

FAMILY NAME _____

FIRST NAME _____

please print

SIGNATURE _____

ID NUMBER _____

INDICATE YOUR LECTURE SECTION:

- Stewart (108 8:00 am MWF) Sabarre (199 9:30 am TTh)
 Stewart (110 10:00 am MWF) Sabarre (122 2:00 pm TTh)
 Withers (103 3:00 pm MWF)

THE UNIVERSITY OF BRITISH COLUMBIA

CHEMISTRY 233

(ORGANIC CHEMISTRY)

Midterm Examination One Oct 4 2007

Time: 1 hour

This paper consists of 8 pages including this title page and a periodic table
Ensure that you have a complete examination

Answer the questions ONLY on this examination paper; Do NOT use university examination booklets

1. CANDIDATES SHOULD BE PREPARED TO PRODUCE, UPON REQUEST, THEIR LIBRARY/AMS CARD
2. READ AND OBSERVE THE FOLLOWING ADDITIONAL RULES:

No candidate shall be permitted to enter the examinations room after the expiration of one-half hour, or to leave during the first half-hour of the examination.

Candidates are not permitted to ask questions of the invigilators, except in cases of supposed errors or ambiguities in examination questions.

CAUTION – Candidates guilty of any of the following, or similar, dishonest practices shall be immediately dismissed from the examination and shall be liable to disciplinary action:

- a) Making use of any books, papers or memoranda, calculators, computers, audio or visual cassette players or other memory aid devices, other than those authorized by the examiners.
- b) Speaking or communication with other candidates.
- c) Purposely exposing written papers to the view of other candidates. The plea of accident or forgetfulness shall not be received.

3. SMOKING IS NOT PERMITTED DURING EXAMINATIONS

Molecular models may be used during this examination

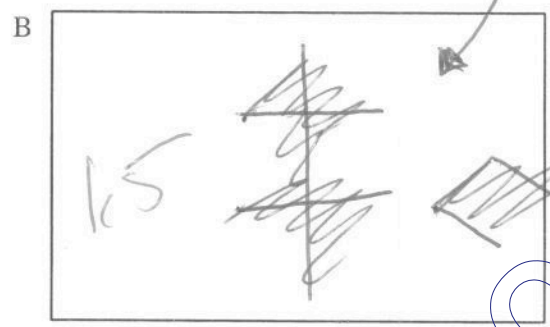
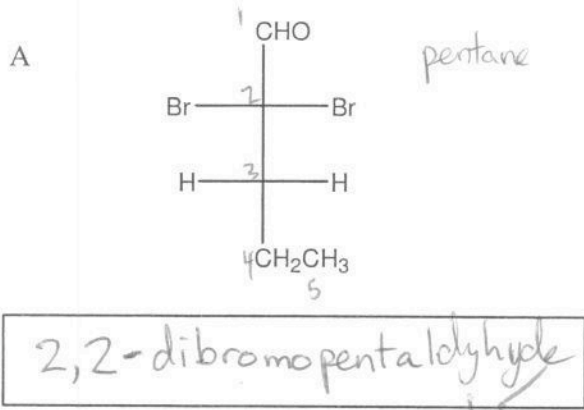
Calculators may not be used during this examination

Turn off all pagers and cellular telephones and remove them from your desk

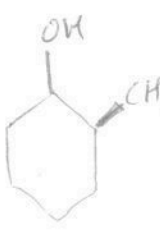
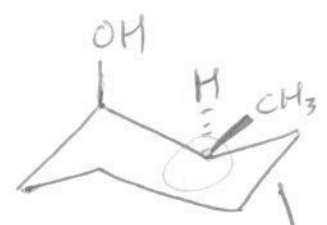
Question	Marks
1	8 /10
2	5 /5
3	12 /12
4	10 /12
5	4 /4
6	10 /12
Total	49 /55

Question 1 (10 marks)

