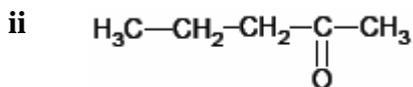


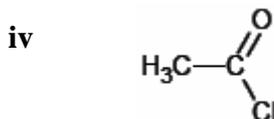
Answers to 90698 (3.5) NCEA 2004

Note: Mark each question with only the highest grade earned (ie, count only 'M', not 'A, M').

1 a i 3-methylbutanal



iii 2-aminobutanoic acid



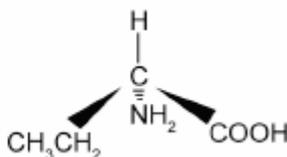
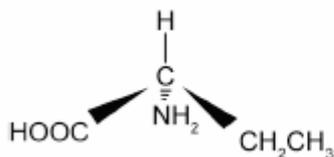
A = 3 of 4 answers correct. Shows ability to draw and name molecules at Level 3

b i Aldehyde / carbonyl group / alkanal

ii carboxyl / alkanic acid / carboxylic acid, amino group

A = 2 of 3 correct indicating correct knowledge of groups in Level 3

c

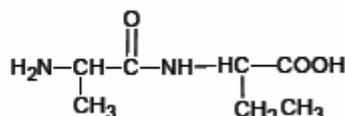
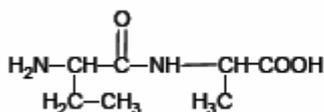


A = One isomer drawn correctly with 3-dimensional arrangement of groups around chiral C (three types of bond lines), M = Both isomers correctly drawn showing 3-dimensional arrangement around chiral C and correct mirror images

d Solutions rotate plane polarised light in different directions. Same physical properties eg same BP, MP, density, polarity; very similar chemical properties (identical in reaction with optically inactive molecules because the same bonds will be broken).

A = Brief description, with appropriate reference to rotation of polarized light, M = Description recognising similarity and differences in physical and chemical properties including rotation of polarized light

e i

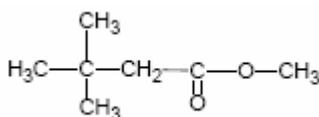


A = Molecule drawn has an amide link, M = 1 correct dipeptide drawn OR both correctly drawn as part of a polymer chain, E = Both dipeptides correctly drawn.

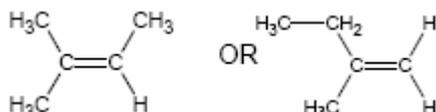
ii Condensation reaction results in removal of a small molecule OR water during the bonding reaction between the 2 molecules, in this case a water molecule is produced for every peptide bond formed. The OH is removed from the carboxylate or OH ends and the H is removed from the amine group.

A = Correct definition of condensation reaction given but not in relation to explanation of (i) above, M = Correct definition related to (i) referring to the dipeptides formed

2 a i



ii



b Reaction (a)(i) condensation /esterification/substitution

Reaction (a)(ii) elimination

A = One structure correct, M = One structure drawn correctly and linked to the appropriate type of reaction, E = Both structures correct with a link to the appropriate reaction type in part (b), reflecting an appreciation of both esterification and elimination

3 a Only the propanal will react with Tollens, Fehling's or Benedict solutions. The aldehyde reduces Tollens reagent producing a silver mirror on the side of the test tube (on warming); reduces Benedict solution, colour change blue to brick-red ppt; (similar for Fehling's).

b The amine $\text{CH}_3\text{CH}_2\text{NH}_2$ is a weak base, it will dissolve in water to give a basic solution, while the amide forms a neutral solution when dissolved in water e.g. litmus solution changes colour from red to blue when placed in an alkaline solution.

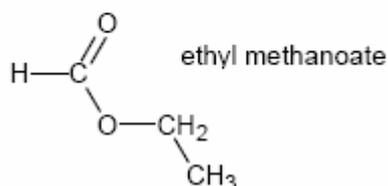
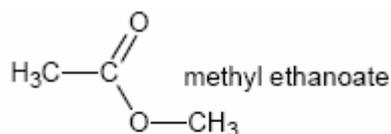
OR amines form deep blue colored complex ions with copper(II), amides do not.

A = Test correctly identified by name or reagent for both pairs of compounds

OR tests distinguishing one pair described in full,

M = Clear explanation for distinguishing between both pairs

4 a



A = One structural isomer correctly drawn and named

b Possible oxidising agents acidified potassium dichromate or potassium permanganate or chromic acid.

Diagram (ii) shows a condenser attached on top of the flask to be heated. As water passes through the condenser jacket it cools any vapour which is then returned to the solution. In this way the rate of reaction is increased by heating and none of the organic material is lost through evaporation.

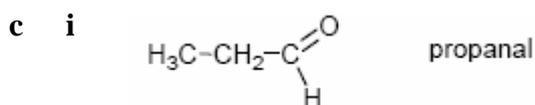
A = One of:

- Appropriate oxidising agent identified as well as diagram (ii) as being appropriate experimental arrangement

Or • how the experimental arrangement works

Or • why it is necessary to heat under reflux,

M = Two of the points above, E = All the points above

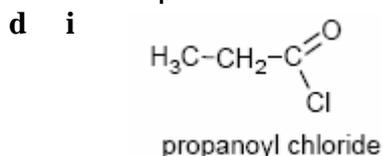


- ii The mixture should not be refluxed, but as the oxidising agent is added to the alcohol and acid catalyst it should be heated and the aldehyde distilled off as it forms.

A = Molecule correctly drawn and named

OR description of how to obtain aldehyde, not carboxylic acid, by distilling off the aldehyde as it forms,

M = both of points above



- ii Anhydrous means in the absence of water ie dry conditions; water will influence the yield as it will produce the reverse reaction – turning the acid chloride into the carboxylic acid / hydrolysing the PCl_5 .

A = Either name or structure identifies an acid chloride OR correct definition of anhydrous,

M = Correct name and structure with appropriate definition of the word anhydrous,

E = All correct with a discussion recognising that any water present would react with and hydrolyse the acid chloride or PCl_5

e i E = propanamide

ii G = ammonia / NH_3

A = Correct name and reagent given

f Ammonia NH_3

Sodium propanoate $\text{CH}_3\text{CH}_2\text{COONa}$ (or the propanoate ion) or Propanoic acid

A = Correct name and structure of one of products or correct structural formula for both,

M = Correct name and structure of the ammonia, and hydrolysis product identified as propanoic acid

- 5 Aspirin is an ester, formed from an equilibrium reaction producing water. In the presence of water (humidity) the reverse reaction occurs, producing ethanoic acid, and the alcohol. (Reaction may be drawn instead.)

A = Discussion identifies that a hydrolysis reaction occurs but lacks depth OR correct formulae of products, M = Brief discussion of hydrolysis reaction of ester correct AND correct formulae of products, E = Full discussion of hydrolysis reaction of ester AND correct formulae of products provided AND identify the smell of ethanoic acid OR increased rate of reaction explained

Judgement Statement

Achievement: Total of 7 opportunities answered at Achievement (or higher)

Merit: Total of 8 opportunities answered with 5 at Merit level and 3 at Achievement level

Excellence: Total of 8 opportunities answered with 3 at Excellence level, 3 at Merit level and 2 at Achievement level