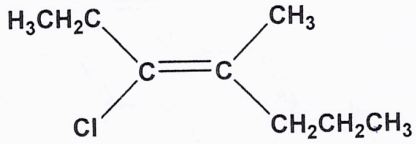
1. Write the IUPAC name of the following compounds in the box provided

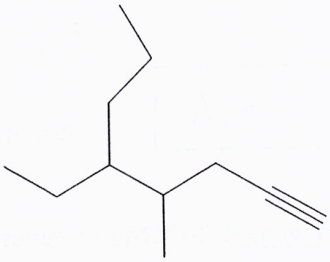
a)



(Z)-3-chloro-4-methylheptene

+3 -2

b)

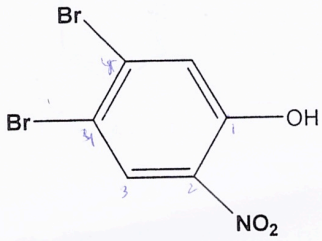


9

5-ethyl-4-methyloctyne

-1 +1

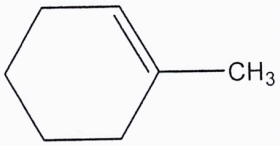
c)

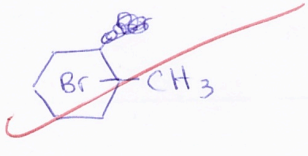


4,5-dibromo-2-nitrophenol

2. Draw the structure of:

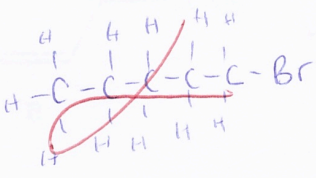
a) The compound of molecular formula $C_7H_{13}Br$ that will give the following alkene as the **exclusive** product of E_2 elimination





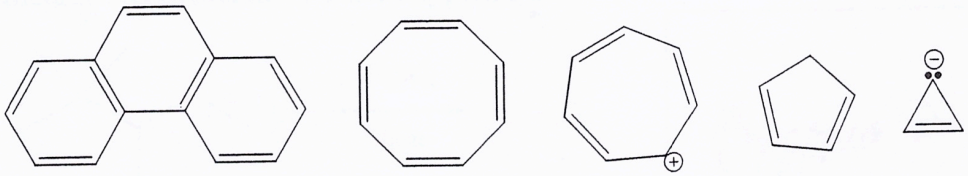
b) The compound of molecular formula $C_5H_{11}Br$ that is **not capable** of undergoing E_2 elimination

5



3. Answer the following questions in the box provided

a) Which of the following compounds or ions are **aromatic** species?

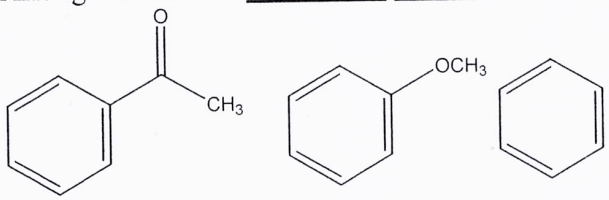


A B C D E

6

Answer A, C ✓

b) Arrange in order of **decreasing reactivity** with SO_3 (most reactive first)

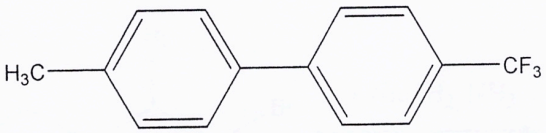


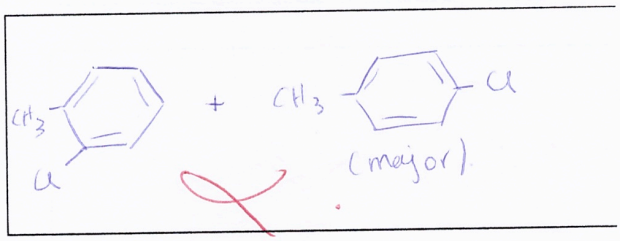
A B C

4

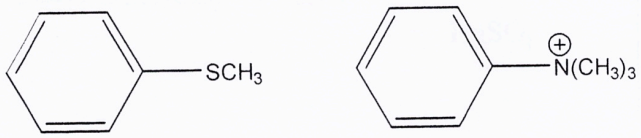
Answer: B > C > A

c) Draw the structure of the **monochlorination** product of the following compound with Cl_2 and $FeCl_3$





d) Which compound will add a nitro group to the **ortho** and **para** positions?



