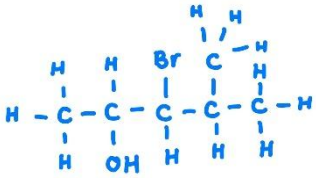
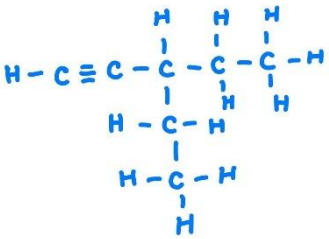
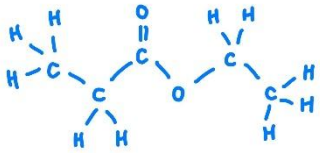
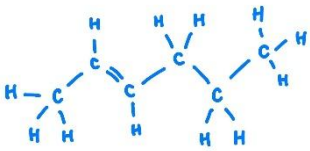
Question 1 (6 marks)

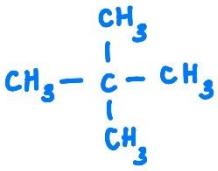
Name the following organic molecules using their systematic naming





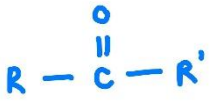


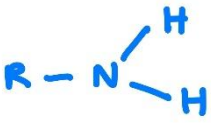


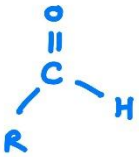


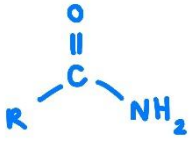
Question 2 (6 marks)

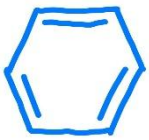
Identify the functional group of the following:

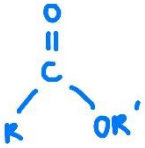












Question 3 (2 marks)

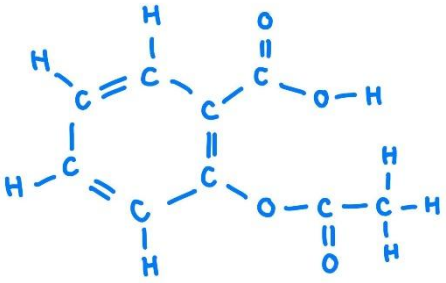
What are the two functional groups that are always in position carbon number 1?

Question 4 (1 mark)

In the space below, draw the following organic compound: 3,3-dimethyl-2-iodoocten-4-oic acid

Question 5 (6 marks)

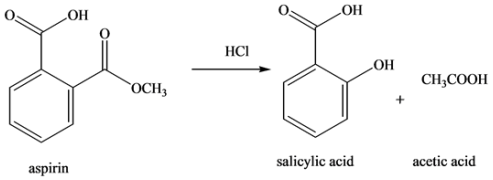
Acetylsalicylic acid also known as aspirin, is a medicine that helps to reduce headache tension, fever, and inflammation. Its molar mass is 180.158 g mol^{-1} and its chemical structure is shown below.



(a) Write the chemical formula of acetylsalicylic acid **2 marks**

(b) How many functional groups are present in aspirin **2 marks**

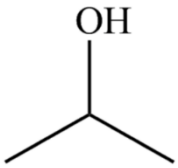
(c) Aspirin can be converted to salicylic acid inside the small intestine, which is then absorbed by the bloodstream, what functional group is formed **1 mark**

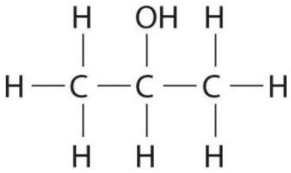


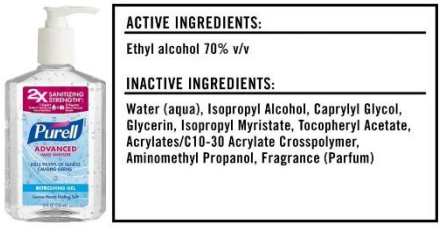
Question 6 (6 marks)

All bacterial cells have a cell wall that acts as a barrier to protect the bacterium and store its components within. In order to remove bacteria from surfaces, 2-propanol is a common alcohol that is a central component of many cleaning disinfectants including hand sanitisers. Like all alcohols, there is a polar (hydrophilic, water 'loving') and a non-polar (hydrophobic, water 'hating') component to the molecules.

When 2-propanol is in contact with a bacterium its non-polar segment will mix with the bacterium's cell wall and disrupt the fatty parts of the wall thus exposing the inner components to disintegrate further.







