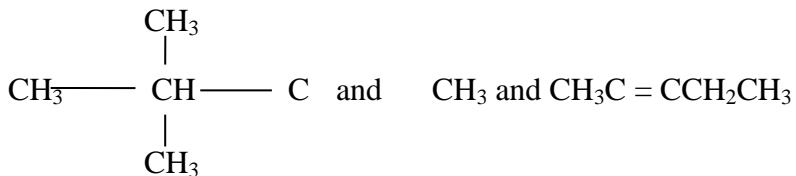


(2 marks)



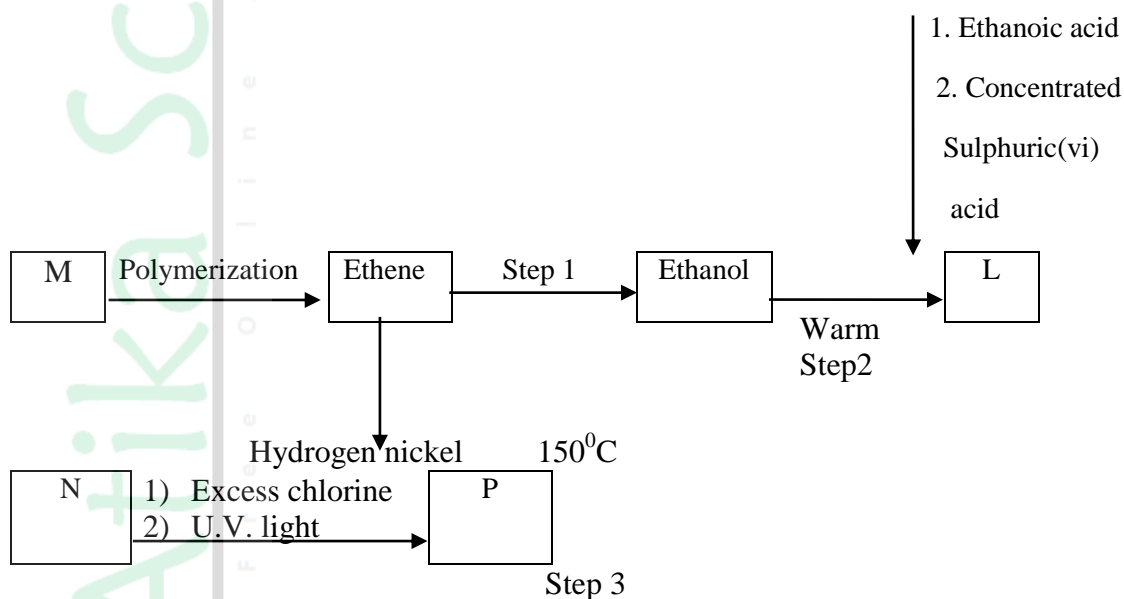
(1 mark)

b) Describe a chemical test that can be carried out in order to distinguish between



(2 marks)

c) Study the flow chart below and answer the questions that follows



i) Name the compounds:

(2 marks)

1. L .....
2. N .....

ii) Draw the structural formula of compound M showing two repeat units

(1 mark)

iii) Give the reagent and the conditions used in step I

(1 mark)

.....

.....

iv) State the type of reaction that take place in: (2 marks)

(I) Step 2 .....

(II) Step 3 .....

b) The molecular formula of compound **P** is  $C_2H_2Cl_4$ . Draw the two structural formulae of compound P (2 marks)

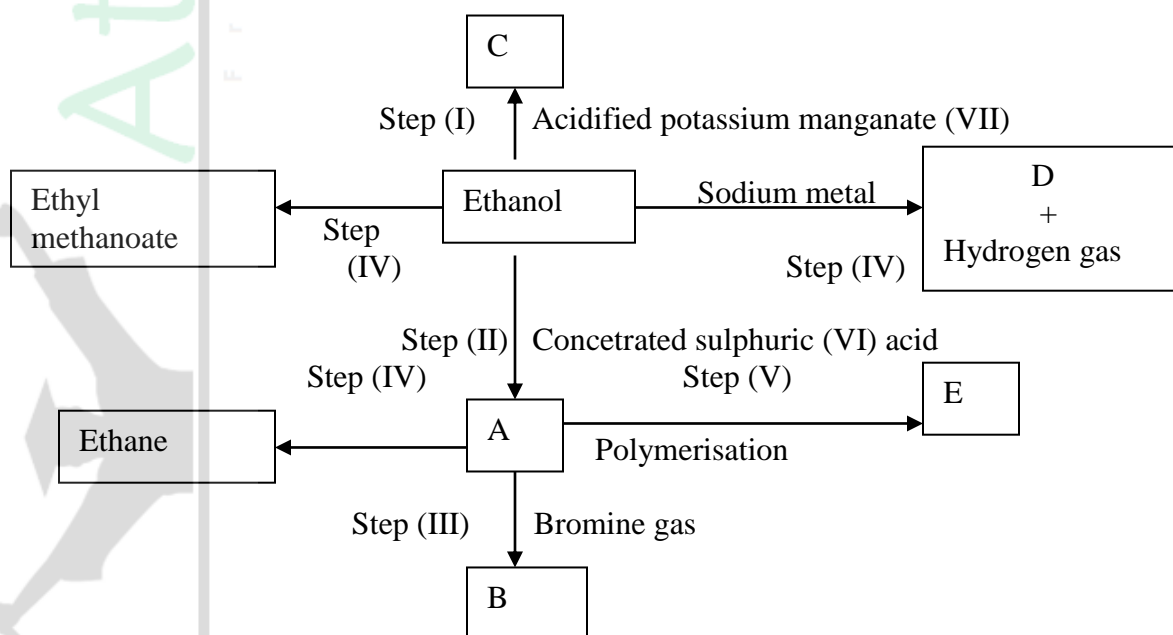
62. 2011 Q 1

a) What name is given to the process by which alcohol is formed from a carbohydrate? (1 mark)

b) Explain why the solubility of ethane in water is lower than that of ethanol. (2 marks)

63. 2011 Q6

a) Study the flow chart below and answer the questions that follow.



(i) I What observation will be made in Step I (1mark)

.....  
II Describe a chemical test that can be carried out to show the identity of Compound C (2 marks)

.....  
.....  
.....  
.....  
(ii) Give the names of the following: (2marks)

I E .....

II Substance D .....

(iii) Give the formula of substances B (1mark)

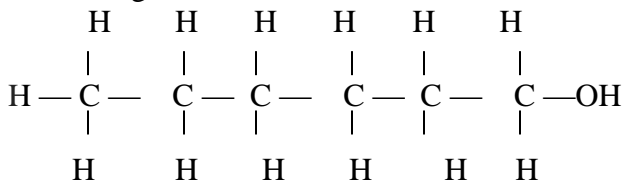
.....  
(iv) Name the type of reaction that occurs in: (1mark)

I Step (II) .....

II Step (IV) .....

(v) Give the reagent and conditions necessary for Step (IV) (2marks)

.....  
.....  
.....  
(b) (i) Name the following structure (1mark)



.....  
(ii) Draw the structure of an isomer of pentane (1mark)

64. 2012 Q20 P1

Draw and name the isomers of pentane.

(3 marks)

65. 2012 Q26 P1

Describe **two** chemical tests that can be used to distinguish ethanol from ethanoic acid

(3 marks)

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