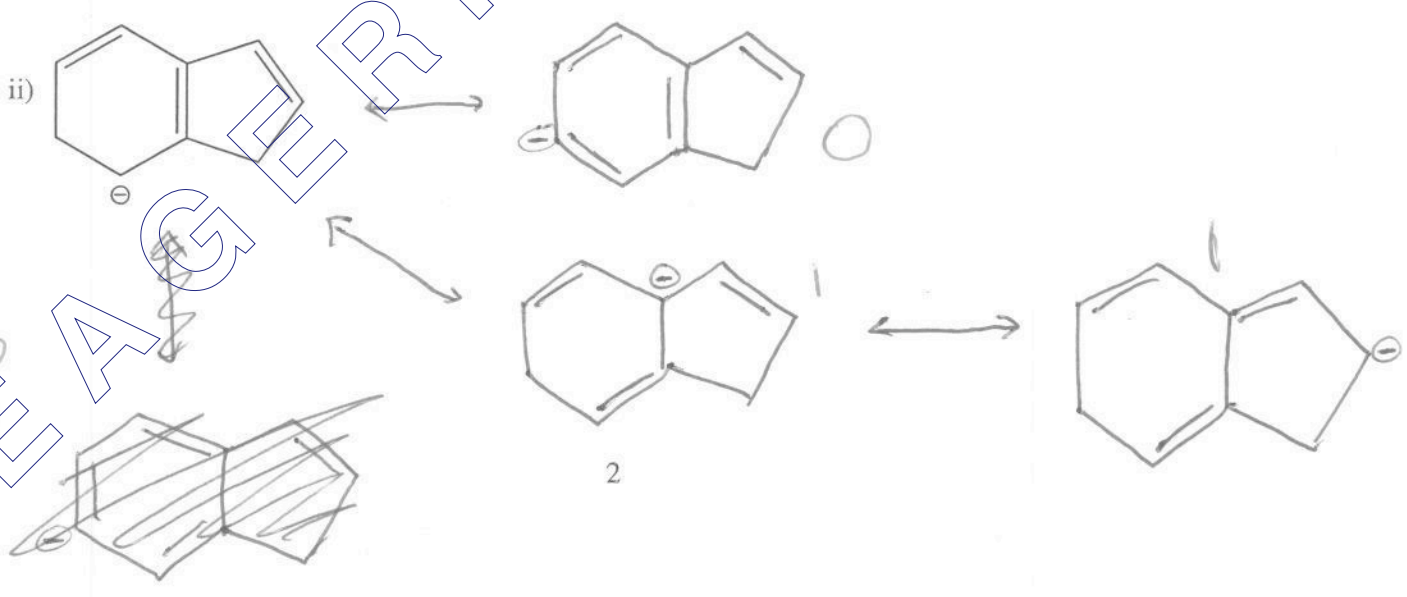
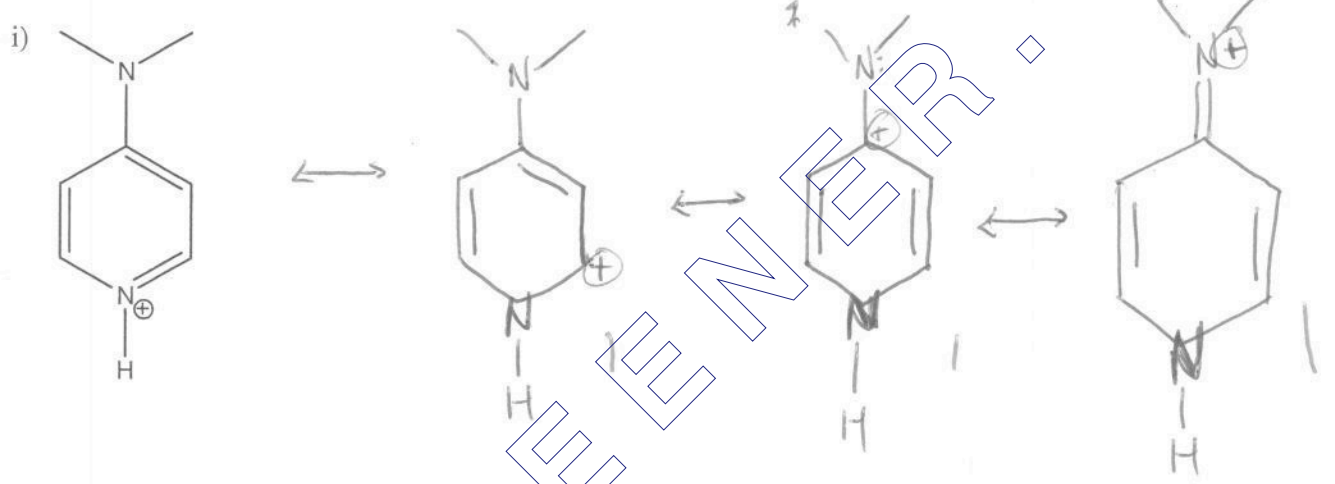
a) Provide the name for compound A and draw compound B in the spaces provided.



