Nanyang Junior College
Chemistry (9729)

Consolidation Exercise 14
Hydroxy Compounds (Answers)

H2

JC2/2025

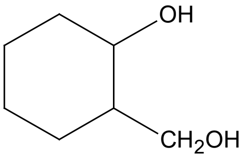
Name: ....

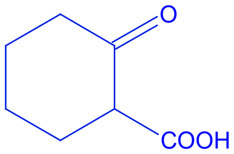
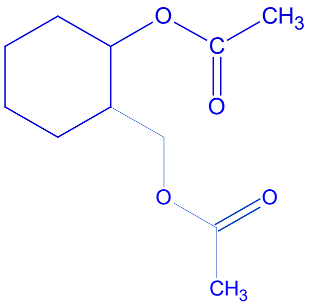
CT: **24** ....   **Tutor**: ....

Marks

/ 10

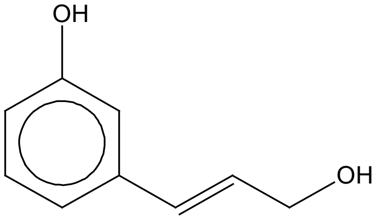
1 (a) State the type of reaction and draw the structural formula of the organic product formed when the following compounds reacts with each of the following reagent. [3]

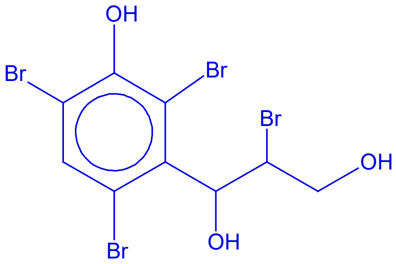
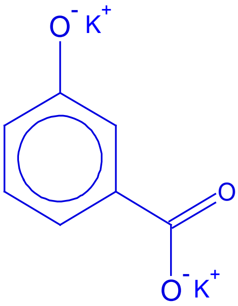


(i) Hot acidified potassium dichromate(VI)	(ii) Ethanoyl chloride, CH_3COCl
 [1] for structure Type of reaction: Oxidation	 [1] for structure Type of reaction: condensation / nucleophilic acyl substitution The acyl choride will react with both the alcohol groups

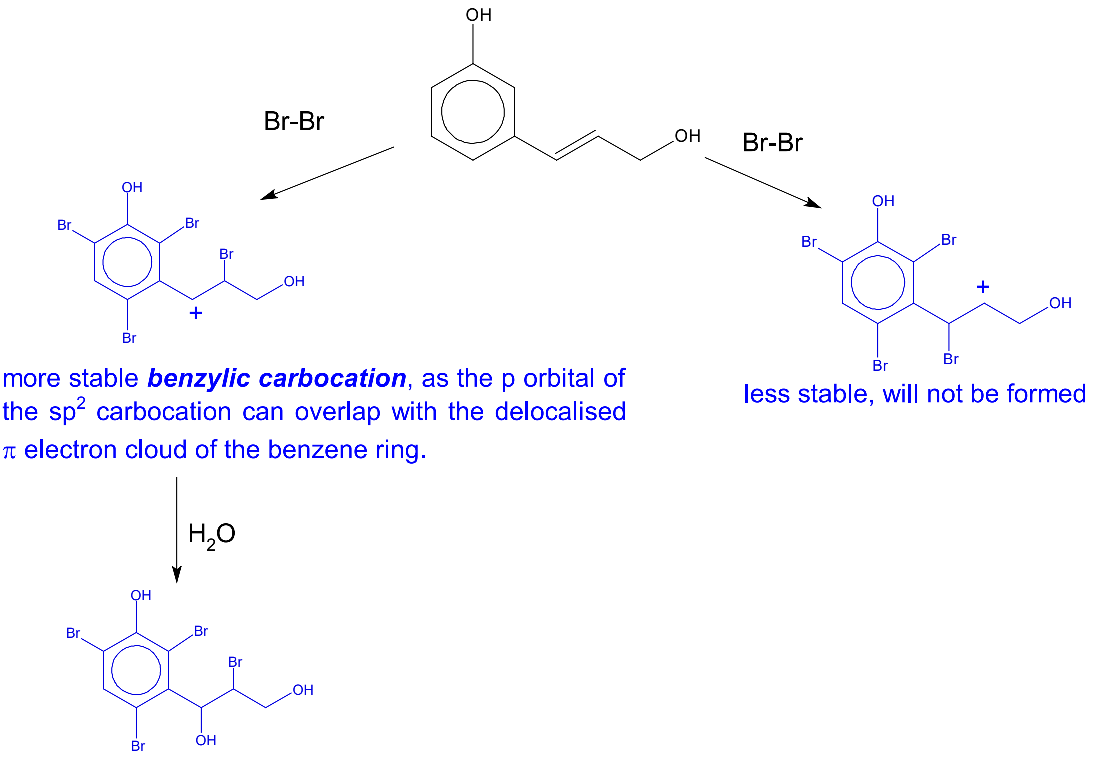
[1] for type of reaction for both (i) and (ii)

