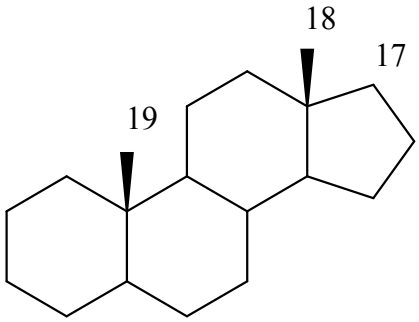
B-Steroid hormones (sex hormones)

b-Androgens (C_{19})

Male hormones

Their parent hydrocarbon is called androstane ,its M.F. $C_{19}H_{32} = C_nH_{2n-6}$,

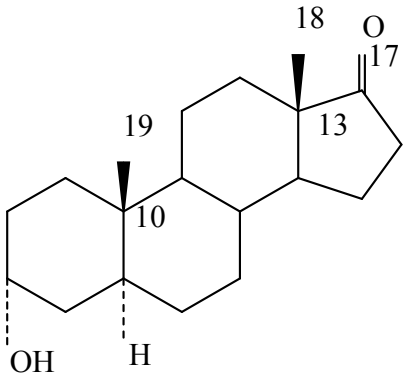
it is tetracyclic ring.



androstane

1- Androsterone M.F. $C_{19}H_{30}O_2$

1-It was isolated from male urine (15mg from 15000 L of urine)



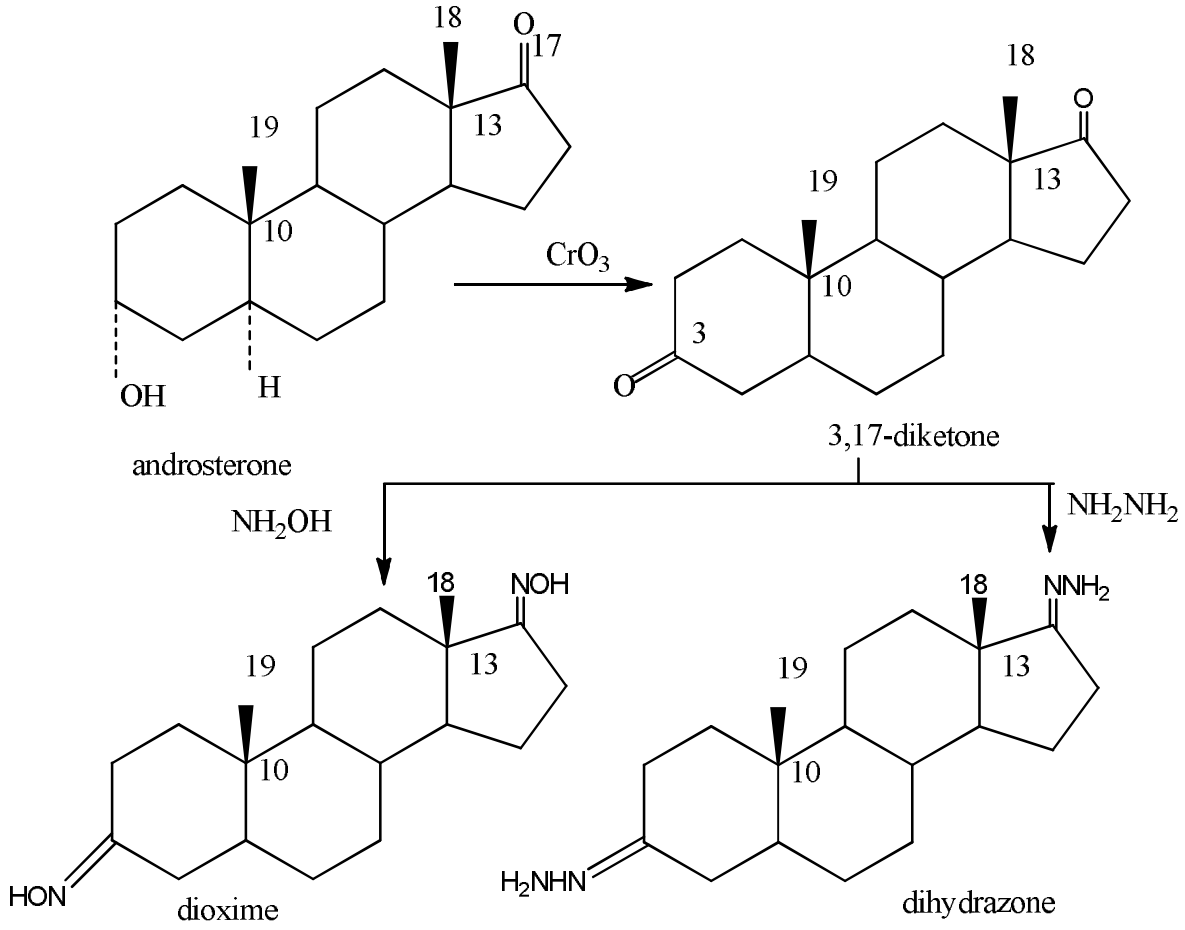
2-It is a saturated compound since it did not add H_2/ Pt or Br_2/CCl_4 (there is no double bonds).

