M.Sc. 1st Semester Examination, 2023

CHEMISTRY

PAPER—CEM-102

Full Marks : 50

Time : 2 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

GROUP-A

Answer any **four** of questions : 2×4

1. Define Ring Closing Metathesis reaction ? What is Grubbs catalyst ?

2. State and explain the principle of microscopic reversibility.

3. Plants are the source of Renewable Phytochemicals. Justify the statement in your own words.

4. What are terpenoids ? Write different classes of terpenoids with the no. of C-atoms in those.

5. What is 'biomimetic control' in chemical transformation ? Give example.

6. What is multicomponent reaction (give example). Write its significance.

GROUP-B

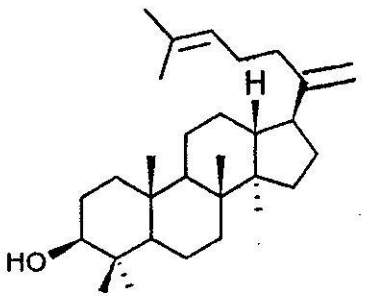
Answer any **four** questions : 4×4

7. Explain the formation of the following from squalene epoxide by applying the "biogenetic isoprene rule" (at least three examples each) : 2×2

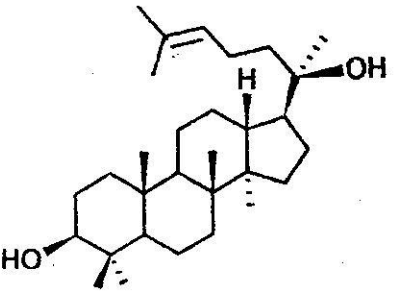
   (*a*) Monocyclic triterpenoids

   (*b*) Bicyclic triterpenoids

8. Synthesize the following 6-6-6-5 tetracyclic triterpenoids from squalene by applying biogenetic isoprene rule : 2×2

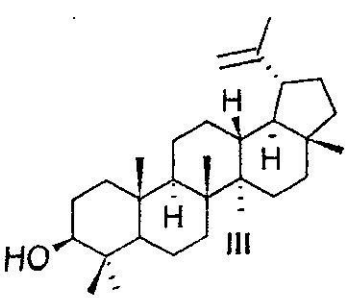


I

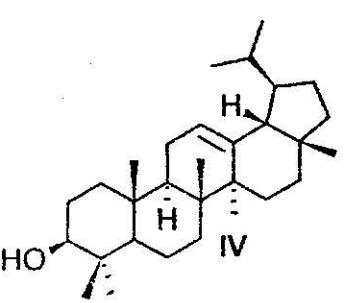


II

9. Synthesize the following 6-6-6-6-5 pentacyclic triterpenoids lupeol III and neolupenol IV from squalene :



III

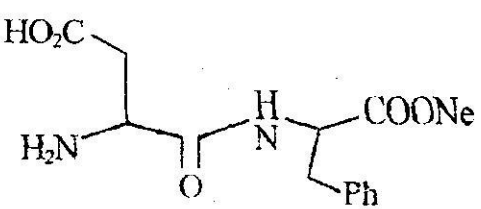


IV

10. What do you mean by Hückel and Mobius system ? Examine using Hückel-Mobius method whether the conrotatory interconversion between cis-1,3,5-hexatriene and cyclohexadiene is a thermally or photochemically allowed process. 2 + 2

11. What are frontier molecular orbitals ? Using FMO theory show that (2E,4Z)-2, 4-hexadiene undergoes thermal cyclisation to give cis-3, 4-dimethylcyclobutene while photocyclisation of the same substrate gives the trans-isomer. 4

12. Using retrosynthetic approach synthesize the following molecule : 4

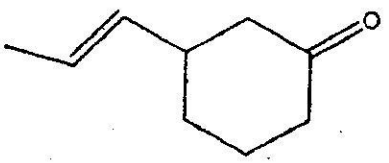


GROUP-C

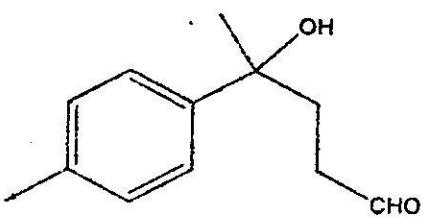
Answer any **two** questions : 8×2

13. How will you synthesize the following compounds ? Use retrosynthetic approach to start with simple available starting materials. 2 + 3 + 3

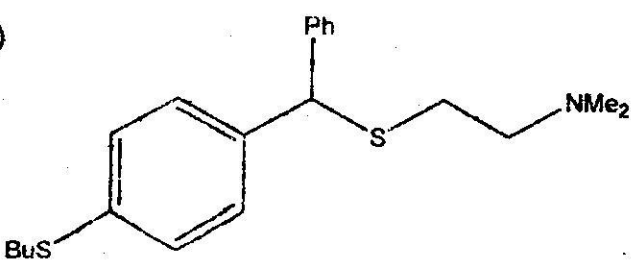
(*i*)



(*ii*)



