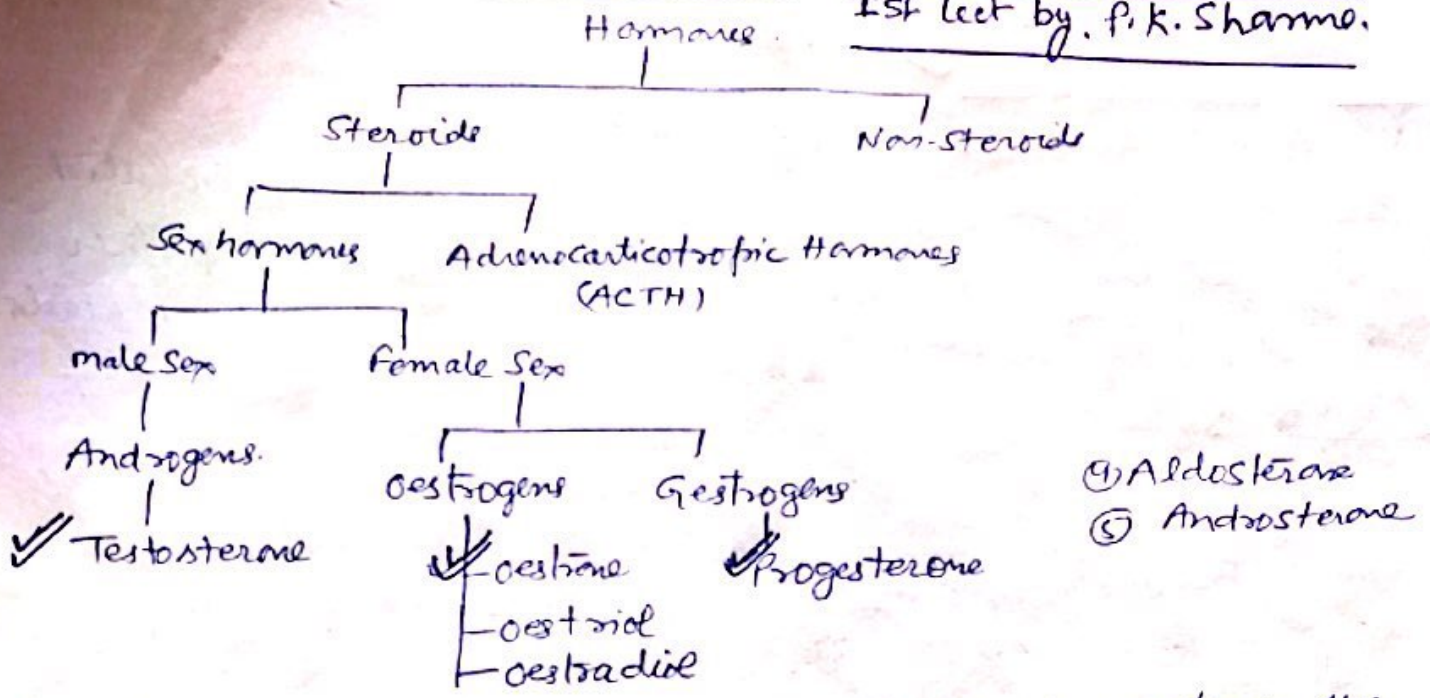


SEX-HORMONES

Natural Products H-4016

1st Lect by P.K. Sharma.



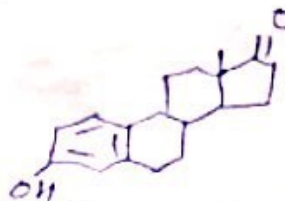
Sex-hormones. These are produced in reproductive parts of the body i.e. testes and ovaries. Their production is stimulated by another group of hormones, which are secreted by Pituitary gland, and carried to the gonads, directly by blood stream. These hormones are called primary sex hormones, whereas the hormones which are produced in reproductive parts are known as Secondary sex hormones. These sex hormones are responsible for sexual processes and for development of secondary sexual characters, on the basis of which we can differentiate between a male and a female. These are texture and distribution of hairs on skin, texture of skin, characteristics of voice etc. Synthetic substitutes for oestradiol, progesterone and testosterone are, ethinyl oestradiol, Ethisterone and Methyl Testosterone.

