

**M.Sc. 1st Semester Examination, 2013**

**CHEMISTRY**

( *Organic* )

PAPER—CEM-102

*Full Marks : 40*

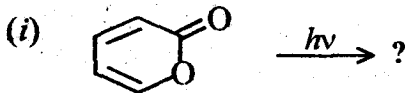
*Time : 2 hours*

Answer any **five** questions taking at least **two** from each Group

*The figures in the right-hand margin indicate marks*

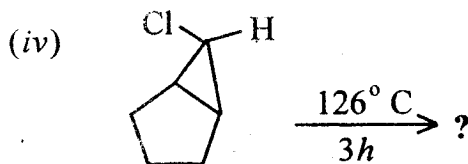
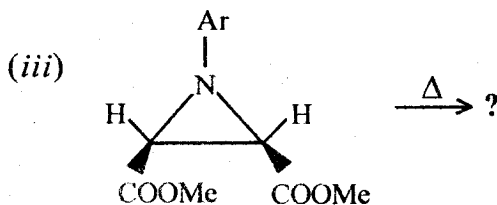
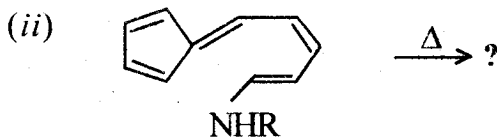
**GROUP – A**

1. Write Woodward-Hoffmann rule for electrocyclic reactions and hence predict the product of the following reactions indicating frontier-orbital interactions (F.O.I.) (answer any *three*) :  $2 + 2 \times 3$



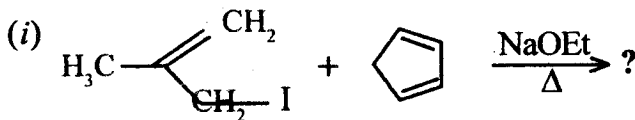
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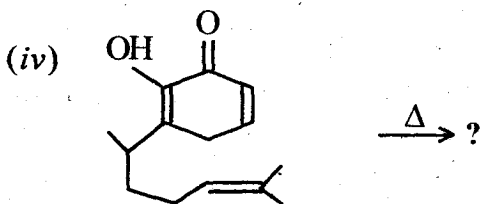
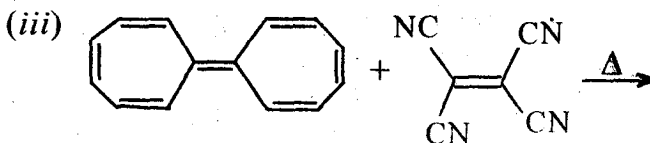
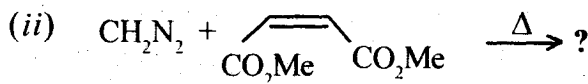


2. (a) What is supra and antarafacial cycloaddition? Write Woodward-Hoffmann selection rules for cycloaddition reactions.

(b) Predict the product of the following reactions indicating F.O.I. (attempt any three):  $2 + 2 \times 3$

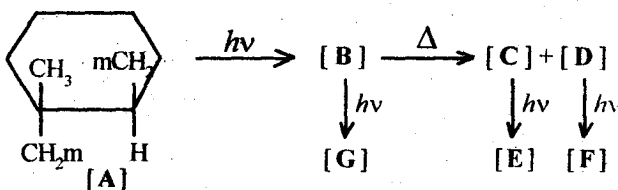


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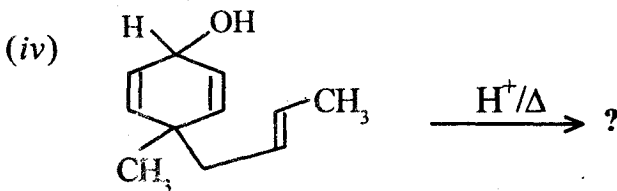
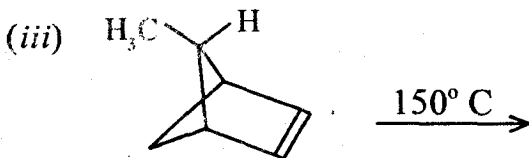
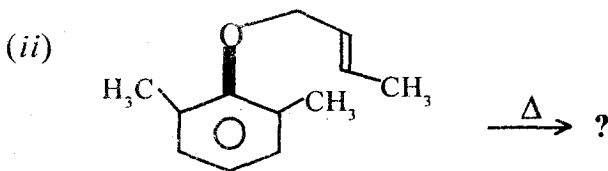
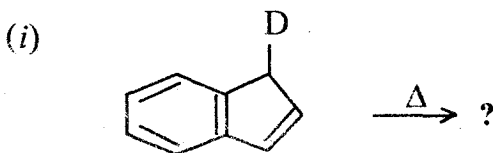


3. (a) Define site 'selectivity' and 'periselectivity' with specific example and explain indicating Frontier Orbital interaction.