(1R, 2R)-2-methyl-cyclohexanol

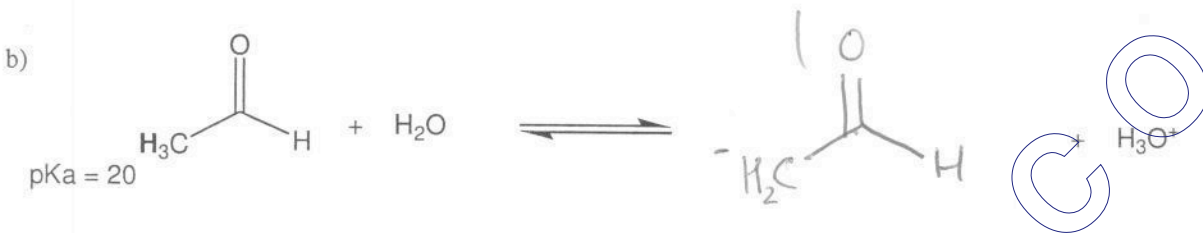


b) Draw 3 additional contributing resonance structures for each of the molecules below.



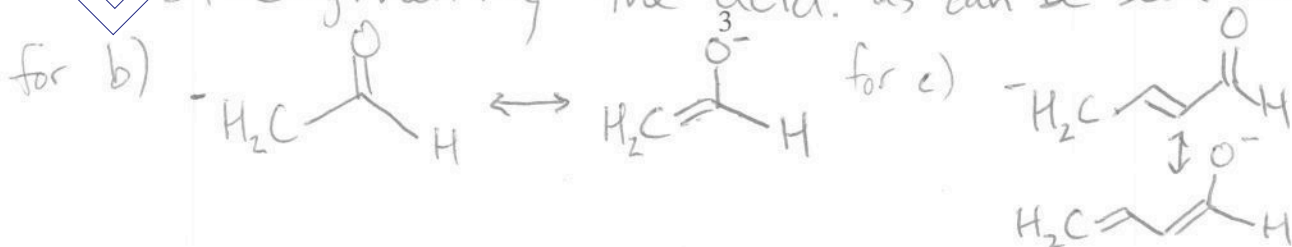
Question 2 (5 marks)

In the space provided, draw the structure of the conjugate base for each acid when ionized in water, wherein the protons indicated in bold are lost.



