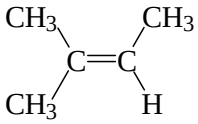
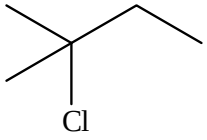
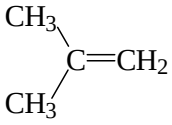
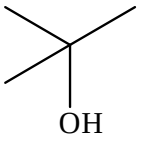
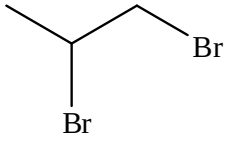
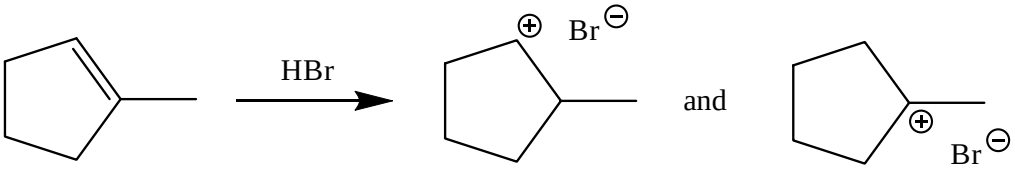
CHEM1611 Answers to Problem Sheet 6

1.

1.	starting material	**reagent(s) and conditions**	**organic product**
		**HCl/CCl_4 (solvent)**	
		**1 M H_2SO_4**	
	$CH_3CH{=}CH_2$	**Br_2/CCl_4 (solvent)**	

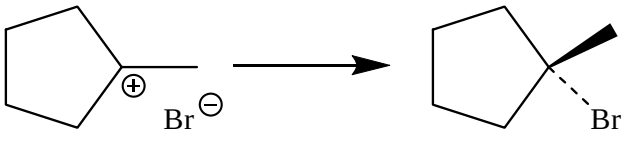
2. (a)



1-methylcyclopent-1-ene **A** **B**

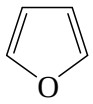
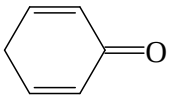
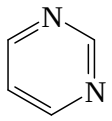
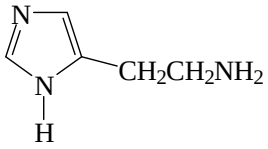
The most stable cation is the one with fewer H groups (or more carbon atoms) around the cationic centre. The positive charge in (A) is surrounded by 1H and 2C and the positive charge in (B) is surrounded by 3C. Hence, (B) is the more stable cation.

(b)



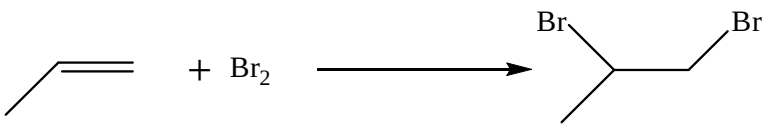
B

1-bromo-1-methylcyclopentane

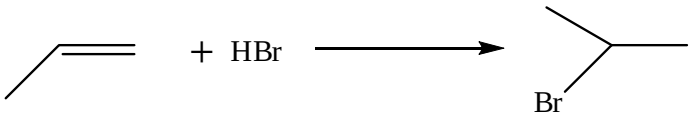
3.	**A**	**B**
		
(i) molecule must be cyclic	✓	✓
(ii) all ring atoms must be sp^2 hybridised	✓	**× (one in sp^3)**
(iii) ring(s) must be planar	✓	✓
(iv) $4n + 2$ π-electrons (n = 0, 1, 2, 3 ...)	✓ **2 × 2 π electrons from 2 C=C + 2 electrons from O sp^2 lone pair:** **6 π-electrons → n = 1** **O also has lone pair directed away from ring.**	**×** **2 × 2 π electrons from C=C:** **4 π-electrons + 1 fromC=0→ n = ½)**
aromatic?	**yes**	**no**
	C	**D**
		
(i) molecule must be cyclic	✓	✓
(ii) all ring atoms must be sp2 hybridised	✓	✓
(iii) ring(s) must be planar	✓	✓
(iv) $4n + 2$ π-electrons (n = 0, 1, 2, 3 ...)	✓ **3 × 2 π electrons from 1 C=C and 2 C=N:** **6 π-electrons → n = 1.** **Lone pair on each N directed away from ring**	✓ **2 × 2 π electrons from 1 C=C and 1 C=N + 2 electrons from N-H lone pair:** **6 π-electrons → n = 1.** **Lone pair on other N directed away from ring**
aromatic?	**yes**	**yes**

4.