A B

4

Answer: A ✓

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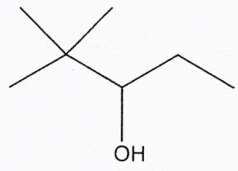
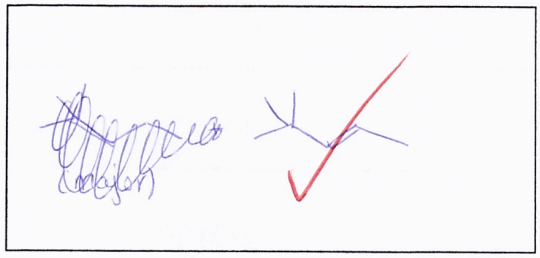
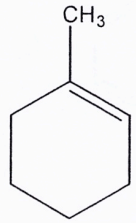
4. Give the structure of the product of each of the following reactions. If more than one product is obtained indicate which one is the major product. Include stereochemistry where applicable

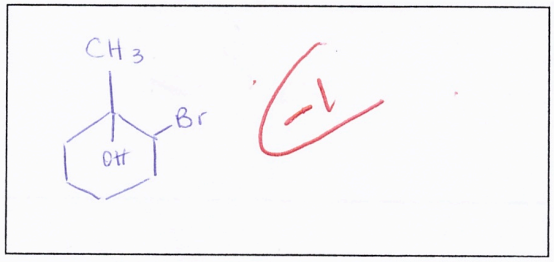
a) 

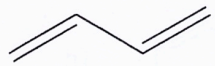
H_2SO_4 / heat



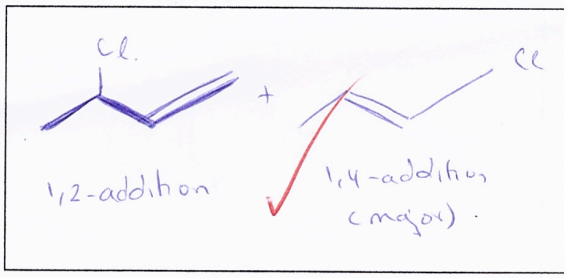
b) 

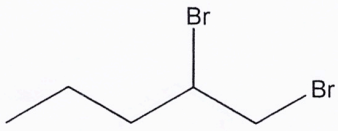
+ Br_2 + H_2O ⟶



c) 

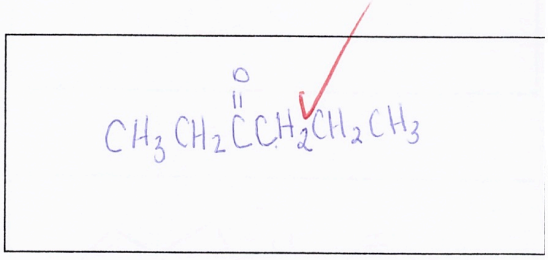
(1 mole) + HCl (1 mole) ⟶



d) 

1. $NaNH_2$, NH_3 / 2. H_2O ⟶

e) $CH_3CH_2C{\equiv}CCH_2CH_3$ + H_2O $\xrightarrow[HgSO_4]{H_2SO_4}$



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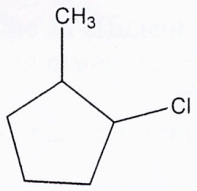
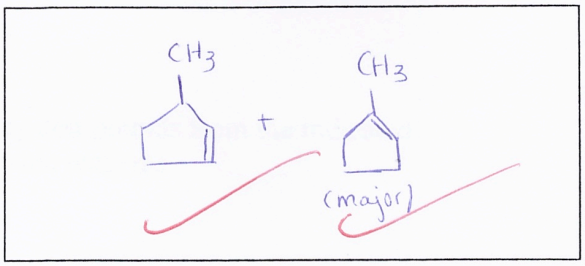
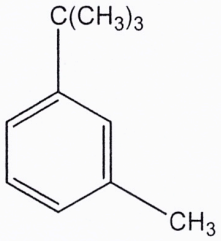
f) 

$NaOCH_2CH_3$

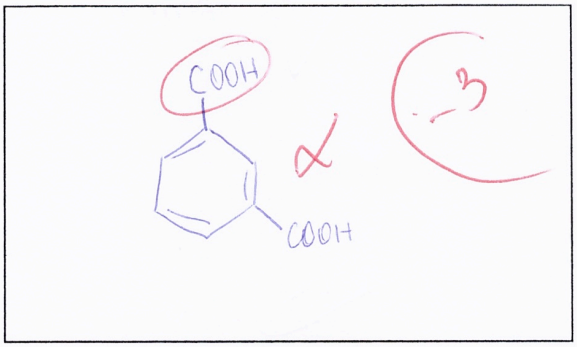
CH_3CH_2OH

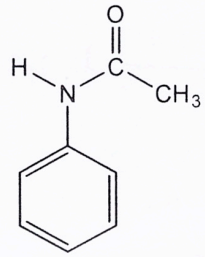


g) 

$K_2Cr_2O_7, H_2SO_4$

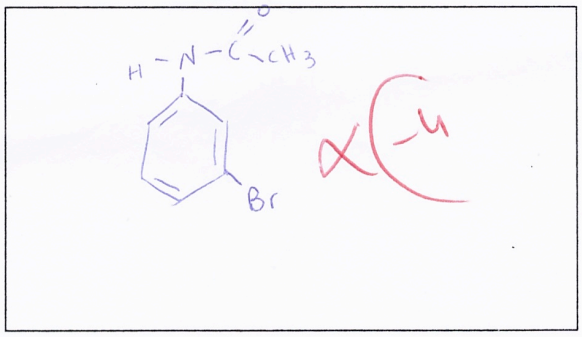
H_2O,heat

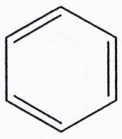


h) 