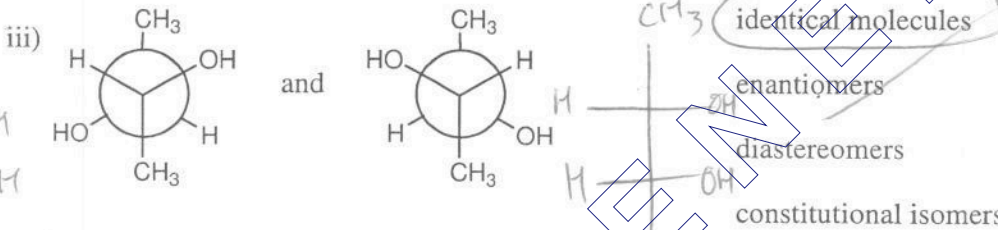
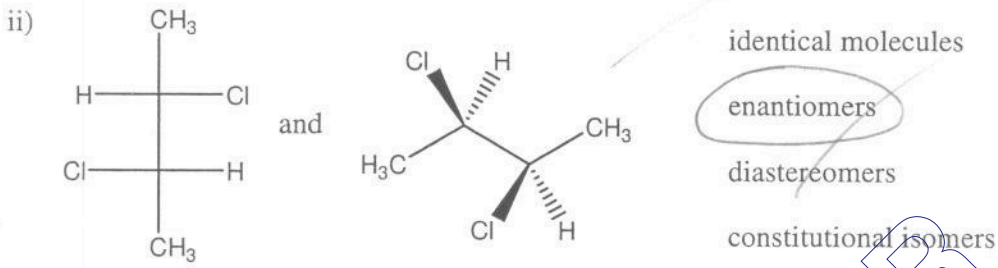
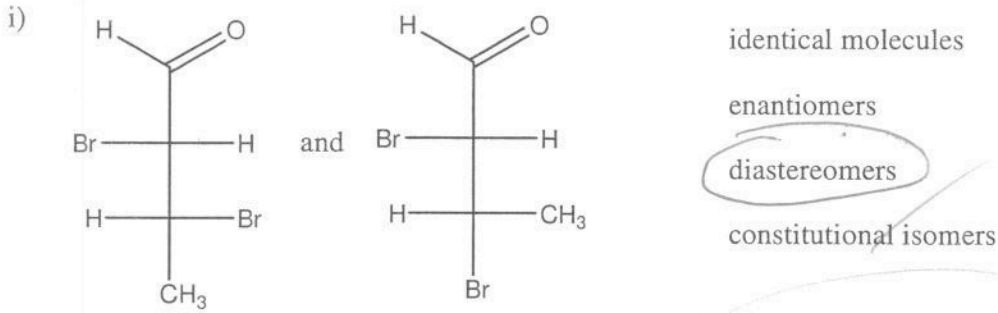
Using appropriate chemical structures, explain **why** the two compounds in questions b and c have pKa values much lower than that of the compound in a.

5 Both b) and c) contain an oxygen double bonded to a carbon. The oxygen is electronegative, and can withdraw electrons through sigma bonds, known as the inductive effect. This stabilizes the conjugate base, and ~~strengthen~~ therefore the conjugate acids are stronger, indicated by a lower pKa than a). Also, b) and c) ~~can~~ have resonance structures that further stabilize the conj. base, strengthening the acid, as can be seen below

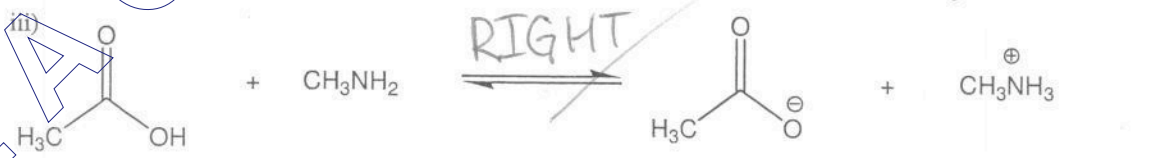
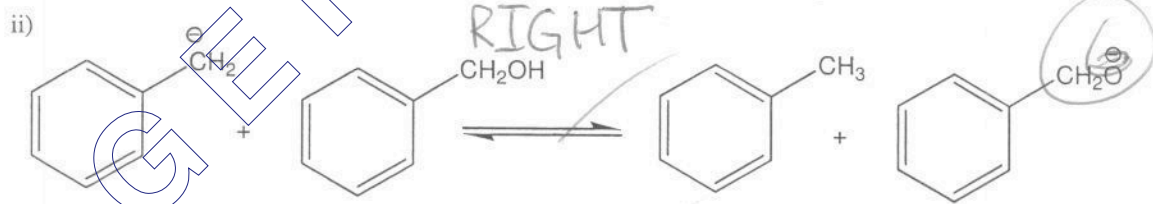


Question 3 (12 marks)

a) Circle the term that describes the stereochemical relationship between each of the pairs of molecules.