3-It has a carbonyl group since it forms monooxime and monohydrazone

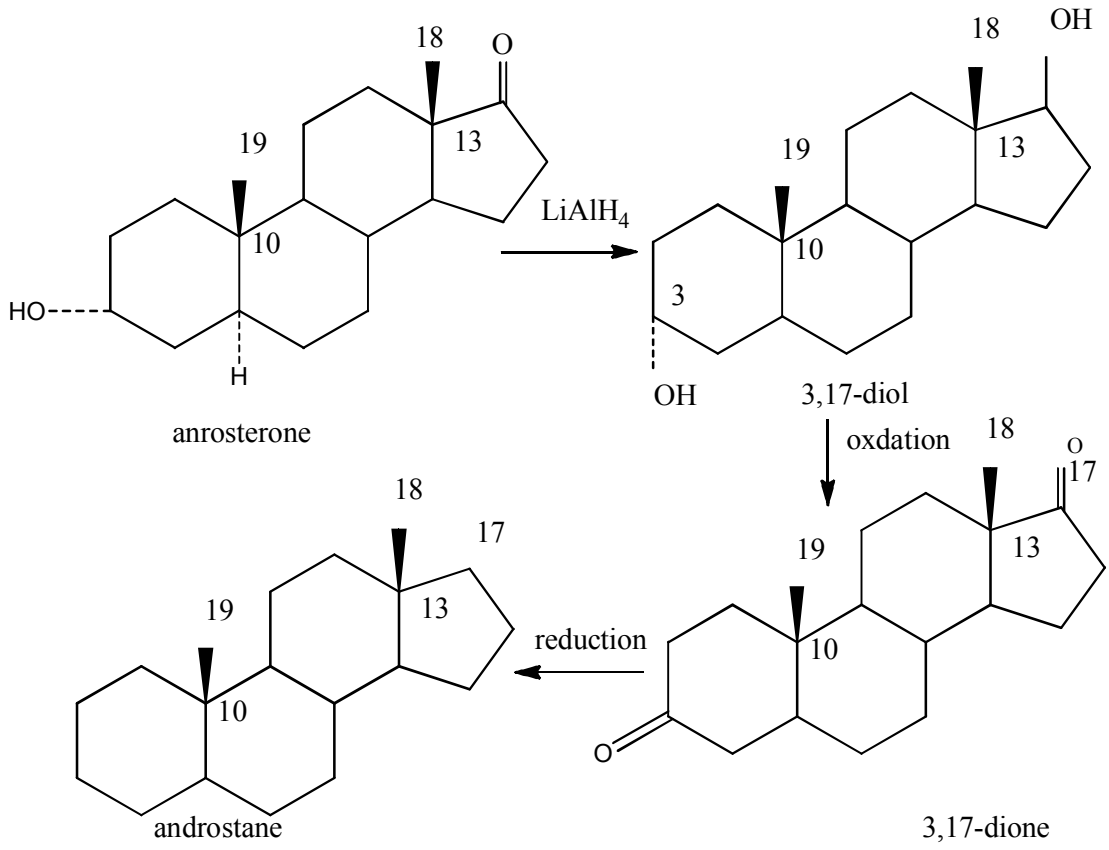
The first oxo-function is a hydroxyl group since it forms mono ester on reaction with acetic anhydride .

4-Oxidation of it followed by condensation with NH_2OH or NH_2NH_2 , it forms dioxime or dihydrazone respectively.