(a)

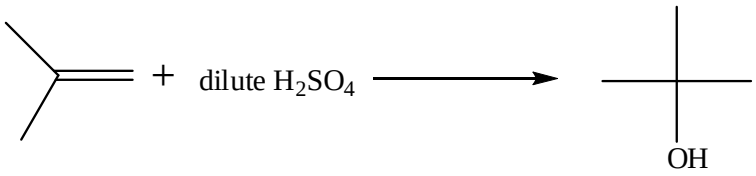


(b)



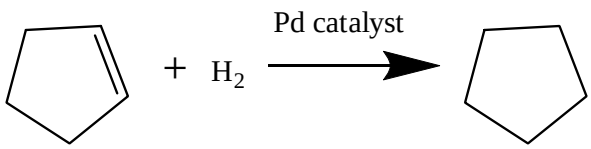
Markovnikov addition - H becomes attached to carbon with fewer alkyl groups attached.

(c)

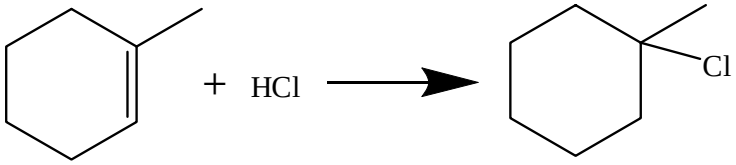


Markovnikov addition - H becomes attached to carbon with fewer alkyl groups attached.

(d)

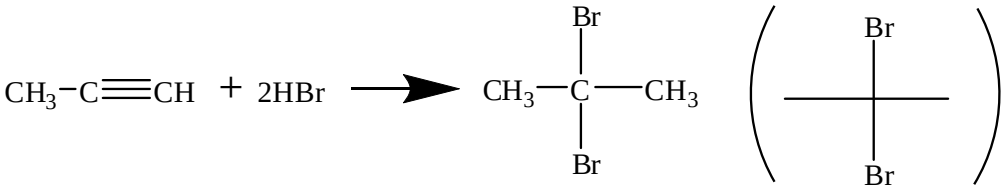


(e)



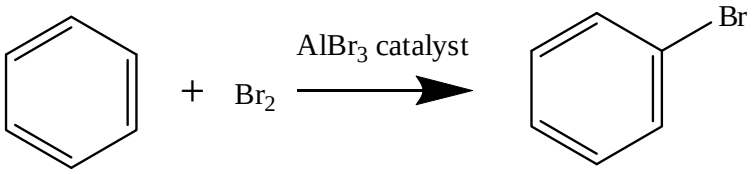
Markovnikov addition - H becomes attached to carbon with fewer alkyl groups attached.

(f)



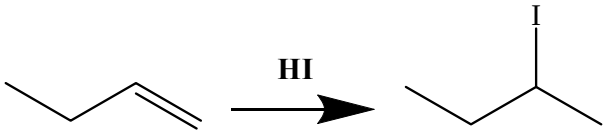
Markovnikov addition *twice* - each time H becomes attached to carbon with fewer alkyl groups attached.

(g)

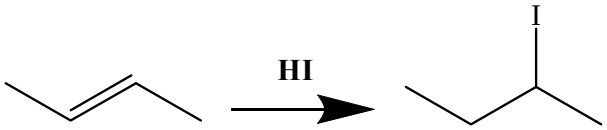


5.

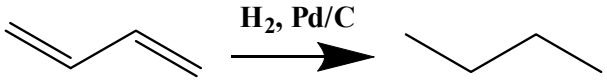
(a)



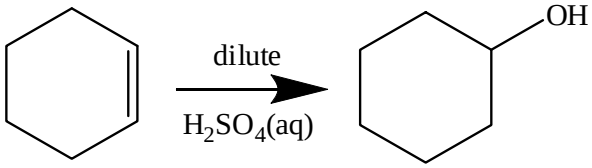
(b)



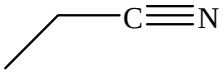
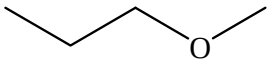
(c)

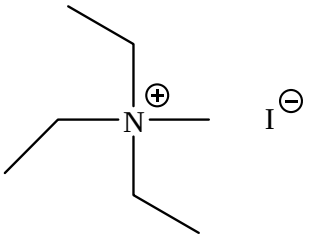
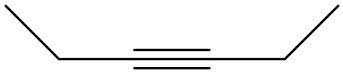


(d)



6.

starting material	reagent(s)/conditions	organic product
CH_3CH_2Br	KCN in ethanol (solvent)	 **propiononitrile**
$CH_3CH_2CH_2I$	$CH_3O^{\ominus}\ Na^{\oplus}$ in methanol (solvent)	 **1-methoxypropane**

CH_3I	$(CH_3CH_2)_3N$	 **_N_,_N_-diethyl-_N_-methylethanaminium iodide**
CH_3CH_2Cl	$CH_3CH_2C{\equiv}C^{\ominus}\ Na^{\oplus}$	 **hex-3-yne**