PG/IS/CEM-102/19

M.Sc. 1st Semester Examination, 2019

CHEMISTRY

(*Organic*)

PAPER – CEM-102

Full Marks : 40

Time : 2 hours

Answer **Q. Nos. 1** & **2** and any **two** from **Q. Nos. 3, 4, 5 & 6**

The figures in the right hand margin indicate marks

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

Illustrate the answers wherever necessary

1. Answer any *four* questions : 2×4

   (*a*) What terpenoids and triterpenoids ?

   (*b*) What is 'biomimetic control' in chemical *transformation* ?

(*c*) What is "biogenetic isoprene rule" ?

(*d*) What is Barton reaction ? Explain schematically with mechanism.

(*e*) What is multicomponent reaction ? Write its significance.

(*f*) What is phase transfer catalyst ? Give an example and explain its mechanism.

(*g*) What is Grob Fragmentation ?

(*h*) Plant based chemicals can be termed as *Renewable Chemicals*. Explain.

2. Answer any *four* questions : 4×4

(*a*) Explain the formation of the following from squalene epoxide by applying the "biogenetic isoprene rule" with at least three examples each (answer any *two*) :

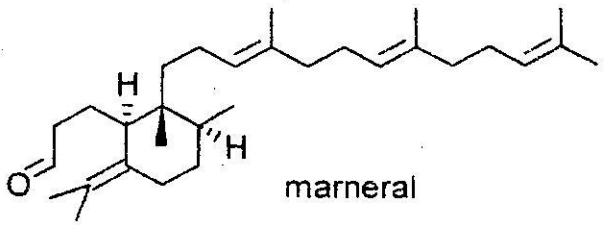
(*i*) monocyclic triterpenoids

(*ii*) bicyclic triterpenoids

(*iii*) tricyclic triterpenoids

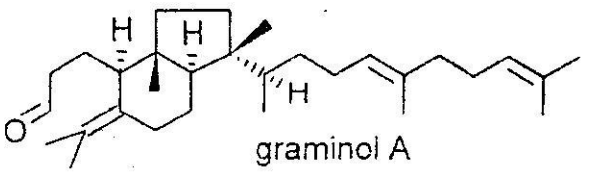
(*b*) Synthesize the following from squalene by applying *g* biogenetic isoprene rule and Grob fragmentation :

(*i*)



marneral

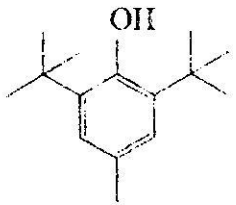
(*ii*)



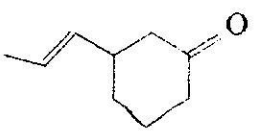
graminol A

(*c*) Give the proper retrosynthetic analysis and forward synthesis of the following compounds :

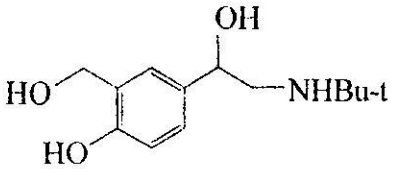
(*i*)



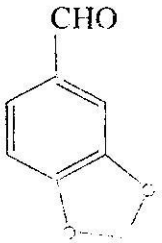
(*ii*)



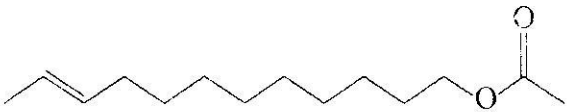
(*d*) How will you synthesize 'Salbutamol' ? Use retrosynthetic approach to start with simple available starting materials.



(*e*) Synthesize the following compounds employing retrosynthetic approach :



(*f*) Synthesize the following compounds employing retrosynthetic approach :

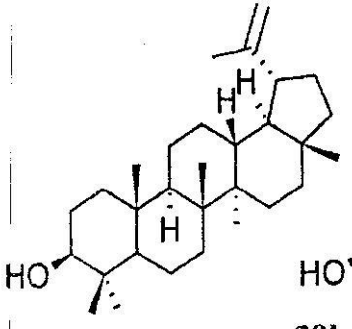


(*g*) (*i*) How will you prepare hordenine from 2-phenylethanol ?

