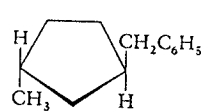
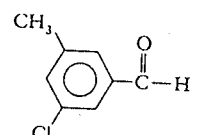
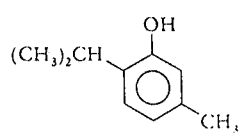
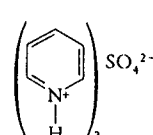


1. For each of the following, provide a structural formula (2% for each; 20%).

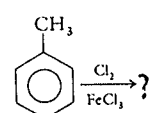
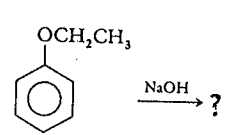
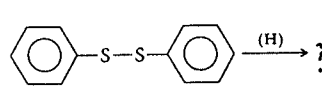
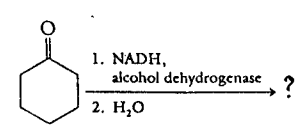
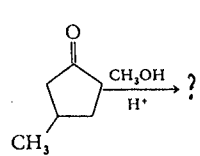
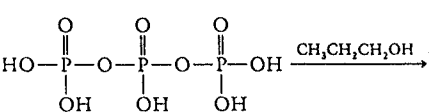
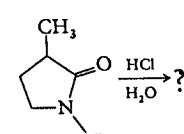
- 1-Chloro-2-methylcyclohexane
- m*-Methoxybenzaldehyde
- 3-Bromo-5-*t*-butylphenol
- 3-Methyl cyclohexanone
- 2-Isopropyl-1, 4-butanedioic acid
- Pyrophosphate
- Pyrimidine
- Glucose
- Imidazole
- ATP

2. For each of the following, provide an IUPAC name. Be sure to indicate stereochemistry when necessary (2% for each; 20%).

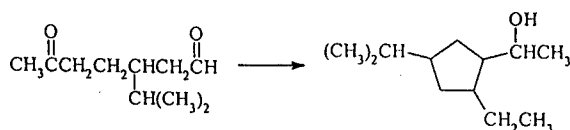
<p>(a)</p> $ \begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{C}-\text{CH}_2-\text{CH}-\text{CH}_2-\text{CH}_3 \\ \qquad \qquad \\ \text{CH}-\text{CH}_3 \qquad \text{CH}_2-\text{CH}_2-\text{CH}-\text{CH}_3 \\ \\ \text{CH}_3 \end{array} $	<p>(b)</p> 
<p>(c)</p> 	<p>(d)</p> 
<p>(e)</p> $ \begin{array}{c} \text{COOH} \\ \\ \text{HOOC}-\text{CHCH}_2\text{CH}_3 \end{array} $	<p>(f)</p> $ \begin{array}{c} \text{O} \quad \text{Cl} \\ \quad \\ \text{HCCH}_2\text{CHC}(\text{CH}_3)_3 \end{array} $
<p>(g)</p> $ \text{CH}_3(\text{CH}_2)_2\text{C}(=\text{O})\text{O}-\text{C}_6\text{H}_4-\text{CH}_3 $	<p>(h)</p> $ \text{CH}_3\text{CH}_2-\text{C}(=\text{O})-\text{O}-\text{C}(=\text{O})-\text{CH}_2\text{CH}_3 $
<p>(i)</p> 	<p>(j)</p> $ \begin{array}{c} \text{O} \\ \\ \text{CH}_3-\text{CH}(\text{NH}_2)\text{CH}_2\text{CH}_2-\text{C}-\text{NH}_2 \end{array} $

(背面仍有題目,請繼續作答)

3. For each of the following, supply a structure for the **major organic product(s)** if the product(s) is(are) not given; if no reaction occurs, write N.R. If an organic reactant is missing, supply a structure; if an inorganic reactant (reagent) or catalyst is missing, simply give a formula. If heat or light is needed, be sure to indicate it appropriately. Show stereochemistry appropriately. If an ortho-para mixture is expected, show both (2 % for each; 20%).

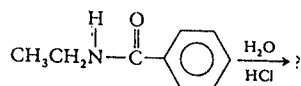
(a) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_3 \xrightarrow[\text{UV or heat}]{\text{Cl}_2} ?$	(b) 
(c) 	(d) 
(e) 	(f) 
(g) $\text{CH}_3\text{CH}_2\text{O}-\text{C}(=\text{O})-\text{C}_6\text{H}_4-\text{C}(=\text{O})-\text{OCH}_2\text{CH}_3 \xrightarrow[\text{H}_2\text{O}]{\text{H}^+} ?$	(h) 
(i) 	(j) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(=\text{O})\text{Cl} \xrightarrow{\text{CH}_3\text{NH}_2} ?$

4. Give a multistep synthesis for the conversion shown below. For each functional group transformation, give all necessary other organic reactants, reagents, and catalysts; For each functional group transformation, show the structure of the organic product (10%).

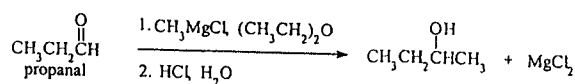


5. Write a stepwise mechanism for the reaction below. Use arrows appropriately to show the flow of electrons (5% for each; 15%).

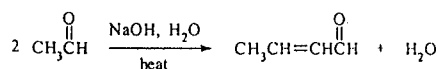
(a)



(b)



(c)



6. Concisely describe and sketch the ^1H -nmr spectrum of each of compounds given below. For each ^1H -nmr spectrum, give the number of protons and multiplicity for each set of protons; you only need to give the order (for example, from most downfield to most upfield) of the approximate relative chemical shifts. Be sure to indicate clearly which peaks correspond to which protons (5% for each; 15%).

(a) Ethanol

(b) Alanine

(c) Tyrosine