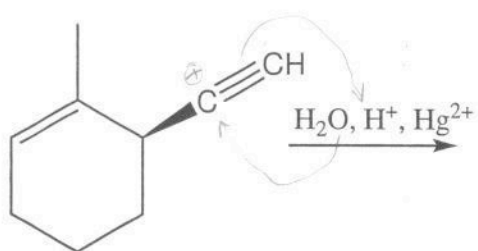
b) For the following equilibria show which side of the equilibrium is favoured by writing the word **LEFT** or **RIGHT** above the equilibrium arrows.



Question 4 (12 marks)

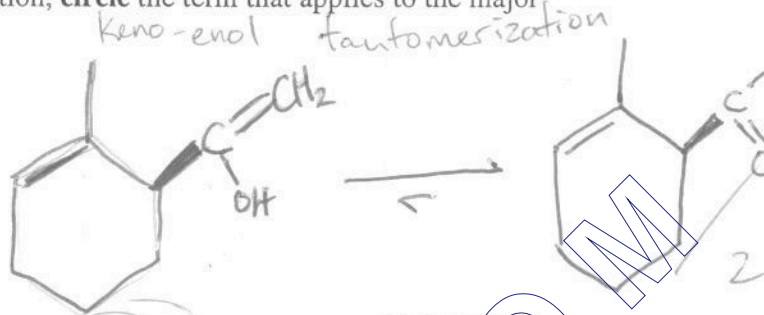
Predict the major product(s) of the following reactions. CLEARLY show stereochemistry where it exists, use the templates where given. For each reaction, **circle** the term that applies to the major product(s) formed.

a)



enantiomers

diastereomers



one product

structural isomers

b)



enantiomers

diastereomers

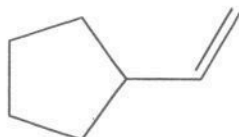
1. H₂, Lindlar's cat.
2. Cl₂, H₂O (excess)



one product

structural isomers

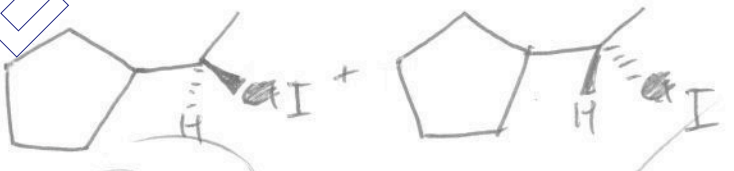
c)



enantiomers

diastereomers

HI



one product

structural isomers

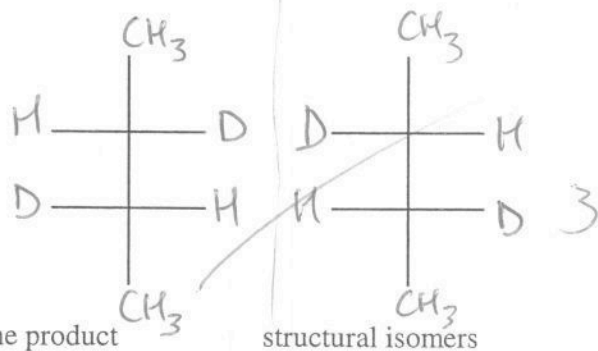
d)



