Question 1

1(a)(i)	C_nH_{2n}	1
1(a)(ii)	to make more of the fractions in demand / to make more petrol / to make hydrogen	1
1(a)(iii)	high temperature (1) catalyst (1)	2
1(b)	has carbon-carbon double bond(s) / has C=C bond(s)	1
1(c)(i)	values between –103 °C and –7 °C (inclusive of these values)	1
1(c)(ii)	liquid (1) –100 °C is between the melting point and boiling point / –100 °C is higher than the and lower than the boiling point / melting point below –100 °C and boiling point above (1)	2
1(f)(i)	H_2O (1) C_2H_5OH (1)	2
1(f)(ii)	circle around acid	1

Question 2

2(a)(i)	circle around one or both COOH groups	1
2(a)(ii)	$C_5H_6O_4$	1
2(a)(iii)	orange (1) to colourless (1)	2

Question 3

3(b)(i)	72 (2) If 2 marks not scored 1 mark for H = (4 × 1) =4 OR O = (2 × 16) = 32	2
3(b)(ii)	add aqueous bromine (1) decolourises / goes colourless (1)	2

Question 4

4(e)(i)	breakdown of larger alkanes	1
	into smaller alkanes **AND** an alkene / ethene / H_2	1
4(e)(ii)	$C_{10}H_{22}$	1

Question 5

5(a)(i)	C	1
5(a)(ii)	D	1
5(a)(iii)	C	1
5(a)(iv)	E	1
5(d)(i)	breakdown / decomposition of hydrocarbons (1) idea of long chain hydrocarbons being converted to short chain hydrocarbons (1)	2
5(d)(ii)	heat / thermal (decomposition) / high temperature (1) catalyst (1)	2

Question 6

6(a)(i)	B	**1**
6(a)(ii)	G	**1**
6(a)(iii)	C	**1**
6(a)(iv)	D	**1**
6(a)(v)	A	**1**
6(b)(i)	one mark each for any 2 of: • breakdown of long chain hydrocarbons / breakdown of large hydrocarbons • to short chain hydrocarbons / to small hydrocarbons • by heat / when heated / thermal (energy)	**2**
6(b)(ii)	C_5H_{10}	**1**

Question 7

7(a)	(but-1-ene) has a lower relative molecular mass	**1**
7(b)	carbon dioxide **AND** water	**1**

7(d)(i)	acid	**1**
7(d)(ii)	**M1** displayed formula of butan-1-ol **M2** displayed formula of butan-2-ol **M3** butan-1-ol **M4** butan-2-ol	**4**

Question 8

8(b)(i)	$C_4H_6O_3$	**1**
8(b)(ii)	**M1** alkene(1) **M2** alcohol(1) **M3** carboxylic acid(1)	**3**
8(b)(iii)	**M1** turns colourless(1) **M2** bubbles / fizzing / effervescence(1)	**2**

Question 9

9(a)(i)	cracking	**1**
9(a)(ii)	$C_{10}H_{22} \rightarrow 4C_2H_4 + C_2H_6$ $C_{10}H_{22}$ as only reactant formulae of ethene **and** ethane as only products correct equation	**3**
9(b)(i)	hydrogen chloride	**1**
9(b)(ii)	ultraviolet light	**1**
9(c)(i)	(only) one product is formed	**1**

Question 10

10(a)	C_nH_{2n}	**1**
10(b)	orange to colourless	**1**
10(c)	addition	**1**

Question 11

11(f)	D	**1**