(a) Why are most alcohols like 2-propanol able to dissolve in water? **2 marks**

(b) Why would an alcohol like 2-propanol be preferred in water-based disinfectants rather than a larger alcohol like hexan-2-ol? **3 marks**

(c) Would 2-propanol be readily oxidised to form the ketone propanone? **1 mark**

Question 7 (6 marks)

The table below lists four semi structural molecules that are different in their functional groups.

Semi-structural formula	Molar mass (g mol^{-1})	Boiling point (°C)
CH3CH2CH2CH3	58	-0.5
CH3CH2CH2OH	60	97
HCOOCH3	60	32
CH3COCH3	58	56

(a) It appears that the alcohol on the table above has the highest boiling point. Provide reasoning for this observation **3 marks**

_____
_____
_____
_____

(b) Which of the four organic molecules would have the highest flashpoint and provide reasoning **3 marks**

_____
_____
_____
_____
_____

Question 8 (7 marks)

Petrodiesel and biodiesel are two different types of substances that are both used as a source of fuel but are structured differently.

Fuel	Major component	Energy content (MJ/kg)	CO_2 emission (kg CO_2/kg of fuel)
petrodiesel	$C_{12}H_{26}$	43	3.17
biodiesel	$C_{19}H_{32}O_2$	38	2.52

(a) Petrodiesel is referred to as a saturated hydrocarbon that determines all of its properties as a fuel. What does saturated mean? **1 mark**

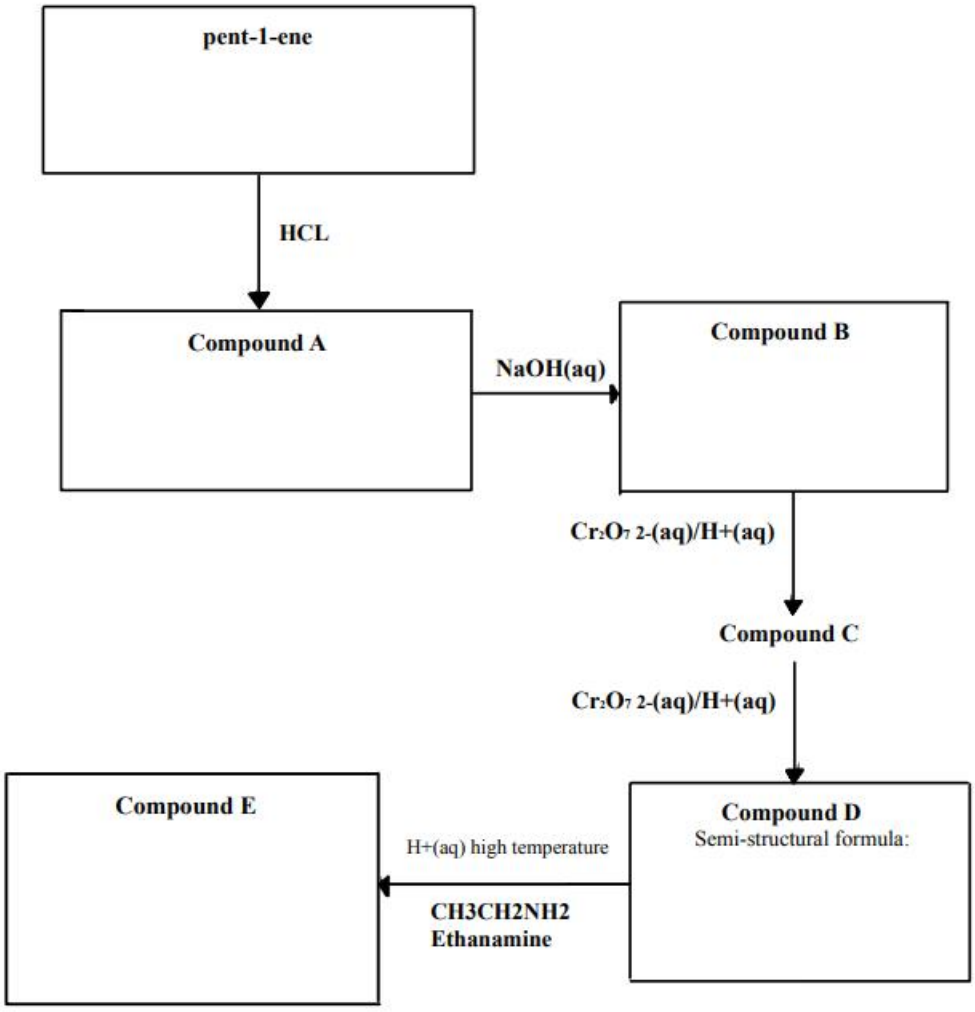
(b) E10, a type of fuel, contains a maximum of 10% ethanol component before safety of the driver is at risk. Why would additional amounts ethanol be an issue especially to older vehicles? **2 marks**