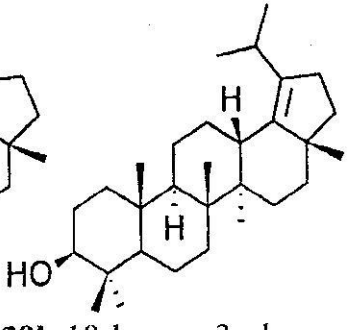
(*ii*) Convert : Anisaldehyde → Tyramine

(*h*) Suggest suitable chemical reactions to distinguish between ephedrine and ψ-ephedrine.

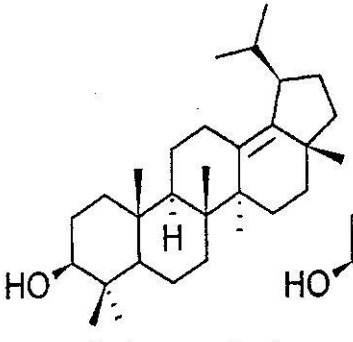
3. Synthesize the following 6-6-6-6-5 pentacyclic triterpenoids from squalene following biogenetic isoprene rule. 2 × 4



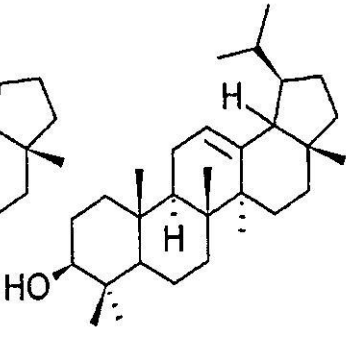
39a lupeol



39b 18-lupene-3-ol

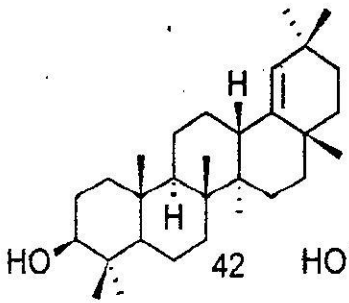


39c 13(18)-lupene-3-ol

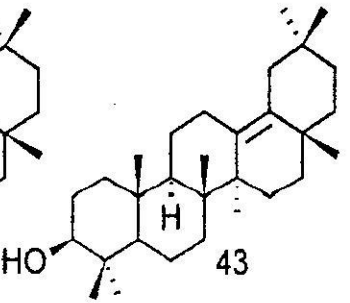


39d neolupenol

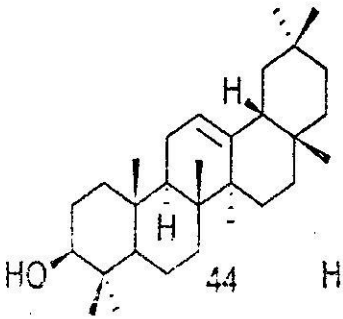
4. Synthesize the following 6-6-6-6-6 pentacyclic triterpenoids from squalene following biogenetic isoprene rule : 2×4



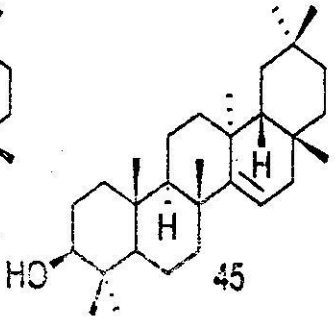
42



43

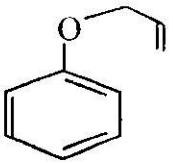


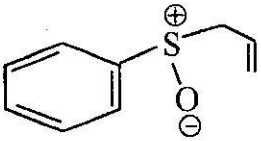
44

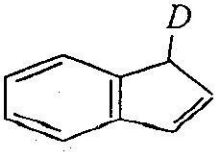


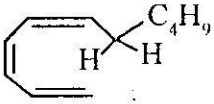
45

5. What is (*i*, *g*) sigmatropic shift ? Illustrate with examples and hence predict the product of the following reaction (attempt any *three*) : $2 + 3 \times 2$

(*i*) 