This means that the hydroxyl group is a secondary hydroxyl group .



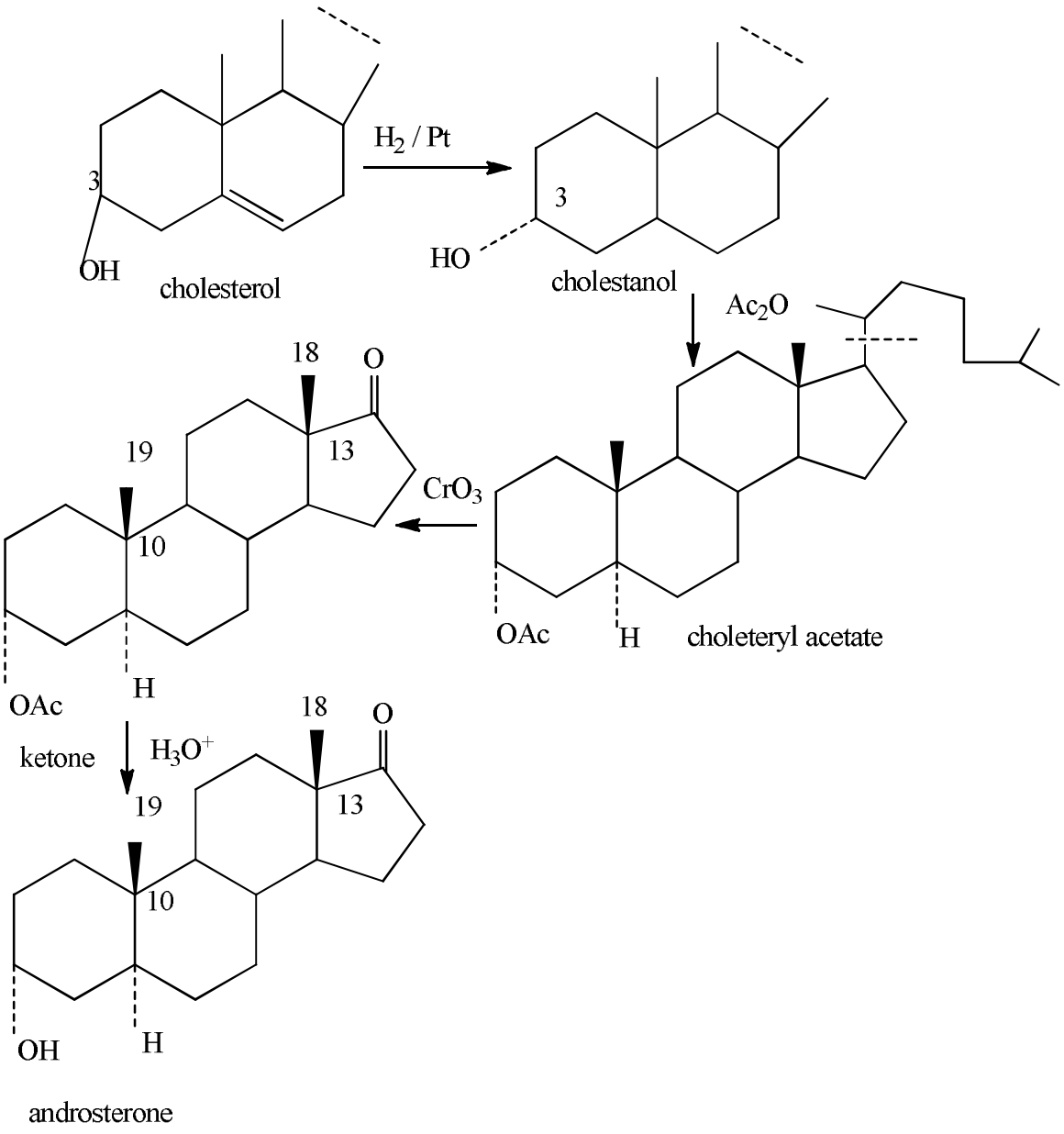
Complete reduction :



