SCH 4U1-a NAME: Edward stratiy DATE: November 27, 2020

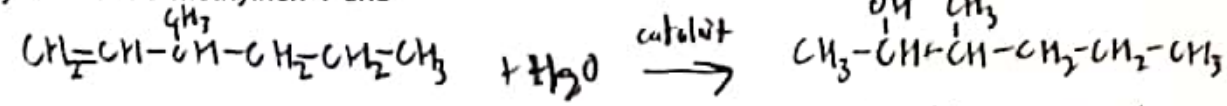
UNIT 1: ORGANIC CHEMISTRY UNIT TEST

KNOWLEDGE /25	INQUIRY /16	COMMUNICATION /10	APPLICATION /5

INQUIRY (16 MARKS)

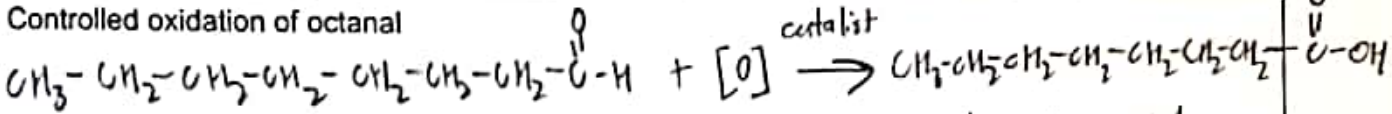
1. Write a chemical equation, using structural formula or carbon skeleton, for each of the following reactions and *name the reactants and products*: (10 Marks total - 2 marks for each reaction)

(a) Hydration of 3-methylhex-1-ene



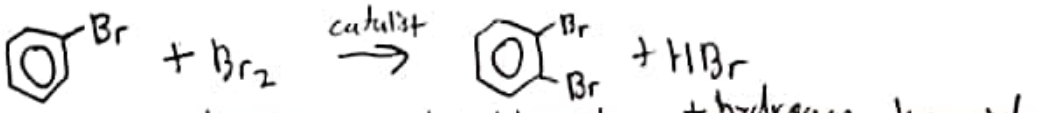
3-methylhex-1-ene + water → 3-methylhexan-2-ol

(b) Controlled oxidation of octanal



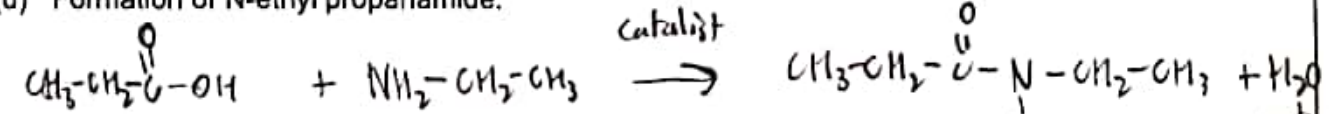
octanal + oxydizing agent → octanoic acid

(c) Substitution of bromine onto bromobenzene



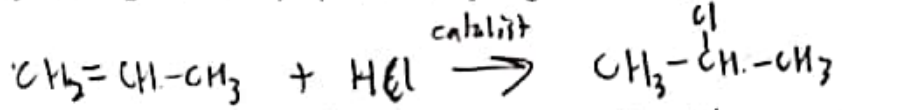
bromo benzene + bromine → 1,2-dibromobenzene + hydrogen bromide

(d) Formation of N-ethyl propanamide:



propanoic acid + ethanamine → N-ethyl propanamide + water

(e) Hydrohalogenation of propene with hydrogen chloride:



propene + hydrogen chloride → 2-chloropropane

2. Predict the relative solubility of butanal, butanoic acid, and ethyl ethanoate in a POLAR solvent. Which is the most soluble vs. the least soluble? Draw each structure and give reasons for your answer (in point form). (6 marks)

high ↑ solubility ↓ low

① butanoic acid: $CH_3-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-OH$

② ethyl ethanoate: $CH_3-\overset{O}{\overset{\|}{C}}-O-CH_2-CH_3$

③ butanal: $CH_3-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-H$

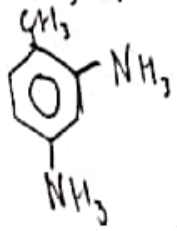
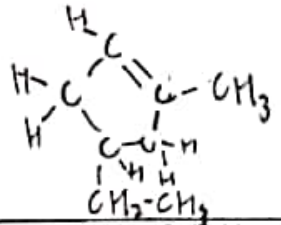
① - carboxyl group $-\overset{O}{\overset{\|}{C}}-OH$
- polar due to c=o double bond
- can hydrogen bond using -O-H with water
- therefore, more polar and soluble

