Chapter Summary Worksheet

Chapter 14 Organic analysis and synthesis

Print out and complete this worksheet to generate a summary for Chapter 14.

1 An organic compound Q contained the following elements by mass: carbon 52.2%, hydrogen 13%, oxygen 34.8%.

Its empirical formula is:

- ☐ **A** CH_3O
- ☐ **B** C_2H_3O
- ☐ **C** C_2H_6O
- ☐ **D** C_4H_6O

2 A compound with molecular formula C_4H_8O gave a yellow precipitate with 2,4-dinitrophenylhydrazine and a red precipitate with Fehling's solution. Its NMR spectrum has three peaks. It is:

- ☐ **A** $(CH_3)_2CHCHO$
- ☐ **B** $CH_3CH_2CH_2CHO$
- ☐ **C** $CH_3COCH_2CH_3$
- ☐ **D** $CH_2{=}CHCH_2CH_2OH$

3 Which substance would **not** react with $NH_2CH_2CH{=}CHCH_2OH$?

- ☐ **A** dilute hydrochloric acid
- ☐ **B** lithium aluminium hydride in dry ether
- ☐ **C** bromine water
- ☐ **D** ethanoic acid in the presence of concentrated sulfuric acid

4 Ethyl 3-aminobenzoate, $NH_2C_6H_4COOC_2H_5$, can be prepared from benzoic acid in three steps.

$$C_6H_5COOH \xrightarrow{\text{step 1}} C_6H_5COOC_2H_5 \xrightarrow{\text{step 2}} NO_2C_6H_4COOC_2H_5 \xrightarrow{\text{step 3}} NH_2C_6H_4COOC_2H_5$$

The correct reagents and conditions for each step are

	Step 1	Step 2	Step 3
☐ **A**	Ethanol and concentrated sulfuric acid	Dilute nitric and sulfuric acids at 50°C	Tin and concentrated hydrochloric acid
☐ **B**	Ethanol and concentrated sulfuric acid	Concentrated nitric and sulfuric acids at 50°C	Tin and concentrated hydrochloric acid
☐ **C**	Ethanol and concentrated sulfuric acid	Dilute nitric and sulfuric acids at 50°C	Tin and dilute hydrochloric acid
☐ **D**	Ethanoyl chloride	Concentrated nitric and sulfuric acids at 50°C	Tin and dilute hydrochloric acid

5 The correct sequence for recrystallisation is to dissolve in the minimum amount of hot solvent, then:

- ☐ **A** cool, filter, wash the residue with the minimum amount of cold solvent
- ☐ **B** cool, filter, wash the residue with the minimum amount of solvent
- ☐ **C** filter, wash the residue with the minimum amount of cold solvent
- ☐ **D** filter, cool the filtrate, filter, wash the residue with the minimum amount of cold solvent

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6 Which drying agent could be used to dry a solution of phenylamine in ether?

- ☐ **A** anhydrous calcium chloride
- ☐ **B** anhydrous copper sulfate
- ☐ **C** potassium hydroxide
- ☐ **D** concentrated sulfuric acid

7 A student planned to prepare a small quantity of ethyl ethanoate by heating under reflux ethanol, ethanoic acid and some concentrated sulfuric acid as a catalyst. Some data for possible hazards of these substances are listed below.

- concentrated sulfuric acid: an oily corrosive liquid that boils with decomposition at 340°C and reacts exothermically with compounds containing an –OH group.
- ethanol, ethanoic acid and ethyl ethanoate: flammable, volatile liquids

Which would **not** be necessary for reducing the risk when performing this experiment?

- ☐ **A** use a water bath to heat the mixture
- ☐ **B** add the concentrated sulfuric acid dropwise to the reaction mixture
- ☐ **C** wear gloves
- ☐ **D** carry out the reaction in a fume cupboard

8 Which reaction would **not** give a single stereo isomer?

- ☐ **A** the addition of hydrogen cyanide, HCN, to ethanal, CH_3CHO
- ☐ **B** the S_N2 substitution of OH^- into a single enantiomer of a halogenoalkane
- ☐ **C** the addition of hydrogen, using a platinum catalyst, to *cis*-3,4-dimethylhex-3-ene, $C_2H_5C(CH_3)=C(CH_3)C_2H_5$
- ☐ **D** the addition of bromine to cyclohexene

9 The ester methyl benzoate can be hydrolysed to benzoic acid and methanol by heating under reflux with dilute hydrochloric acid. The solid benzoic acid is filtered off and solid sodium hydrogencarbonate is added to the solution. The purpose of the sodium hydrogencarbonate is to:

- ☐ **A** remove any organic impurities
- ☐ **B** remove any inorganic salts
- ☐ **C** remove any acidic impurities
- ☐ **D** dry the methanol

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