Chemistry Department

Christ Church Grammar School

Year 12

2022

Organic Topic Test

Time allowed: 45 minutes

Instructions

Please ensure you enter your name and circle your teacher's initials below. Scientific calculators only.

Chemistry Data Sheet will be provided

Name:

_____

Teacher: (circle)

MXC NMO BLR

Mark:_____ **/ 48**

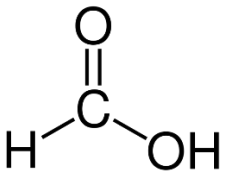
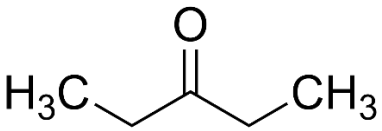
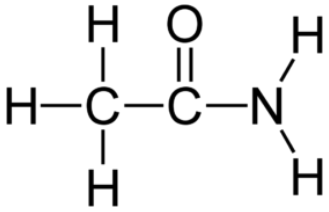
Section 1: Multiple Choice (10 marks)

Question	Answer
1	B
2	C
3	A
4	D
5	B
6	A
7	D
8	B
9	A
10	B

Section 2: Short Answer (38 marks)

Question 11 **(11 marks)**

a) Complete the following table using structural formula, IUPAC Nomenclature, and listing all intermolecular forces (IMFs) between molecules. (6 marks)

IUPAC Name	Structural Formula	List all IMFs
methanoic acid		Dispersion forces (dipole-dipole) H-bonds (1)
pentan-3-one		Dispersion forces Dipole-dipole (1)
ethanamide		Dispersion forces (dipole-dipole) H-bonds (1)

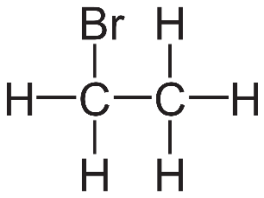
b) Write a balanced equation and appropriate observation for the reaction of liquid propanal and acidified potassium permanganate. (5 marks)

Equation	Working (not required) $CH_3CH_2CHO + H_2O \rightarrow CH_3CH_2COOH + 2\ H^+ + 2\ e^-$ $MnO_4^- + 8\ H^+ + 5\ e^- \rightarrow Mn^{2+} + 4\ H_2O$ **Equation** $5\ CH_3CH_2CHO + 2\ MnO_4^- + 6\ H^+ \rightarrow 5\ CH_3CH_2COOH + 2\ Mn^{2+} + 3\ H_2O$ (3)
Observation	A purple solution is added to a colourless liquid. The purple solution turns pale pink (colourless) / decolourises. (2)

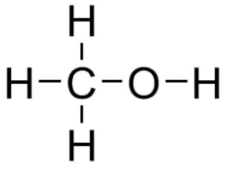
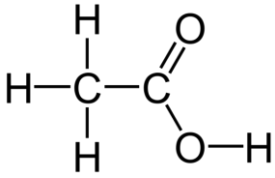
Question 12 **(8 marks)**

Draw the structural formula and write the IUPAC name of all possible organic products of the following reactions.

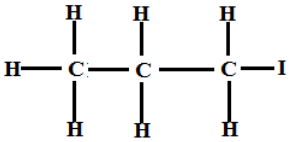
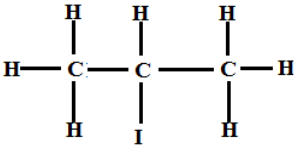
a) Hydrogen bromide gas was bubbled through a solution containing ethene.

Structural formula of product(s)	 (1)
Name of product(s)	bromoethane (accept: 1-bromoethane) (1)

b) Methyl ethanoate was hydrolysed in acidified conditions.

Structural formula of product(s)	 (1)  (1)
Name of product(s)	methanol (1) and ethanoic acid (1)

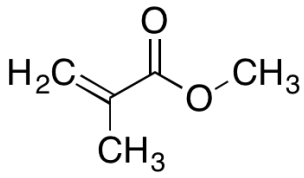
c) Propane gas was bubbled through a solution of iodine water, in presence of UV light.

Structural formula of product(s)	 OR  (1)
Name of product(s)	1-iodopropane OR and 2-iodopropane (1)

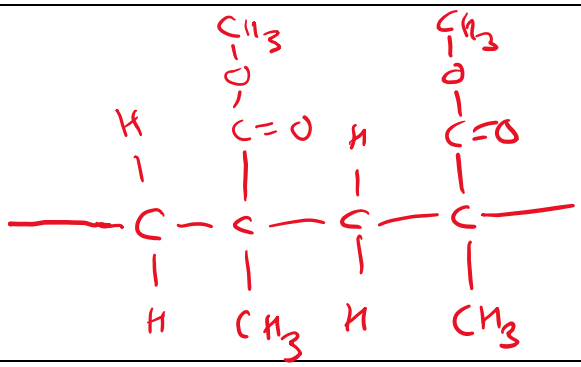
Question 13 **(4 marks)**

Lucite acrylic is a classic polymer invented by the Dupont Corporation® in 1931. It is made from a methyl methacrylate monomer, and produces a strong, transparent, UV resistant polymer, that is commonly used in aeroplane windows.

