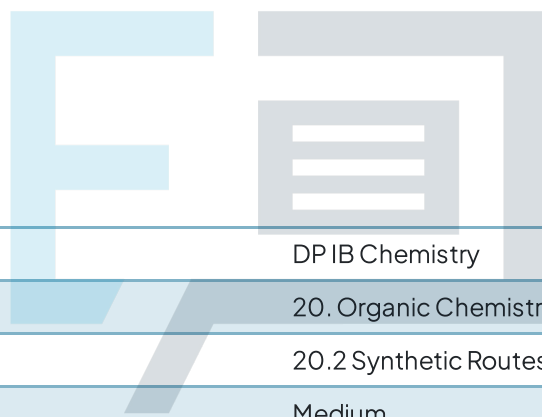




20.2 Synthetic Routes

Mark Schemes



Course	DP IB Chemistry
Section	20. Organic Chemistry (HL only)
Topic	20.2 Synthetic Routes
Difficulty	Medium

Exam Papers Practice

To be used by all students preparing for DP IB Chemistry HL
Students of other boards may also find this useful

1

The correct answer is **A** because:

- The conversion of a haloalkane to an alcohol in step I is nucleophilic *substitution*
- In step II, an alcohol becoming a carboxylic acid is *oxidation*
- The formation of an ester in step III, can be called a *condensation* reaction

B is incorrect as	the first and second steps are wrongly classified
C is incorrect as	the first and second steps have been switched around
D is incorrect as	the third step has been wrongly classified

2

The correct answer is **B** because:

- The first step is the reduction of a ketone, so a reducing agent would be needed, in this case sodium borohydride
- The second step is esterification which requires the appropriate carboxylic acid and sulfuric acid as a catalyst
- The $-\text{C}_2\text{H}_5\text{COO}$ group is three carbons long, so the acid must be propanoic acid



A is incorrect as	step 1 is using an oxidising agent not reducing agent
C is incorrect as	the wrong carboxylic acid is used in step 2
D is incorrect as	step 1 is using an oxidising agent not reducing agent and the wrong carboxylic acid is used in step 2

3

The correct answer is **C** because:

- The first step is the nitration of benzene which occurs by electrophilic substitution
- The second step is the reduction of a nitro group to an amine

A is incorrect as	step 1 is not oxidation and step 2 is a reduction
B is incorrect as	step 1 is not addition as a hydrogen has been replaced on the ring by a nitro group, and step 2 is a reduction
D is incorrect as	step 1 is not an oxidation reaction

4

The correct answer is **D** because:

- The OH group will substitute for the Br, so only pentan-2-ol can be formed

A is incorrect as	the OH group can join on the first or second carbon so the products will be pentan-1-ol and pentan-2-ol
B is incorrect as	the OH will substitute for the Br so the only product will be pentan-1-ol
C is incorrect as	the OH group can join on the second or third carbon so the products will be pentan-2-ol and pentan-3-ol

5

The correct answer is **B** because:

- The final product is an alcohol which could be made from an alkene, an aldehyde, a ketone, a carboxylic acid or halogenoalkane
- The starting material is an alkane which typically have two characteristic reactions:
 - Combustion
 - Halogenation
- Combustion would produce CO_2 and H_2O so that can be eliminated
- Halogenation producing a halogenoalkane must be the correct intermediate



A is incorrect as	this is the formula of an nitrile which cannot be made from an alkane in one step
C is incorrect as	there are two chlorines on the intermediate
D is incorrect as	an alkane cannot be converted into a carboxylic acid in one step



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