(b) Predict the product of the following reaction indicating F.O.I. in each case : 2 + 2 + 4



4. Write Woodward-Hoffmann Rule for carbon migration indicating frontier orbital interaction in each case and hence predict the product of the following reaction (attempt any two) :  $4 + 2 \times 2$

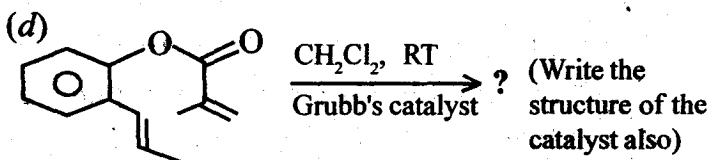
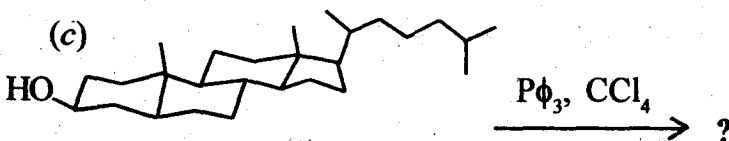
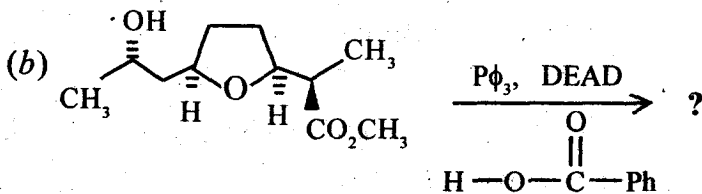
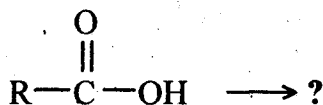
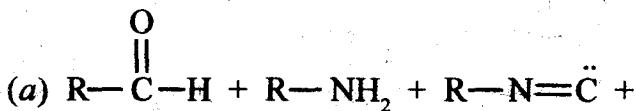


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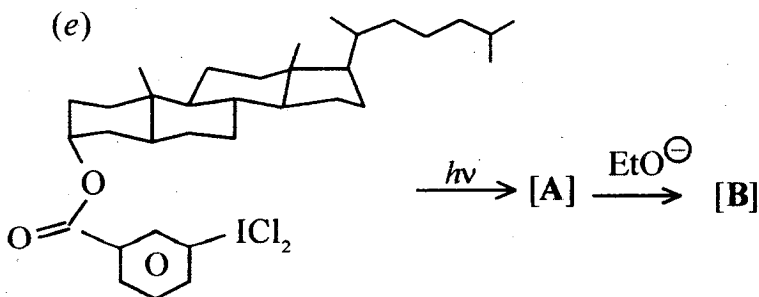
5. Predict the products with plausible mechanism

(any four) :

2 × 4



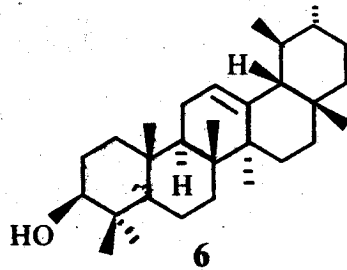
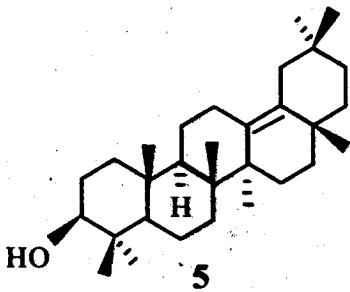
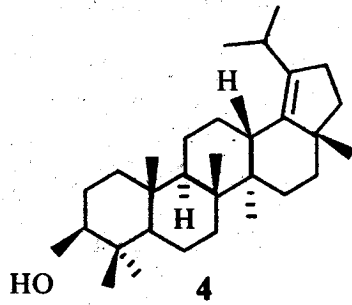
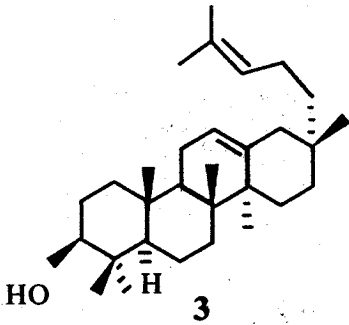
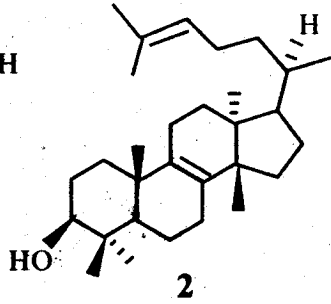
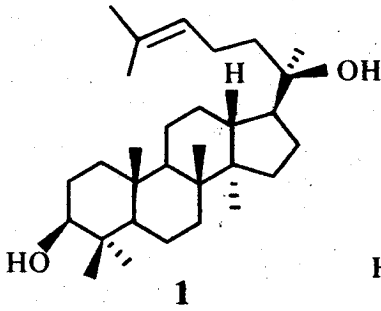
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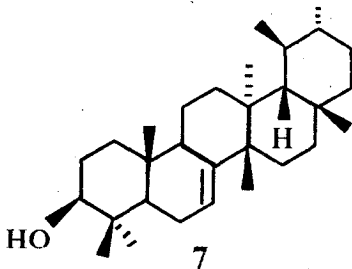
GROUP – B

