## **Stage 2 Chemistry**

## **Birdwood**

HIGH SCHOOL **Topic 4: Organic and Biological Chemistry**

**Naming, Physical Properties**, **Alcohols**

**Review Paper 10**

**DUE DATE:** Ref: ESSENTIALS pages 228 - 237

**Question 1**

Cholesterol is a waxy, fat-like substance, also known as a lipid.  Cholesterol is essential to the body's cell membranes, insulation of the nerves and to the production of certain hormones.  To help digest food, the liver uses cholesterol to make bile acids.  However, high blood cholesterol is a 'risk factor' for heart disease, which means it increases your chance of getting a heart disease.

A structural formula for cholesterol is shown:



a *Name one* of the functional groups present in

cholesterol.

Hydroxyl

b In what type of solvent, polar or non-polar, would

you expect cholesterol to be most soluble? Explain.

Non polar. Cholesterol is a large non polar molecule with only one polar functional group. To dissolve it must form bonds of similar strength to the solvent that it forms with itself, therefore the solvent must be non polar.

c Cholesterol can be oxidized using a suitable

oxidizing agent.

To what organic family of compounds would

the *product* of this oxidation belong?

The product would be a ketone

(5 marks)

**Question 2**

The table below shows the boiling points of two common substances.

|  |  |  |
| --- | --- | --- |
| **Substance** | **Molecular Formula** | **Tb/0C** |
| ethanal | CH3CHO | 20.1 |
| ethanol | CH3CH2OH | 78.3 |

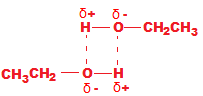
a i Describe the main *type* of secondary interaction that is present in ethanol.

Ethanol will form hydrogen bonds.

ii State its relative strength compared to the secondary interactions shown in ethanal.

Hydrogen bonds are much stronger than the dipole-dipole interactions present in ethanal

b Draw a diagram to show *two* ethanol molecules held together by this secondary interaction.

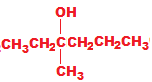


c Explain why the melting point of ethanol is so much higher than that of ethanal.

As stated previously, hydrogen bonds are a much stronger secondary bond than dipole-dipole bonds. The stronger interactions will require more energy to break and so will require a higher melting point.(8 marks)

**Question 3**

a Draw the structural formula for 3-methylhexan-3-ol.



b Is 3-methylhexan-3-ol a primary, secondary or tertiary alcohol? (3 marks)

tertiary

**Question 4**

The United States Environmental Protection Agency states that the legal limit for mercury in public water systems is 0.002 mg L-1.

Convert this to g mL-1. (2 marks)

0.002 mg L-1 / 1000 = 0.000002 mg mL-1

0.000002mg mL-1 / 1000 = 0.000000002 g mL-1

**Question 5**

Wynn’s Coonawarra Estate, just north of Penola in South Australia, is one of several wineries throughout the Lower south-east. Grapes are grown locally, some being converted into a variety of wines.

a Write two balanced equations which show the hydrolysis of starch to glucose.

(C6H10O5)x + xH2O -> xC6H12O6

Two equations would be going through a disaccharide and then onto the monosaccharide

b Write a balanced equation for the conversion of glucose into ethanol by fermentation.

C6H12O6 -> 2C2H5OH + 2CO2

c State three reaction conditions that are necessary for fermentation to occur. (7 marks)

mildly acidic

temperature 25-30oC

anaerobic conditions

**Question 6**

a Calculate the mass, in mg, of sodium hydroxide needed to prepare 500 mL of a 100 ppm standard solution.

100ppm = 100 mg L-1

50 mg in 500mL

b The concentration of Cd2+ ions in a sample of waste water was found to be 5000 ppb.

The legal limit is 2.5 ppm. Is this sample within the limit?

5000 ppb / 1000 = 5 ppm

This is twice the legal limit

c Prozac is a drug given to patients suffering from depression and the eating disorder, bulimia nervosa.

For depression, the recommended dose is 20 mg per day.

If the volume of aqueous body fluid in an average adult is 45 L, calculate the concentration of Prozac,

in mmol mL-1 in the aqueous body fluid in an average adult who has taken the prescribed daily dosage.

[The molar mass of Prozac is 309.326 g/mol ]

20 mg in 45L = 0.44mg L-1

0.44mg L-1 / 309.326 = 0.00144mmol L-1

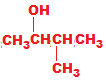
0.00144 mmol L-1 x 1000 = 1.44 mmol mL-1

(8 marks)

**Question 7**

Write *structural formulae* and *name* the alcohol that would be oxidized to form the compound

3-methyl butan-2-one. (2 marks)



3-methyl butan-2-ol

**TOTAL MARK = 35**