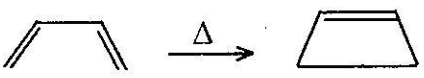
(*ii*) 

(*iii*) 

(*iv*) 

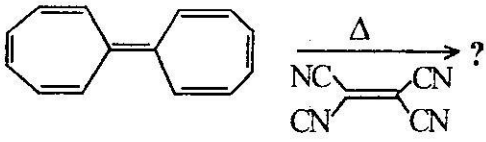
Or

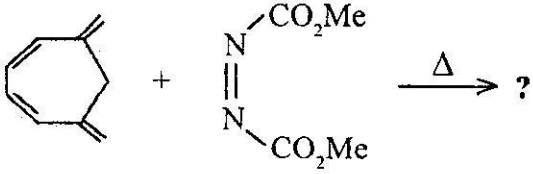
(*a*) Draw the correlation diagram of the following interconversion under thermal condition :

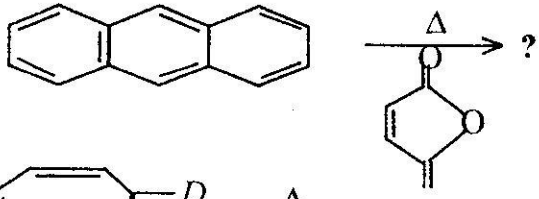


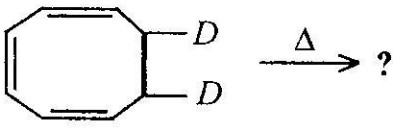
And indicate the symmetry allowed path under this condition.

(*b*) In predict the products of the following reaction with F.O.I (attempt any *two*) :

(*i*) 

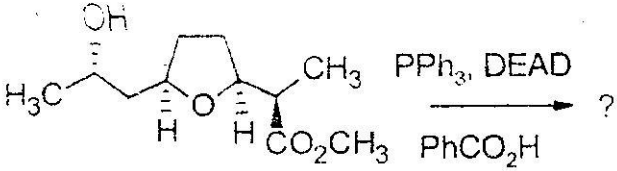
(*ii*) 

(*iii*) 

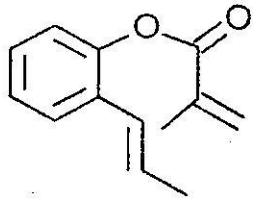
(*iv*) 

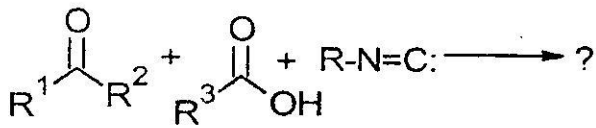
4 + 2 × 2

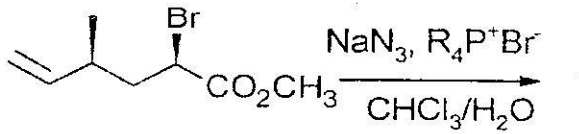
6. Predict the products (with plausible mechanism) (any *four*) : 2 × 4

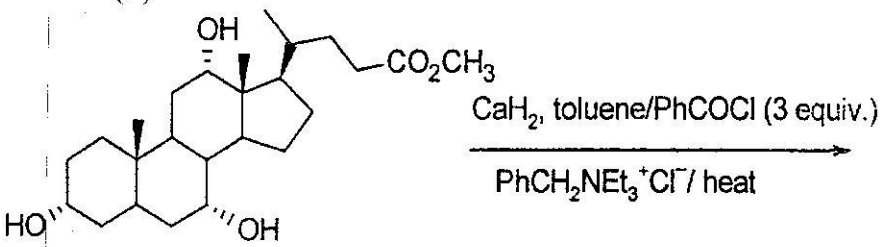
(*i*) 

(*Continued*)

(*ii*) 
O
O
Grubb's cat.
?

(*iii*) 
O
R1
R2
+
O
R3
OH
+ R-N=C:
?

(*iv*) 
Br
CO2CH3
NaN3, R4P+Br-
CHCl3/H2O
?

(*v*) 
OH
CO2CH3
HO
OH
CaH2, toluene/PhCOCl (3 equiv.)
PhCH2NEt3+Cl-/ heat