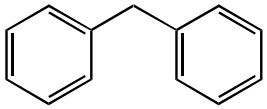
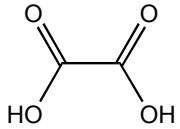
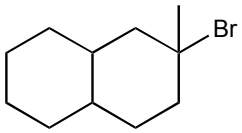
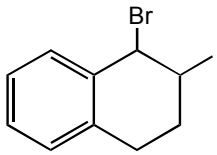
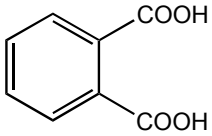
Immanuel Lutheran College
S7 Chemistry Test 1 (2006 - 2007)
Marking Scheme

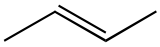
1. **A** $CHCl_3$ or 

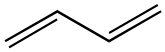
B/C CHI_3 , 

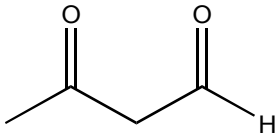
D 

E 

F 

G 

H 

I 

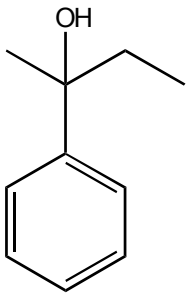
(1 mark each)

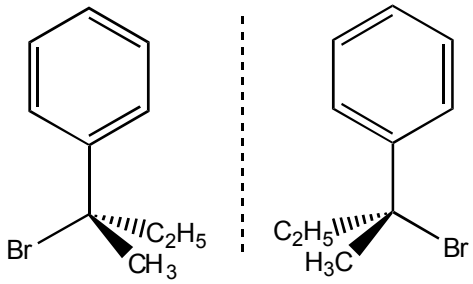
2. (a) (i) identical (1)
(ii) geometrical isomeric (1)
(iii) Identical (1)

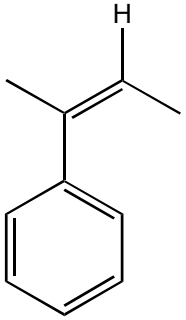
(b) (i) add Br_2 in CH_3CCl_3 (1)
bromine solution is decolourized immediately in cyclohexene but remains unchanged in benzene. (1)
(ii) heated with hot acidified $KMnO_4$(aq) (1)
A colour change is observed with *sec*-butylbenzene (presence of benzylic hydrogen) but not with *tert*-butylbenzene. (1)

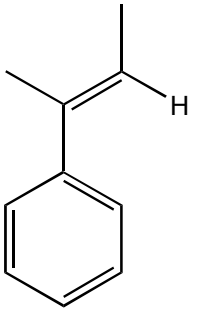
(c) The C – Cl bond in chlorobenzene has partial double bond character due to delocalization of lone pair electrons of chlorine into benzene ring.
The C – Cl sigma bond is stronger than normal ones since C is sp^2 hybridized. (2)

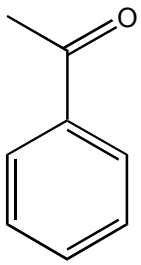
3. (a)

A 

B 

C 



D 

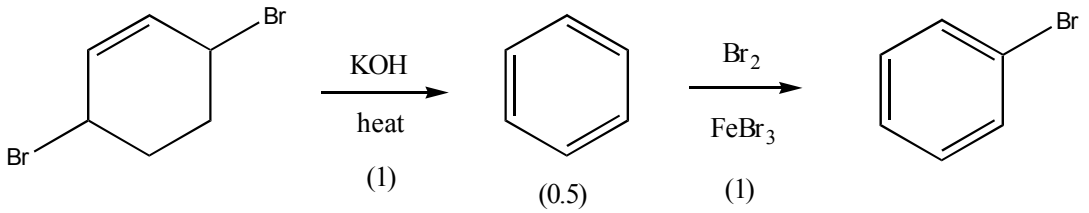
E CH_3CHO

(7)