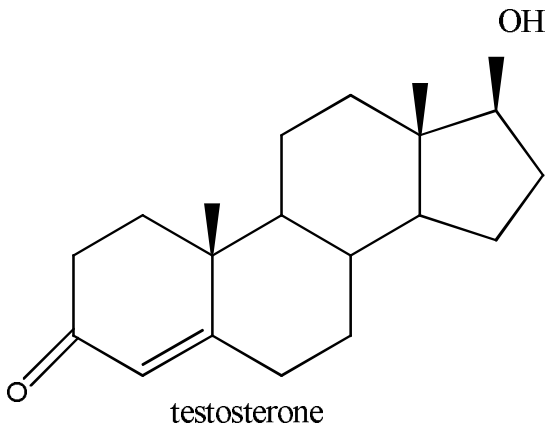
The M.F.of androstane is $C_{19}H_{32} = C_nH_{2n-6}$

Thus , androsterone is a tetracyclic steroid and containing a steroid nucleus.

Its structure was established on the bsis of its preparation from cholesterol.



2- **Testosterone** ; M.F. $C_{19}H_{28}O_2$



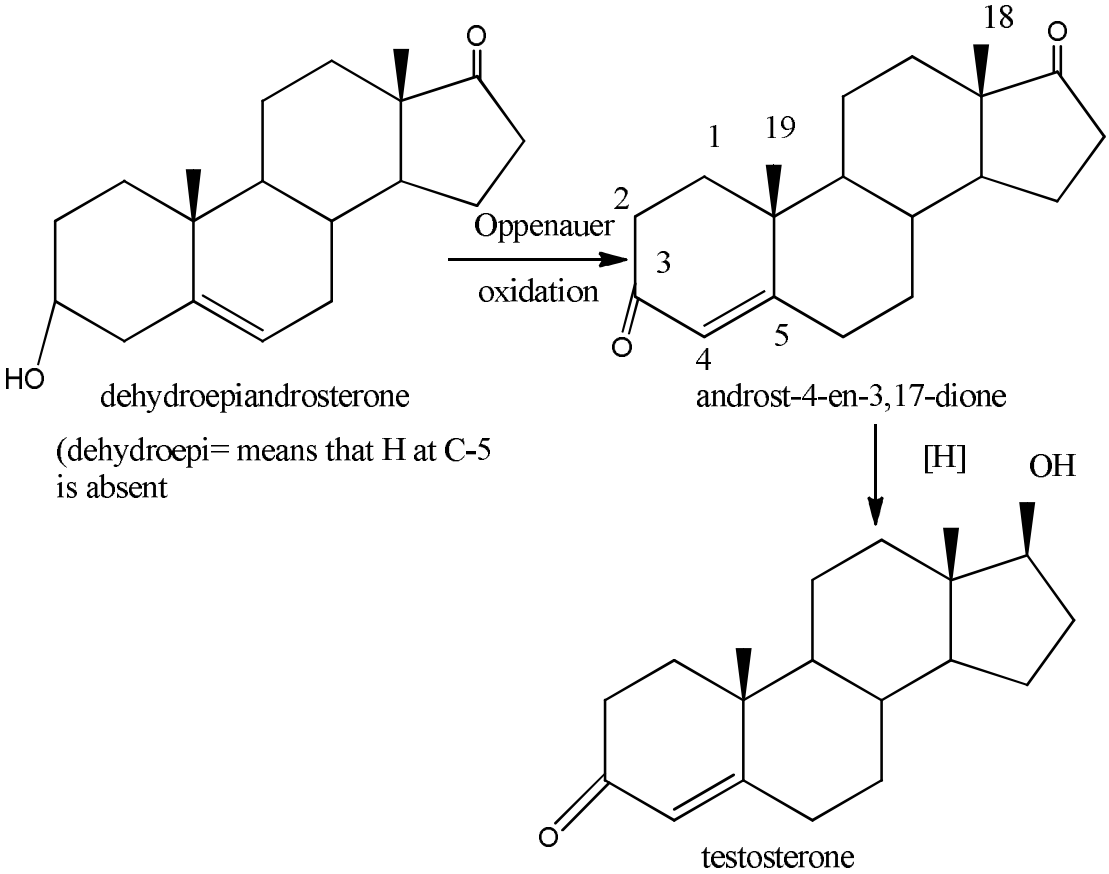
testosterone

1-It is the main and real male sex hormone in the body and the others are metabolic products of testosterone .

2-Its structure was established by its preparation from cholesterol.

3-It was shown that it contains one hydroxyl group and α,β-unsaturated ketone .