(c) Calculate how much CO_2 emission is released when 10800MJ of petrodiesel is released under complete combustion. **2 marks**

(d) There is a major push to distribute biodiesel as the main fuel source worldwide to reduce CO_2 impact on the environment. This may not benefit the environment as much as predicted. Provide a reason for this. **2 marks**

Question 9 (6 marks)

The following diagram is a reaction pathway for the synthesis of compound E



(a) Draw the structural formula for pent-1-ene in the box provided **1 mark**

(b) When pent-1-ene reacts with HCL compound A is formed. Identify compound A and the reaction that occurred **2 marks**

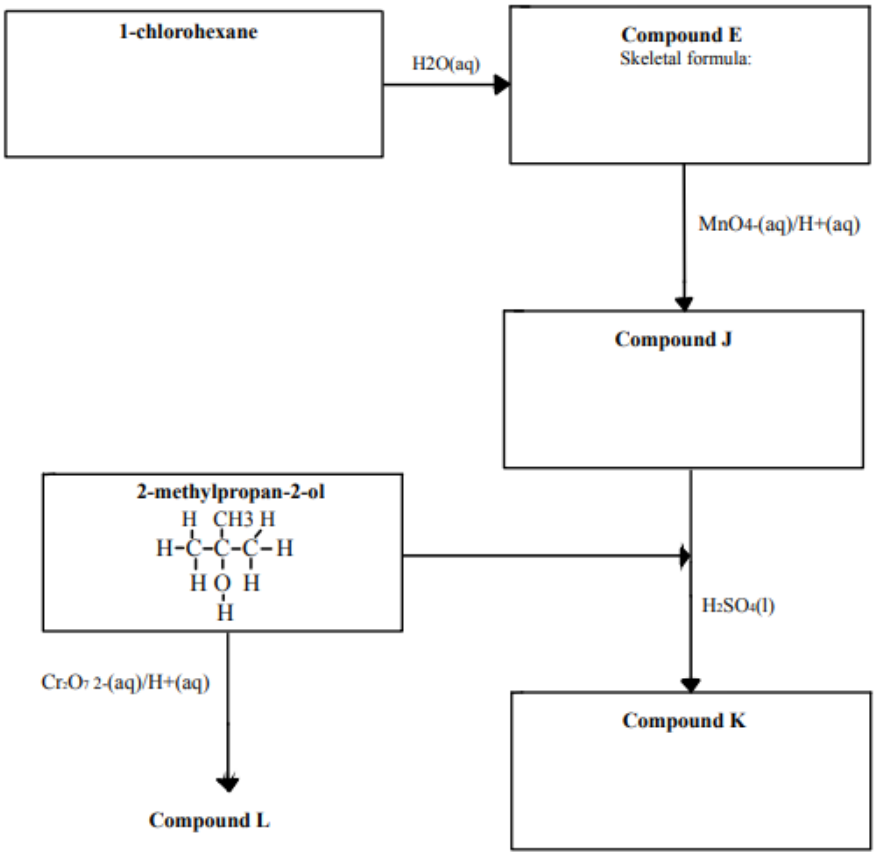
(c) Identify compound B and draw its structural formula in the box provided **1 mark**

(d) Compound B has undergone two reactions to form Compound D using the reagents listed. Write the semi-structural formula of Compound D in the box provided. **1 mark**

(e) Compound E, the desired molecule, is formed when compound D is mixed with ethanamine, CH3CH2NH2. Draw its structural formula in the box provided. **1 mark**

Question 10 (8 marks)

Below is a reaction pathway beginning with 1-chlorohexane.



(a) Draw the structural formula of 1-chlorohexane in the box provided **1 mark**

(b) Draw the skeletal structure of compound E in the box provided **2 marks**

(c) Once compound E is formed it then oxidised to form J, a carboxylic acid. Draw the structural formula for compound J in the box provided **1 mark**

(d) Butan-2-ol is reacted with compound J using propanoic acid, $H_2SO_{4(l)}$, as a catalyst.

(e) Draw the structural formula for compound K in the box provided **1 mark**

(f) Name the homologous series to which compound K belongs to **1 mark**

_____

(g) The reaction pathway suggests that 2-methlypropan-2-ol can be oxidised to form compound L. Explain, with reasoning, the error in this suggestion. **2 marks**

_____

_____

_____

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