6. Predict the possible (i) monocyclic, (ii) bicyclic and (iii) tricyclic products by acid catalyzed transformation of squalene epoxide (with *Plausible mechanism*) :  $2\frac{1}{2} + 2\frac{1}{2} + 3$
7. Synthesize (20R) dammarene-diol, 1, euphol 2, bacchara-12, 21-dien-3-ol 3, 18-lupen-3-ol 4,  $\delta$ -amyrin 5,  $\alpha$ -amyrin 6 and bauerenol 7 from squalene epoxide (any *four*, with plausible mechanism) :  $2 \times 4$

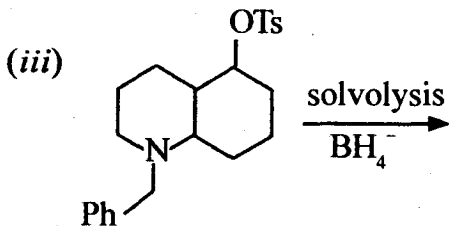
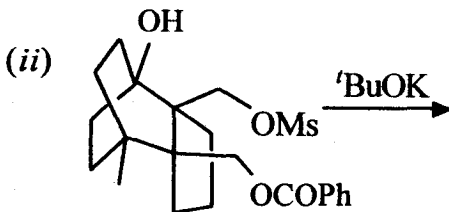
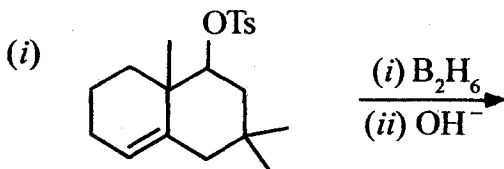
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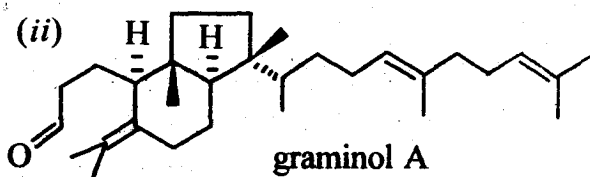
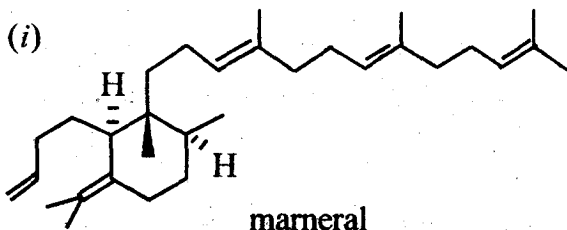


8. (a) Predict the products in the following transformations (any two) : 2 × 2





(b) Synthesize the following : 2 + 2



9. Answer any four : 2 × 4

- (a) What is multi-component-reaction ? Give an example.
- (b) What is metathesis reaction ? Illustrate with example.
- (c) What is a phase transfer catalyst ? Illustrate with mechanism.
- (d) What is Grob fragmentation reaction ?

- (e) What is the necessary condition for nuclear magnetic resonance ? How is it maintained ?
- (f) Explain the term "chemical shift" with reference to proton magnetic resonance spectroscopy.
- (g) What would be the multiplicity of the signals for the proton in  $\text{CH}_3\text{—CH}_2\text{—OH}$  ?

10. A monoterpeneoid having molecular weight,  $\text{C}_{10}\text{H}_{18}\text{O}$  (A) on reduction with  $\text{Ni}/\text{H}_2$  yields  $\text{C}_{10}\text{H}_{22}\text{O}$  (B) and on acetylation yields monoacetyl derivative. Compound (A) on permanganate ( $\text{KMnO}_4/\text{H}^+$ ) oxidation gives Laevulic acid, Oxalic acid and acetone and on treating with dilute  $\text{HCl}$  yields isomeric product geraniol (C). Compound (B) on heating with cone.  $\text{H}_2\text{SO}_4$  produces a known compound 3, 7 dimethyl -oct-2-ene. Deduce the structure for these observations.

8

Or

- (a) 10  $\pi$  electron system cyclodecapentaene is very unstable – why? What modification in the structure is required to make the system more stable? 3
- (b) What do you mean by the term "antiaromaticity". Explain with a suitable example. 3
- (c) How many non-equivalent protons are there in the following compounds : 2