enantiomers

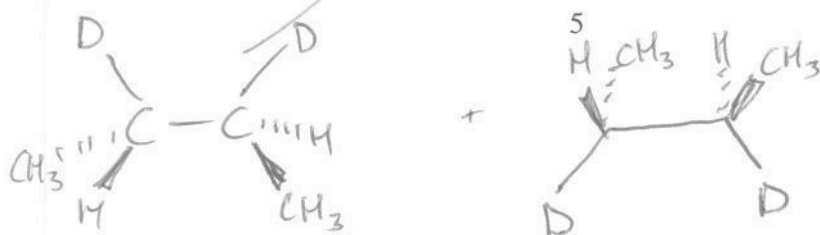
diastereomers

1. Na, NH₃
2. D₂, Pd/C



one product

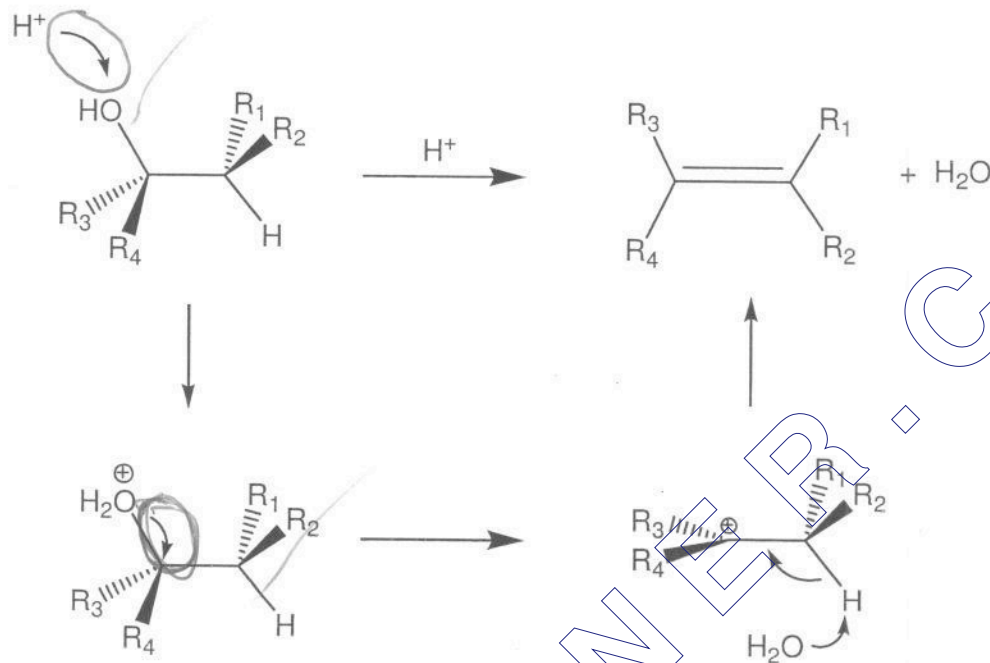
structural isomers



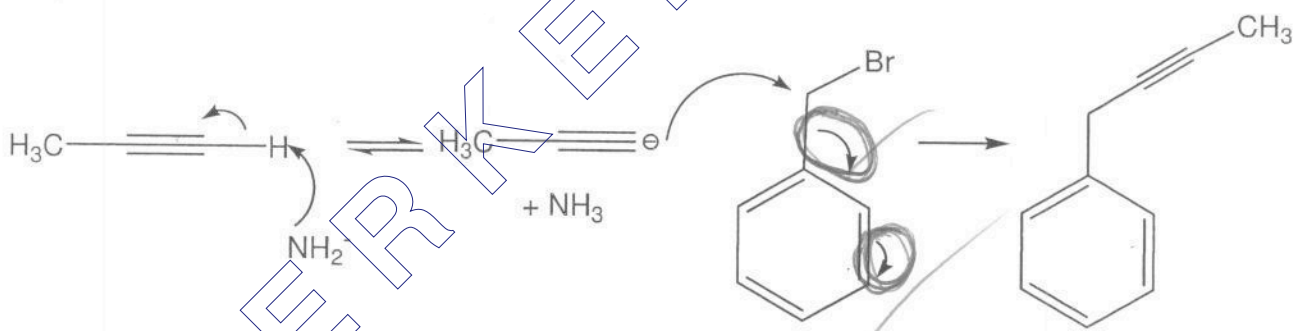
Question 5 (4 marks)