4-By conversion of dehydroepiandrosterone into testosterone by means of micro-organisms , the first stage used an oxidizing yeast in the presence of oxygen and the second stage a fermenting yeast .



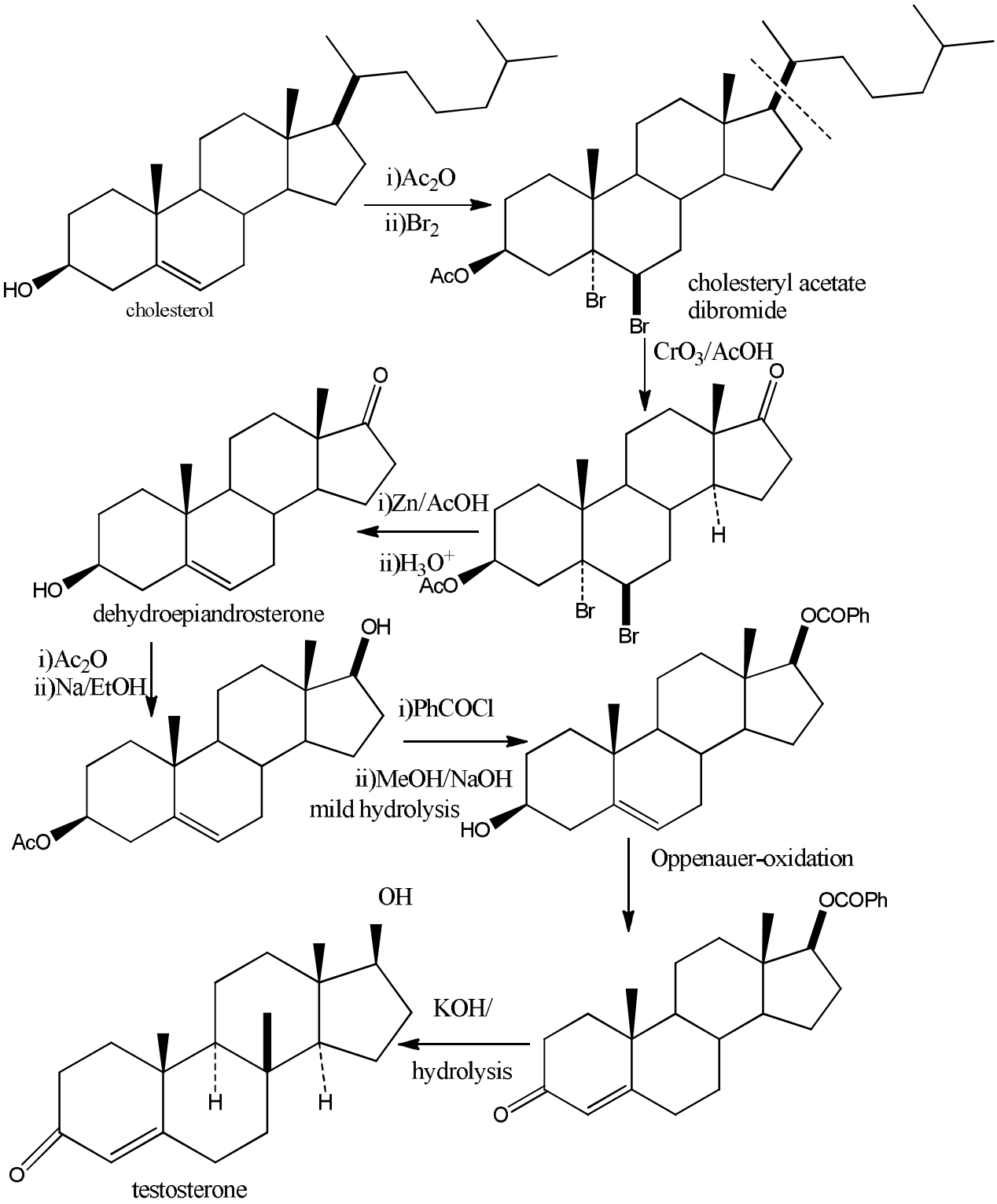
dehydroepiandrosterone

(dehydroepi= means that H at C-5 is absent

androst-4-en-3,17-dione

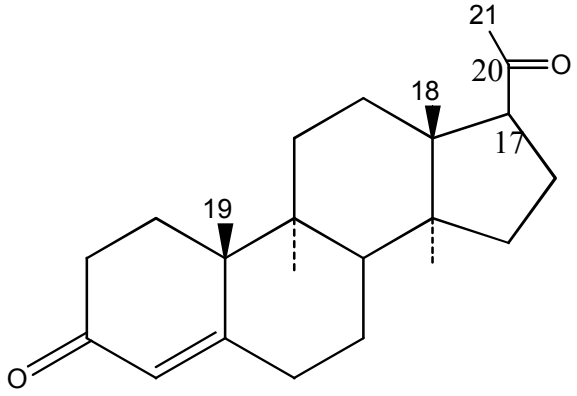
testosterone

The preparation of testosterone from cholesterol establishes the structure of this hormone which had been shown to contain one hydroxyl group and an α,β-unsaturated ketone group.



