**Carbon pathways topic test solutions**

**SECTION A: Multiple-choice questions (1 mark each)**

**Question 1**

*Answer:* D

*Explanation:*

The ester would form from the reaction of propan-1-ol and methanoic acid.

**Question 2**

*Answer:* A

*Explanation:*

The molecule shown is an amide. It would form from ethanamine and propanoic acid.

**Question 3**

*Answer:* B

*Explanation:*

The reaction with chlorine will form a chloroalkane and the reaction with KOH will convert this to an alcohol.

**Question 4**

*Answer:* D

*Explanation:*

The alcohol group on the second carbon takes precedence over the alkene group.

**Question 5**

*Answer:* D

*Explanation:*

Products are chloromethane, dichloromethane, trichloromethane, tetrachloromethane and HCl

**Question 6**

*Answer:* A

*Explanation:*



**Question 7**

*Answer:* B

*Explanation:*

C2H4(g) + 2O2(g) 🡪 2CO2(g) + 2H2O(l)

**Question 8**

*Answer:* B

*Explanation:*

The compound has a C=C double bond and an acid group but no alcohol. This matches option B

**Question 9**

*Answer:* C

*Explanation:*

Option C is the only balanced half-equation.

**Question 10**

*Answer:* B

*Explanation:*

Option B is an addition reaction. It will have an atom efficiency of 100%

**SECTION B: Short-answer questions**

**Question 1** (4 marks)

**a**. 

 other products also possible



**b**.

 + HCl



**c**.



**d**.

**Question 2** (9 marks)

**a**. propan-1-ol and propan-2-ol

 3 marks



**b**. 2 marks

 1,2-dichloropropane

**c**. 1-brompropane 2-bromopropane 2 marks



**d**. 2 marks

**Question 3** (10 marks) 

**a**. 1-chlorobutane 2 marks



**b**. butan-1-ol 2 marks



**c**. butanoic acid 2 marks



**d**. + H2O 2 marks



**e**. methyl butanoate 2 marks

**Question 4** (12 marks)

**a**. **i**. The molecule could be hexene in which case the carbon-to-carbon double bond should react with

 bromine. 2 marks

  **ii**. If the molecule had been cyclohexane it would not react with bromine.

 1 mark

**b. i**. 1 mark



 **ii**. 2 marks

**c. i**. CH3CH2COOH(l) + H2O(l) 🡪 H3O+(aq) + CH3CH2COO-(aq) 1 mark

 **ii**. CH3CH2COOH(l) + NaOH(aq) 🡪 H2O(l) + CH3CH2COONa(aq) 1 mark



**d**. butan-1-ol pentanoic acid 4 marks

**Question 5** (5 marks)

**a**. C3H8(g) + Cl2(g) 🡪 C3H7Cl(g) + HCl(g) 1 mark

**b**. n(propane) = 5.4/44 = 0.123 mol

 n(C3H7Cl) = 0.123 mass = 0.123 x 78.5 = 9.63 g

 yield = 2.5/9.63 x 100 = 25.9% 2 marks

**c**. atom economy = 78.5 x 100/(44 + 71) = 68.3% 2 marks