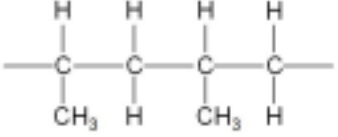
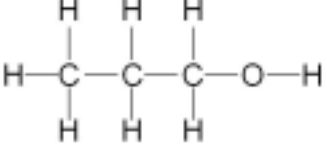
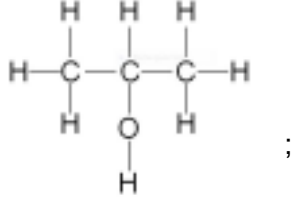
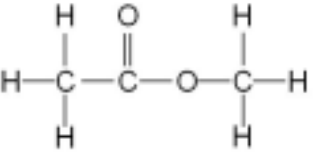


Question	Answer	Marks
1(a)	fractional distillation; cracking;	2 1 1
(b)(i)	add	1
(b)(ii)	2;	1
(b)(iii)	 <p><b>M1</b> chain of 4 carbon atoms with single bonds and continuation bonds; <b>M2</b> correctly positioned CH<sub>3</sub> side chains;</p>	2
(c)	 ;  ;	2
(d)(i)	(concentrated) sulfuric acid;	1
(d)(ii)	ethanoate;	1
(d)(iii)	 <p><b>M1</b> ester link; <b>M2</b> rest of molecule;</p>	2
d)(iv)	te	1

- 2 (a) (i) a compound which contains carbon and hydrogen **only** [1]
- (ii) alkanes contain **only** C-C single bonds  
**or** they are saturated (hydrocarbons)  
**or** have the general formula  $C_nH_{2n+2}$  [1]
- alkenes contain at least one C=C double bond  
**or** they are unsaturated (hydrocarbons)  
**or** have the general formula  $C_nH_{2n}$  [1]
- (b)  $C_{20}H_{42} \rightarrow 2C_4H_8 + 2C_2H_4 + C_8H_{18}$  [1]
- (c) (i) any unambiguous structure of  $BrCH_2CH_2Br$  [1]  
**NOT** just  $C_2H_4Br_2$
- (ii)  $CH_3-CH=CH-CH_3$  [2]  
 For any butene [1] only
- (iii)  $(CH_3-CH_2-CH=CH_2) + H_2O [1] \rightarrow CH_3-CH_2-CH_2-CH_2OH [1]$  [2]  
**ALLOW**  $CH_3-CHOH-CH_2-CH_3$   
 butene reacts with **water/steam** (to form butanol) **ONLY** [1]
- (iv)  $C_6H_{12} + H_2 \rightarrow C_6H_{14}$  [2]  
 alkenes react with **hydrogen** [1] **ONLY**
- (d) volume of oxygen used =  $150\text{ cm}^3$  [1]
- volume of carbon dioxide formed =  $100\text{ cm}^3$  [1]  
 any equation of the combustion of an alkene  
 e.g.  $2C_5H_{10} + 15O_2 \rightarrow 10CO_2 + 10H_2O$   
 formulae [1]  
**COND** balancing [1]

- 3 (a) (i) have same molecular formula / both are  $C_5H_{12}$  [1]  
they have different structural formulae / different structures [1]
- (ii)  $CH_3-CH_2-CH=CH-CH_3$  / any other correct isomer [1]
- (b) (i)  $CH_2-(Br)-CH_2Br$  [1]  
**NOT:**  $C_2H_4Br_2$   
dibromoethane [1]  
**NOTE:** numbers not required but if given must be 1, 2
- (ii)  $CH_3-CH_2-CH_3$  [1]  
**NOT:**  $C_3H_8$   
propane [1]
- (iii)  $CH_3-CH_2-CH_2-CH_2-OH$  /  $CH_3-CH_2-CH(OH)-CH_3$  [1]  
butanol [1]  
numbers not required but if given must be correct and match formula
- (c)  $CH_3-CH=CH-CH_2-CH_3$  [1]  
 $CH_3-CH=CH-CH_3$  [1]
- (ii) pink / purple [1]  
colourless [1]  
**NOT:** clear
- (d)  $-CH_2-CH(CN)-CH_2-CH(CN)-$   
correct repeat unit  $CH_2-CH(CN)$   
**COND:** at least 2 units in diagram [1]  
continuation [1]

[Total:16]

4 (a) (i)  $\text{CH}_2/\text{H}_2\text{C}$  [1]

(ii) same ratio of C:H (atoms) / all cancel to  $\text{CH}_2$  / because general formula is  $\text{C}_n\text{H}_{2n}$  / same ratio of atoms or elements (in the compound) / C:H ratio is 1:2; [1]

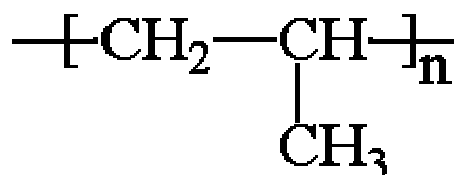
(b) (i) propanoic / propionic (acid); [1]  
ethanoic / acetic (acid); [1]

(ii) formula of ethene / but-2-ene / any symmetrical alkene; [1]

(c) (i)  $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{Br}$  [

(ii)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$  /  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$  /  $\text{C}_3\text{H}_7\text{OH}$  [

(d)



correct unit; [1]

**accept:** more than one repeat unit

continuation bonds at **both** ends; [1]

(e) if  $\text{C}_5\text{H}_{10}$  is given award 3 marks;;; [3]

if  $\text{C}_{10}\text{H}_{20}$  is given award 2 marks;;

if 1:7.5:5 / 2:15:10 is given award 2 marks;;

in all other cases a mark can be awarded for moles of  $\text{O}_2$  ( $= 2.4/32 =$ ) 0.075 **AND** moles of  $\text{CO}_2$  ( $= 2.2/44 =$ ) 0.05;

$2\text{C}_5\text{H}_{10} + 15\text{O}_2 \rightarrow 10\text{CO}_2 + 10\text{H}_2\text{O}$  [1]

**accept:** multiples including fractions

**allow:** ecf for correct equation from any incorrect alkene

- 5 (a) correct method shown [1]  
 i.e.  $126/14 (= 9)$  or  $14x = 126$  or  $x = 9$  or  $(12 \times 9) + 18 = 126$  [1]  
 $C_9H_{18}$   
**note:** correct formula only = 1 [1]
- (b) (i) all hydrogen atoms 1bp [1]  
 C—C bond atoms 1bp [1]  
 C=C 2 bp [1]
- (ii) correct repeat unit [1]  
 continuation [1]
- (iii) bonds broken [1]  
 H-H +436 (kJ/mol) C=C +610 = +1046 (kJ/mol)  
 bonds formed [1]  
 2C-H  $-415 \times 2$  kJ/mol C-C  $-346 = -1176$  (kJ/mol) [1]  
 $-130$  kJ/mol / more energy released than absorbe [1]  
**or:**  
 bonds broken [1]  
 3882 (kJ/mol) [1]  
 bonds formed [1]  
 4012 (kJ/mol) [1]  
 $-130$  kJ/mol / more energy released than absorbe [1]  
**allow:** ecf for final mark as long as the answer is not positive  
**note:** units not necessary
- (c) (i) butan-1-ol or butan-2-ol or butanol [1]
- (ii)  $CH_3-CH_2-CH(Br)-CH_2Br$  [2]  
 $C_4H_8Br_2 = 1$   
**note:** any other dibromobutane = 0
- (iii) HI [1]