c-Gestogens (C_{21})

1- Progesterone ; M.F.$C_{21}H_{30}O_2$

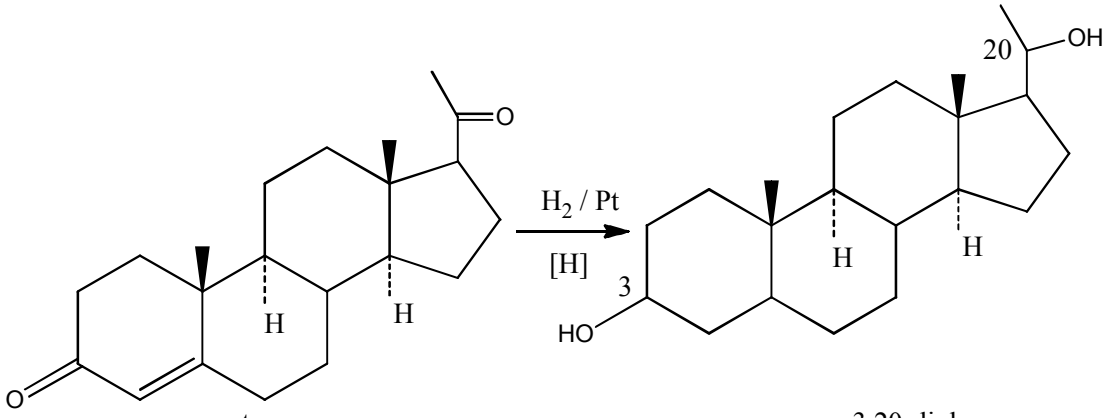


progesterone

1-This was isolated in a pure form from the corpora lutea of pregnant sows أنثي الخنزير

2-The chemical reactions of it show that there are two keto groups present(by condensation of it with two molecules of both NH_2OH and NH_2NH_2.

3-Catalytic reduction of progesterone give dialcohol with M.F.$C_{21}H_{36}O_2$,means that the compound absorbs $3H_2$,indicating that it contains one double bond and two carbonyl ketones .