The methyl methacrylate monomer unit is shown below:



a) Draw the structural formula of <u>two</u> repeating units of the polymer. (2 marks)



Description	Marks
Two repeating units	2
Each minor error (i.e. capping the end of the molecule)	-1
Total	2 marks

b) Name this polymer. (1 mark)

Description	Marks
Polymethyl methacrylate **or** poly(methyl methacrylate)	1
Total	1 mark

c) Name the type of polymerisation reaction used here. (1 mark)

Description	Marks
Addition (polymerisation)	1
Total	1 mark

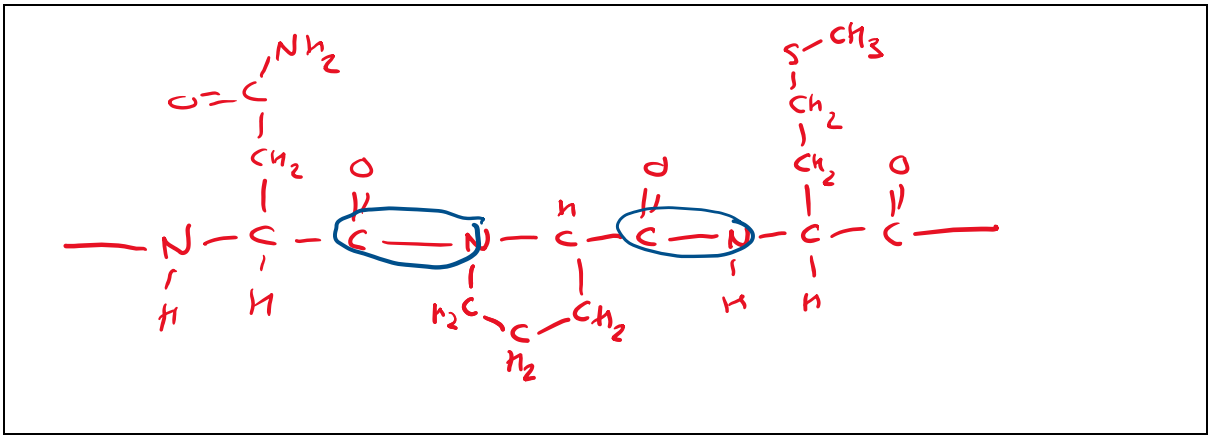
Question 14 **(8 marks)**

The Irukandji Jellyfish is a type of box jellyfish found in northern Australian waters. Its sting is extremely venomous, and symptoms include excruciating pain and a psychological sense of impending doom.

The venom of the Irukandji Jellyfish contains a protein, which has a segment containing the following amino acids:

– Asn – Pro – Met –

a) Draw this segment of the venom protein and circle all peptide bonds. (4 marks)



Description	Marks
Correct structure of each amino acid	3
Circle <u>two</u> peptide bonds NOTE: accept circling the entire peptide linkage (i.e. CONH)	1
Each minor error i.e. too many bonds on atoms, incorrect peptide bond	-1
Total	4 marks

b) Use this segment of the protein, as an example to define the primary structure of a protein. (1 mark)

Description	Marks
Primary structure definition: sequence order and number of amino acids in the protein chain.	1
Total	1 mark

c) State the tertiary interactions which could occur in this protein, as contributed by Asn, Pro and Met. (3 marks)

Description	Marks
Asn: dispersion forces, (dipole-dipole), H-bonds	1
Pro: dispersion forces	1
Met: dispersion forces, dipole-dipole	1
Total	3 marks

NOTE: for marks to be allocated for part (c) the interactions must be attributed as contributed by either Asn, Pro or Met as per above. A list of interactions with no detail as contributed by which amino acids R-group will not be awarded marks.

Question 15 **(7 marks)**

Ethanamine, ethanoic acid and glycine are all molecules that contain two carbon atoms in their chain. However, their boiling points are quite different.

IUPAC Name	MW (g mol^{-1})	Boiling Point (°C)
Ethanamine	45.08	17
Ethanoic acid	60.05	118
Glycine (Gly)	75.07	233

Explain this observation, with reference to the information in the table above.

Description	Marks
MW / no e^-: comment on number e- of each molecule. Gly > acid > amine	1
Dispersion forces: comment on relative strength of dispersion forces. Gly > acid > amine	1
no. of H-Bonds: ethanamine (one), ethanoic acid (two)	1
Ionic interactions recognition of Gly zwitterion forming ionic interactions	1
Sum of IMFs: Gly > acid > amine	1
B.p: Gly > acid > amine	1
As increase sum of IMFs requires more energy to overcome in order to move molecules into gaseous state. NOTE: this mark is for a link between b.p and amount of energy required to overcome sum of IMFs.	1
Total	7 marks

END OF TEST