1. An alcohol reacting with an acyl chloride gives:

   ☐ a halogenoalkane

   ☐ an ester (plus HCl)

   ☐ an alkene

   ☐ an amine

2. Phenol is:

   ☐ an –OH on a long alkyl chain

   ☐ an –OH group joined directly to a benzene ring

   ☐ a halogenoarene

   ☐ a carboxylic acid

3. Compared with using a carboxylic acid, making an ester from an acyl chloride is:

   ☐ slower

   ☐ faster and more complete

   ☐ reversible and incomplete

   ☐ impossible

4. Unlike an ordinary alcohol, phenol reacts with NaOH(aq). This shows phenol is:

   ☐ less reactive than an alcohol

   ☐ less acidic than an alcohol

   ☐ a stronger base than an alcohol

   ☐ more acidic than an alcohol

5. Ethanol + ethanoyl chloride gives:

   ☐ ethene

   ☐ ethanoic acid

   ☐ ethyl ethanoate

   ☐ ethanal

6. Phenol is a weak acid that reacts with sodium hydroxide.

   ☐ True ☐ False

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8. What is the M_r of 2,4,6-tribromophenol, $C_6H_2Br_3OH$? (C 12.0, H 1.0, Br 79.9, O 16.0)

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9. Carboxylic acids are more reactive than acyl chlorides.

   ☐ True ☐ False

10. Like esterification with a carboxylic acid, the reaction of an alcohol with an acyl chloride reaches an equilibrium.

    ☐ True ☐ False

1. **an ester (plus HCl)**

   The alcohol's –OH reacts with the acyl chloride to form an ester, releasing HCl.

2. **an –OH group joined directly to a benzene ring**

   The –OH is bonded straight to the aromatic ring, changing both the –OH and the ring chemistry.

3. **faster and more complete**

   Acyl chlorides are very reactive, so esterification with them is fast and goes essentially to completion.

4. **more acidic than an alcohol**

   Phenol is acidic enough to react with NaOH, forming sodium phenoxide; alcohols are not.

5. **ethyl ethanoate**

   The ester ethyl ethanoate forms, along with HCl fumes.

6. **True**

   The –OH on the ring is more acidic than in an alcohol.

7. **ester**

   Releasing hydrogen chloride gas.

8. **330.7**

   $6(12.0) + 3(1.0) + 3(79.9) + 16.0 = 72.0 + 3.0 + 239.7 + 16.0 = 330.7$.

9. **False**

   False. Acyl chlorides are more reactive than carboxylic acids, because chloride is a good leaving group and the carbonyl carbon is strongly $\delta+$.

10. **False**

    It is not reversible: the HCl escapes as a gas, so the reaction goes to completion at room temperature.

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