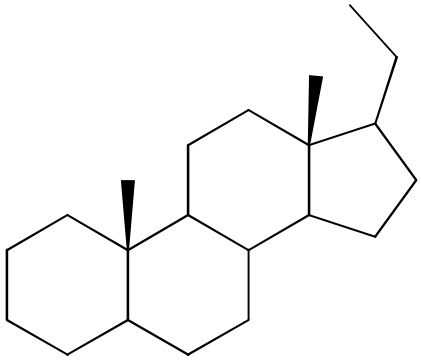


progesterone
$C_{21}H_{30}O_2$

pregnane-3,20-diol
$C_{21}H_{36}O_2$

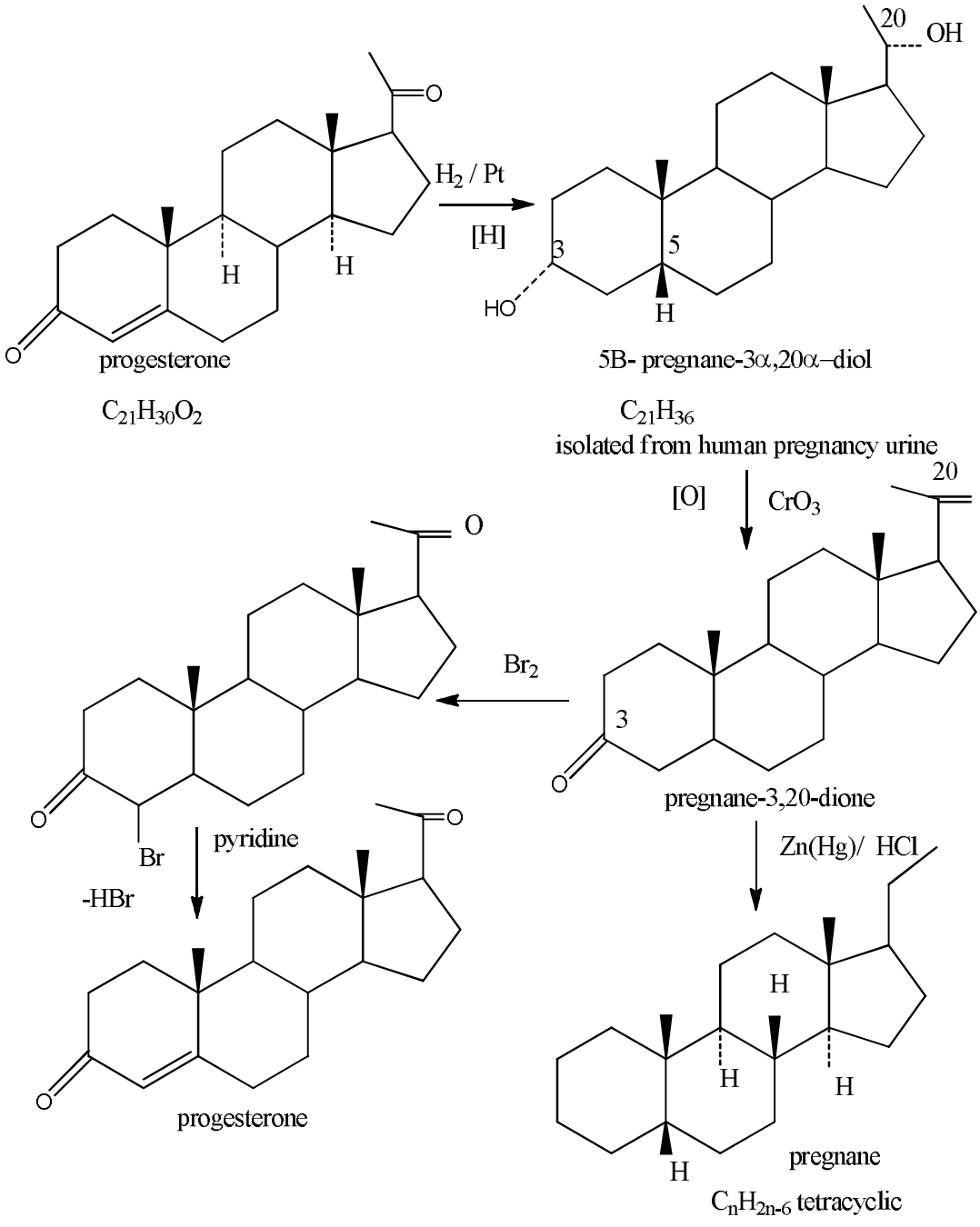
Thus , its parent hydrocarbon is called pregnane with M.F.$C_{21}H_{36}$ = C_nH_{2n-6} .

Thus , progesterone is a tetracyclic ring compound .



pregnane

4-The structure of progesterone was established on the basis of its preparation from 5β-pregnane-3α,20α-diol.



2- 5β-Pregnane-3α,20α-diol

M.F.$C_{21}H_{36}O_2$

1-It was isolated from human pregnancy urine by Marrian (1929).

2-It is biologically inactive , and is the main metabolic product of progesterone .

3-The functional nature of the two oxygen atoms was shown to be secondary alcoholic .

4-Since pregnanediol is saturared ,the parent hydrocarbon is $C_{21}H_{36}$ (it is tetracyclic ring compound).

5- Pregnanediol give haloform reaction ,therefore a CH_3CHOH group is present.

6-When oxidized , pregnanediol is converted into the diketone pregnanedione and this ,on the Clemmensen reduction ,forms pregnane , $C_{21}H_{36}$.

7-Finally ,the relationship between pregnanediol and progesterone shows that the former contains one hydroxyl group at position -3.

8- Further,work showed that the configuration of the 3-hydroxyl group is α.Thus,