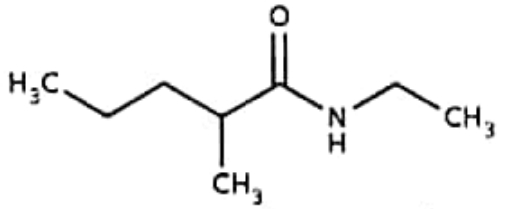
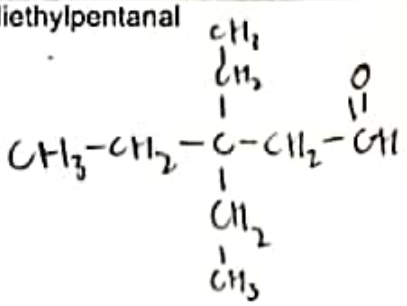
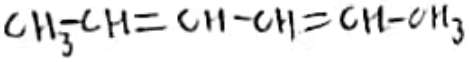
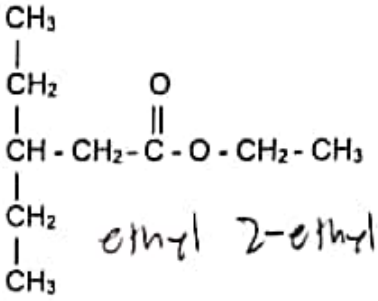
② - ester linkage group $-\overset{O}{\overset{\|}{C}}-O-$
- less polar than carboxylic acid
- double bonded c=o
- no -O-H group therefore less soluble

③ - has carbonyl group $\overset{O}{\overset{\|}{C}}$
- polar but less polar than other 2
- cannot form hydrogen bonds
- therefore soluble but less soluble than other 2

COMMUNICATION (10 MARKS)

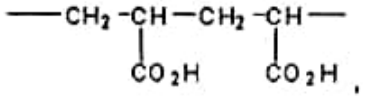
1. Complete the following table: (10 marks)
   - Name the structural formula OR
   - Draw the structural formula corresponding to each name

(a) 1-methyl-2,4-diaminobenzene 	(b) $CH_3-CH_2-O-CH_2-CH_3$ ethoxyethane
(c) $CH_3-CH_2-\underset{\displaystyle CH_3}{\underset{\|}{N}}-CH_2-CH_2-CH_3$ N-ethyl-N-methylpropanamine	(d) 4-ethyl-2-methylcyclopentene 
(e) hexan-3-one $CH_3-CH_2-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-CH_3$	(f) $CH_3-CHOH-CH_2-CH_3$ butan-2-ol

(g)  N-ethyl-2-methylpentanamide	(h) 3,3-diethylpentanal 
(i) hexa-2,4-diene 	(j)  ethyl 2-ethylbutanoate

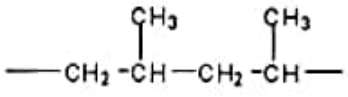
APPLICATION (5 MARKS)

1. In the design of a new baby diaper, the manufacturer uses two polymers. The structure of these molecules is given below. Which type of polymer is best suited to the outside of the diaper and which to the inside? Explain your reasoning. (3 marks)



(I)

more for inside



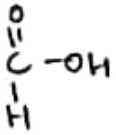
(II)

more for outside

part ② therefore, (II) makes for a good protective layer (1) ' absorbs water

part ① (I) is more suitable for inside as it has a carboxyl group CO_2H and therefore will absorb more water due to it being more soluble. (II) has no oxygen groups and therefore will be less soluble and idea as a layer which water cannot escape from... unless sprayed through

2. Fire ants excrete formic acid (methanoic acid) when they sting. Why is this compound an effective organic acid for them to use as defense? Include a sketch and refer to the structure and properties of this compound in your answer. (2 marks)

methanoic acid: 

- carboxyl group 
- soluble in water as it can form hydrogen bonds
- human body is 70% water
- works as a weak acid
- is short-chained so it becomes even more soluble in water due to a smaller non-polar side

- can easily dissolve in water and humans are about 70% water
- therefore very effective in swelling and spreading