Circle ALL the incorrect parts of the following mechanisms (IF ANY). Marks will be deducted for incorrect circles. Note that all electron movement arrows are 2-electron arrows.

a)



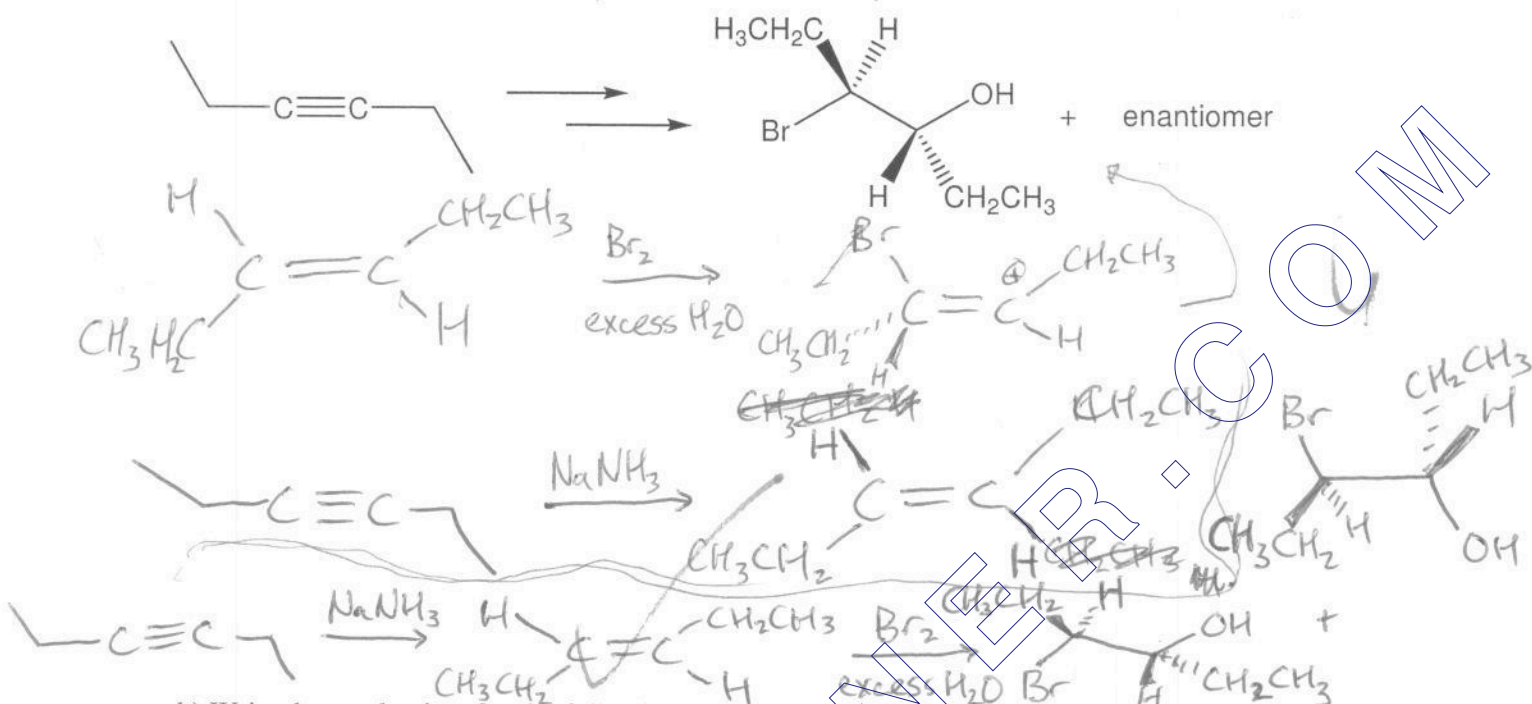
b)



