Question 1

1(f)(i)	H_2O (1) C_2H_5OH (1)	**2**
1(f)(ii)	circle around acid	**1**

Question 2

2(e)	ethene (1) steam / water (1)	**2**

Question 3

3(d)	carbon dioxide (1) water (1)	**2**

Question 4

4(a)(i)	circle around the OH group	**1**
4(a)(ii)	C=C bond	**1**
4(a)(iii)	C_4H_8O	**1**
4(a)(iv)	1 mark each for any two of: • (when mixture is heated) water boils off first / water boils off before crotyl alcohol • (because) water has a lower boiling point / crotyl alcohol has a higher boiling point • water reaches the condenser first / water condenses first	**2**
4(b)	1 mark each for any two of: • 25–35 °C (inclusive of these values) • anaerobic / absence of oxygen • yeast	**2**

Question 5

5(a)(i)	C	**1**
5(a)(ii)	D	**1**
5(a)(iii)	C	**1**
5(a)(iv)	E	**1**

Question 6

6(a)(i)	circle around OH attached to middle carbon atom	**1**
6(a)(ii)	$C_3H_6O_3$	**1**
6(b)(i)	ethene	**1**
6(b)(ii)	1 mark each for any two of: • anaerobic / no oxygen • yeast • room temperature / quoted values between 10 °C and 40 °C (inclusive) • pH neutral / pH 7	**2**
6(b)(iii)	solvent	**1**
6(b)(iv)	melting point / boiling point	**1**
6(c)	compounds with similar chemical properties (1) same functional group (1)	**2**

Question 7

7(e)	G	1

Question 8

8(a)	**M1** yeast (1) **M2** absence of air (1)	2
8(b)(i)	**M1** 300 (1) **M2** 6000 (1)	2
8(b)(ii)	ethene	1
8(b)(iii)	only one product	1
8(c)(i)	proton donor	1
8(c)(ii)	partial dissociation	1
8(c)(iii)	**M1** 4×-2 or -8 (1) **M2** $P + (4 \times -2) = -3 \therefore P = \mathbf{+5}$ (1)	2
8(d)	**M1** uses renewable resources (1) **M2** high rate of reaction (1)	2
8(e)(i)	potassium manganate(VII)	1
8(e)(ii)	reducing agent	1

Question 9

9(d)(i)	one product is formed	1
9(d)(ii)	temperature above 100 °C **OR** steam is used; **A** a quoted pressure 20–100 atm	1
9(d)(iii)	acidified aqueous	1
	(potassium) manganate(VII)	1

Question 10

10(c)(i)	propanoic acid structure of propanoic acid	2
10(c)(ii)	methanol	1

Question 11

11(c)	ethanol (1) carbon dioxide (1)	2