(b) Draw the structure of the organic product formed when the following compound reacts with each of the following reagent. [2]



(i) Aqueous bromine	(ii) Hot, alkaline potassium manganate(VII)
 [1]	 [1] Accept Na^+/K^+ as counter ion or no counter ion. Phenol undergoes acid base reaction with the alkaline medium, while the carbon containing side chain of benzene undergoes oxidation. *Note that the side pdt ethandioic acid will be further [O] to CO_2 and H_2O; and turned to inorganic pdts CO_3^{2-} and H_2O.*

Explanation for 1b(i)



more stable ***benzylic carbocation***, as the p orbital of the sp^2 carbocation can overlap with the delocalised π electron cloud of the benzene ring.

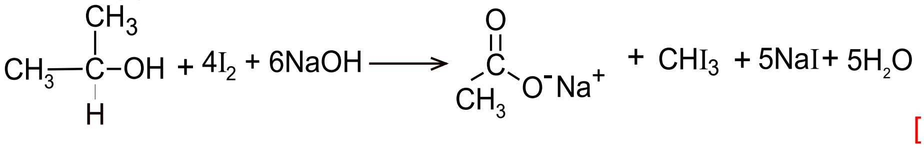
less stable, will not be formed

2 State how propan-1-ol and propan-2-ol could be distinguished by a simple chemical test. Give the observation and write equations for any reaction(s).

Test: Add NaOH(aq), I_2(aq), warm

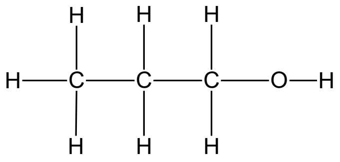
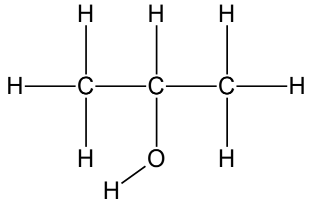
Observation: Yellow ppt of CHI_3 formed for propan-2-ol, no yellow ppt for propan-1-ol
(must state both positive and negative observations for both alcohols)
[1] for test and observations

Equation(s):



$$CH_3-\overset{CH_3}{\underset{H}{C}}-OH + 4I_2 + 6NaOH \longrightarrow CH_3COO^-Na^+ + CHI_3 + 5NaI + 5H_2O$$

[1] for eqn

propan-1-ol		propan-2-ol	

3 Explain why ethanol is a weaker acid than phenol in terms of the Bronsted-Lowry theory. [3]

(Ethanol and phenol are Bronsted-Lowry acids as they are **proton donors.** Strength of the acid depends on the stability of the conjugate base)

The ethoxide ion ($C_2H_5O^-$) is **less stable** than the phenoxide ion as the **negative** charge on the O atom is intensified by an **electron donating** alkyl group, hence **destabilising it**. Ethanol is therefore less acidic, and donates protons **less** readily and POE of the ethanol dissociation lies more to the **left.**

The phenoxide ion is more stable as the **p** orbital of O overlaps with the π orbitals of benzene ring resulting in the delocalisation of lone pair of electrons on the O atom into the benzene ring. **Negative** charge on O atom is dispersed over the benzene ring and one oxygen atom, hence **stabilising** it. Therefore phenol is more acidic and it donates a proton **more** readily and POE of the phenol dissociation lies more to the **right**.

total **[3]** for all 3 marking points:

- stating that ethoxide ion is less stable than the phenoxide ion
- explanation of stability of each conjugate base
- stating the POE of dissocation of each acid