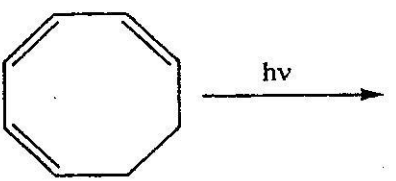
(*iii*)



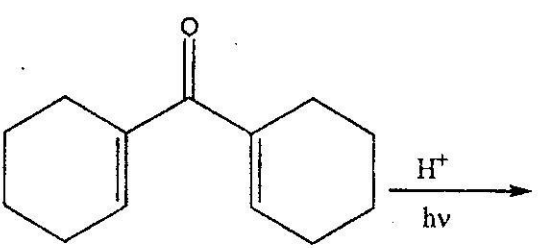
14. (*a*) Examine using correlation diagram whether conrotatory mode of ring-opening of cyclobutene to 1,3-butadiene is thermally allowed or photochemically allowed process.

(*b*) Predict the product(s) with plausible mechanism :

(*i*)

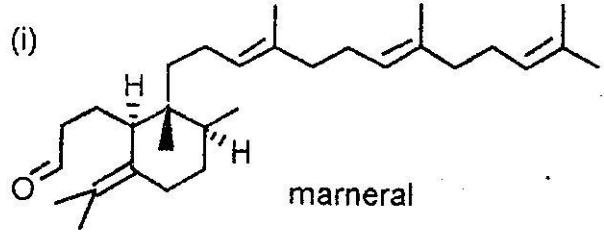


(*ii*)



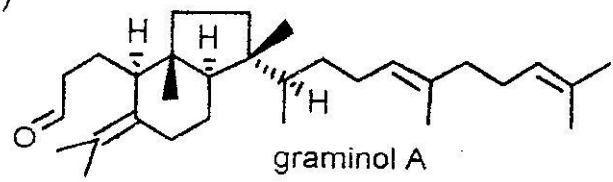
15. (*a*) Synthesize the following from squalene by applying biogenetic isoprene rule and Grob fragmentation : 4

(i)



marneral

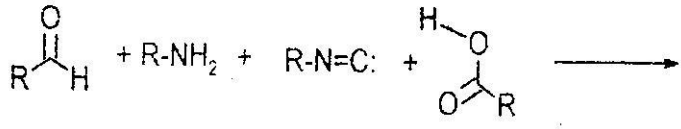
(ii)



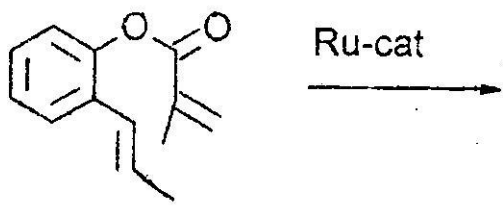
graminol A

(*b*) Predict the products with plausible mechanism (any *two*) : 4

(*i*)

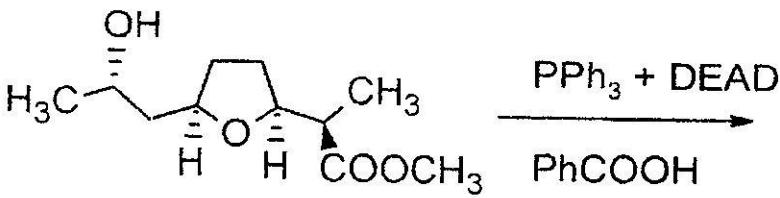


(*ii*)

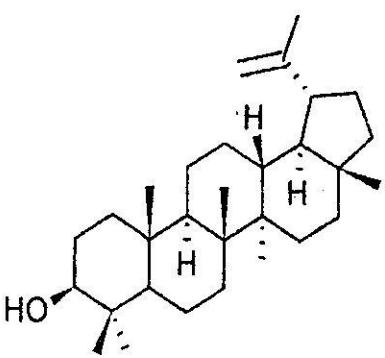


Ru-cat

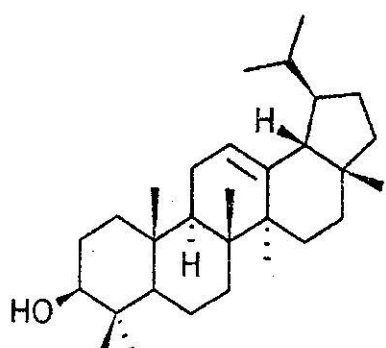
(*iii*)



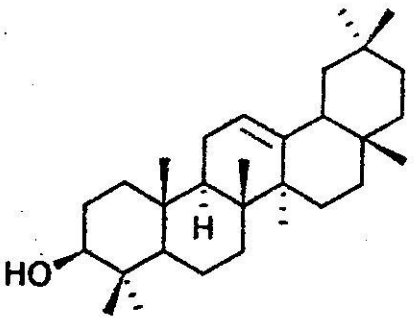
16. Synthesize the following from squalene by applying biogenetic isoprene rule (any *two*) : 4 × 2



I: Lupeol



II: 13(18)-lupene-3-ol



III: β-amyrin

[Internal Assessment - 10 Marks]