Br_2

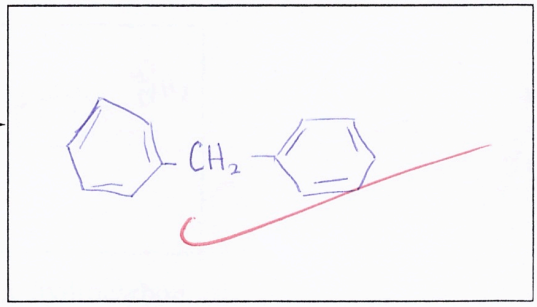
$FeBr_3$

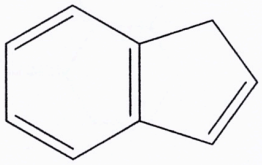


i) 

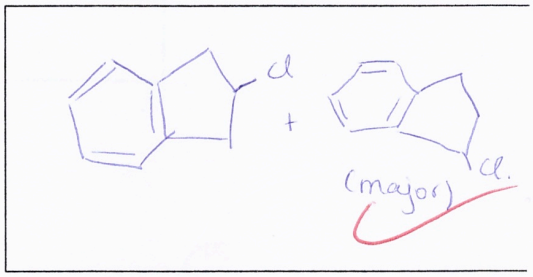
+ $C_6H_5CH_2Cl$

$AlCl_3$



j) 

HCl



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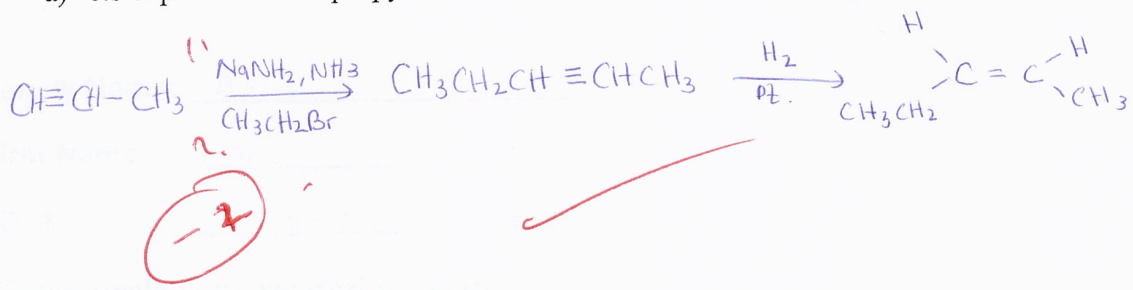
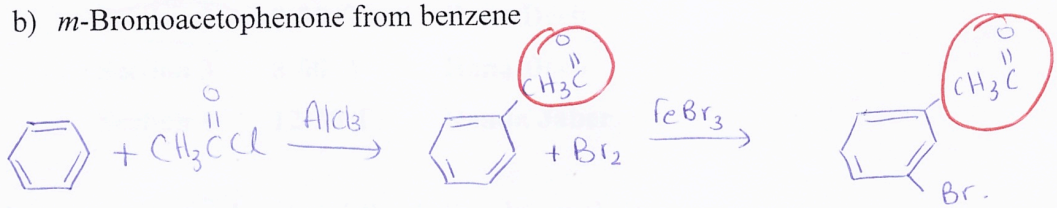
5. Outline an efficient synthesis of each of the following compounds from the indicated starting material and any necessary organic or inorganic reagents

a) *cis*-2-pentene from propyne

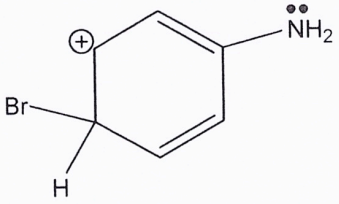


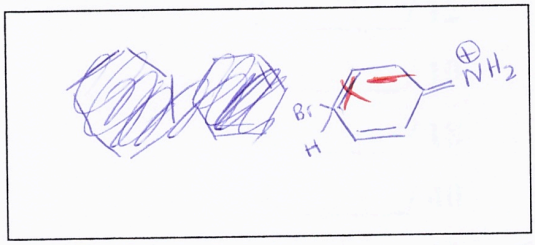
b) *m*-Bromoacetophenone from benzene



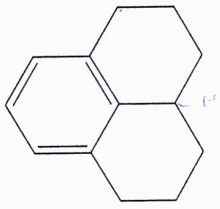
Bonus questions (5pts)

a) Draw the structure of the **most stable** resonance contributing structure of the following intermediate:





b) How many **benzylic hydrogens** are present in the following hydrocarbon



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