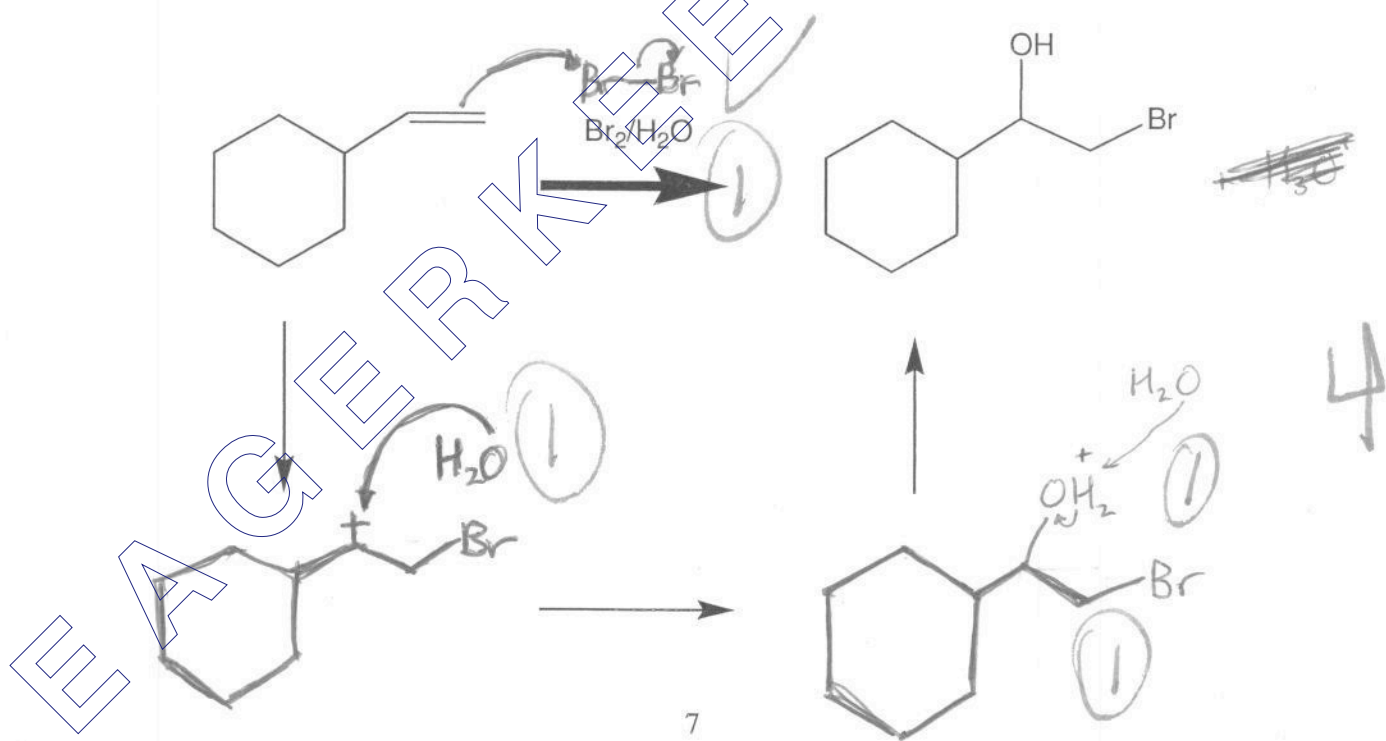
Question 6 (12 marks)

a) Provide the reagents and write out the steps, including the structures of the intermediates in the following multi-step synthetic transformation. You do not need to include mechanistic details of your reactions.

full steps at bottom



b) Write the mechanism for the following transformation, showing intermediates formed and using curved arrows to indicate electron flow.



Periodic Table of the Elements

1 H																	1 H	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne	
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	
87 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110	111	112		114		116		118	

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr