# Stage 2 Chemistry — *Organic & Biological Chemistry*

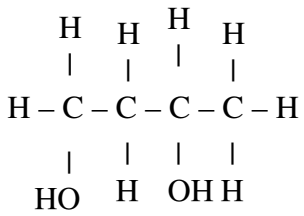
## Summative Test *SOLUTIONS*

1.

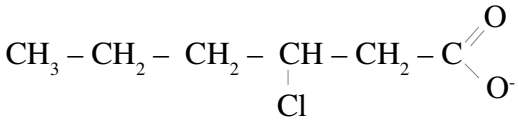
(a) 4-methyl pentanal
(b) propanoic acid
(c) 1,3-pentadiene
(d) 2,4-hexadione
(e) ethyl butanoate
(f) 2-pentanamine

2.

(a)



(b)



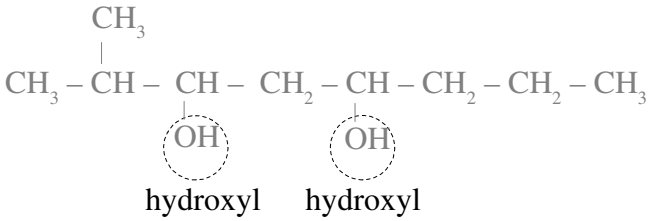
3. Propanal will be oxidised by Tollens' reagent, reducing it to silver ions which will be visible. Propanone will not react.
(this is a *how* question so the chem explanation is not actually required, and details like applying heat are most welcome)

4. Hexanoic acid has a larger carbon chain than ethanoic acid, so the dispersion forces will be stronger between hexanoic acid molecules than between ethanoic acid molecules. Stronger secondary forces means higher boiling point.

5. Methanamine has has N-H bonds which are able to form hydrogen bonds with water molecules. Chloromethane's Cl-C bond is not polar enough to do so and therefore will not dissolve.

6.

(a)



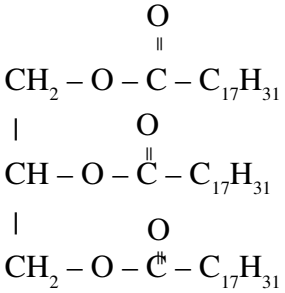

(b) It would change colour from orange to green, as secondary hydroxyl groups are oxidised reducing the dichromate ions to chromium ions.

7.

(a) hydrogen gas ($H_{2\,(g)}$), nickel catalyst
(b) high pressure / high temperature
(c) unsaturated to saturated
(d) from a liquid at room temperature to a solid at room temperature (higher melting point)

8.

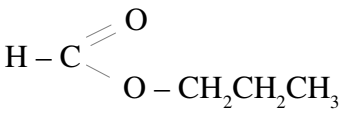
(a) methanol
(b) ester
(c)



(d) It will react with bromine water since it is unsaturated (contains alkene groups).

9.

(a) Example: propyl methanoate



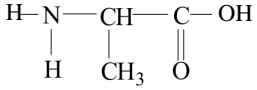
(b) 81.2°C. Short chained molecule (lower b.pt.), but dipole-dipole secondary forces so not as low as 15.9°C. No hydrogen bonding so not as high as butanoic acid (rules out 151.6°C).

10.

(a) protein (or polypeptide)

(b) amide (any C=O;N-H circled)

(c)



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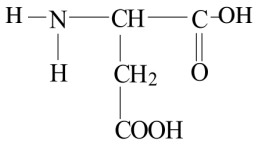

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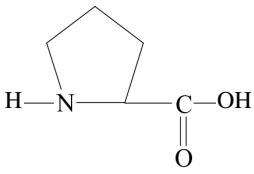


11.

Drugs that are more soluble in water will be more effective.
Paracetemol is more polar because it has two polar functional groups (hydroxyl and amide) so it is sufficiently soluble in water whereas ibuprofen only has one polar functional group (carboxyl) so it is not.
When the tablet is added to water, the sodium carbonate reacts with the carboxyl group forming a sodium carboxylate salt which is more soluble in water due to being ionic (ion dipole bonding).

12.

(a) Polysaccharide

(b) The polar hydroxyl functional groups occur often along the molecule, providing a large number of sites where water can hydrogen bond with the cellulose and hence become absorbed.

(c)

(i) Hydrolysis

(ii) $C_6H_{12}O_6$

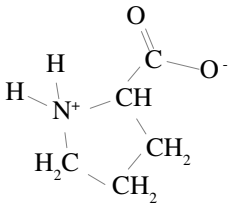
(iii) Enzymes, warmth, dilute aqueous solution, slightly acidic, anaerobic conditions

(iv) $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

13.

(a) C (carbon)

(b)



(c)