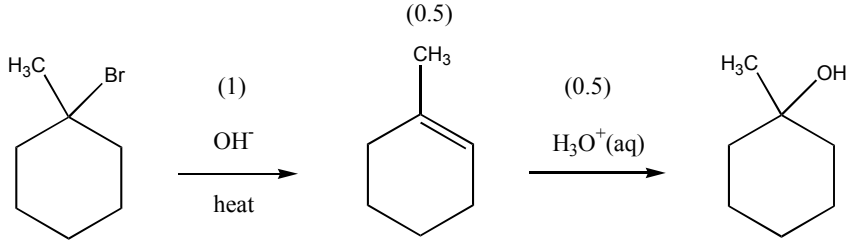
(b) **A** is 2-phenylbutan-2-ol (1)

(c) **A** undergoes S_N1 reaction which involves the formation of a planar carbocation intermediate. Then, the Br^- ions can attack the positive carbon from both sides of the plane with equal probabilities. Thus, the resulting solution is a racemic mixture which is optically inactive. (3)

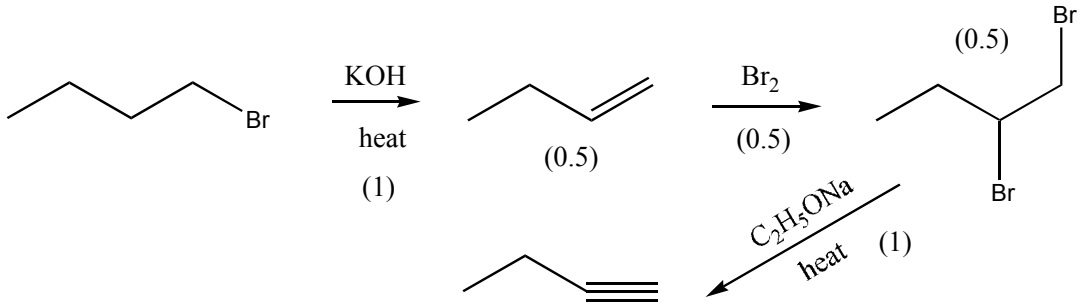
4. (a)



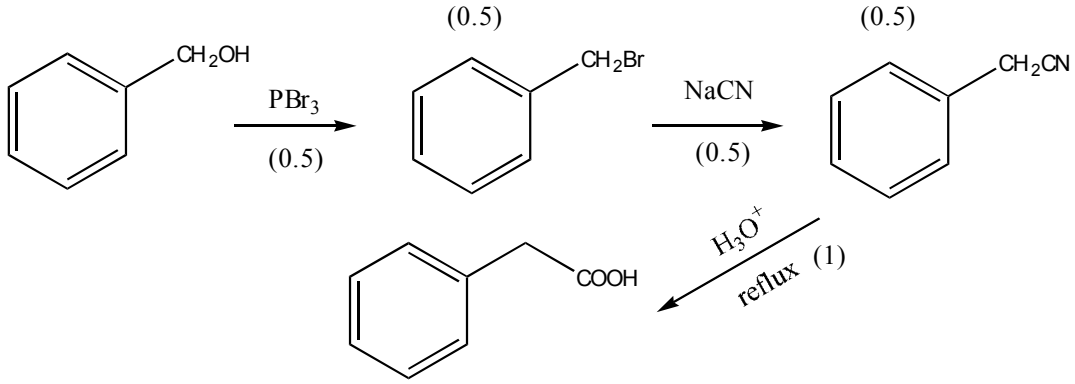
(b)



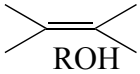
(c)



(d)



5. Core marks (4.5) – 1.5 marks for outlining each of the following mechanisms

- Free radical substitution RH → RX
- Electrophilic addition  → RX
- Nucleophilic substitution (S_N1 or S_N2) ROH → RX

(An example is required for each mechanism)

Options (5.5) –

- Limitation of free radical substitution (1)
- Markovnikov's rule for electrophilic addition (2)
- Elimination Vs S_N reactions (2)
- factors affecting the reactivity of S_N reactions (2)
- Preparation of RX from $ROH/PX_3/PCl_5/SOCl_2$ (0.5)
- Any reaction mechanism other than the ones mentioned above (2)