Ovary produces mainly oestradiol and progesterone while testes secrete Testosterone only. All other sex hormones are metabolic products of these main hormones.

① Oestrogens or Follicular Stimulating Hormones FSH
Oestradiol is the most important member of this group.

The main function of oestrogens is to induce the state of ⁽²⁾ estrus or heat.

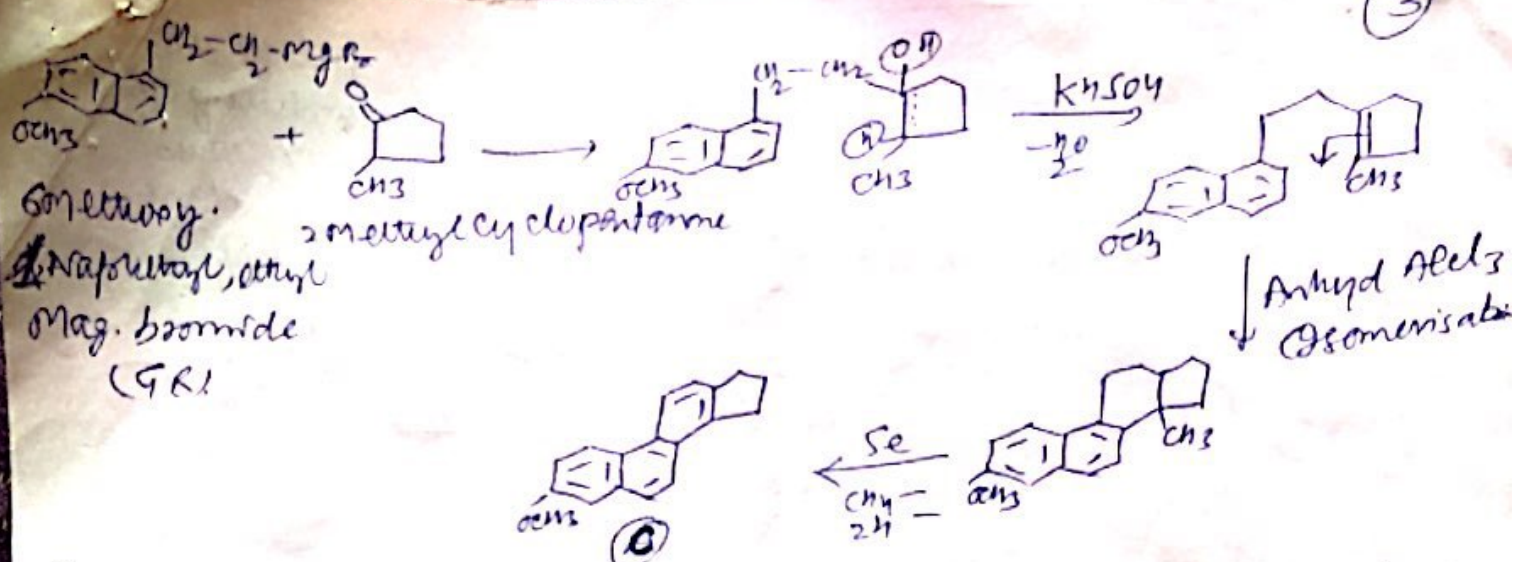
Oestron OESTRONE ✓ V. Imp



It was the first sex hormone, to be discovered. It was isolated from urine of pregnant or non-pregnant women. Among other sources are urine pregnant mares, stallions, human placenta and adrenal cortex etc.

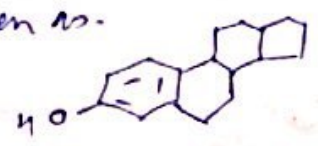
Constitution ① mol. formula. $C_{18}H_{22}O_2$

- ② Presence of 1-ketonic group. It forms semicarbazone with semicarbazide and oxime with hydroxylamine, showing the presence of 1 ketonic group.
- ③ Presence of 1-phenolic OH-group. It forms mono methyl ether with Diazomethane, dissolves in alkali, undergoes coupling with diazonium salt solutions and forms mono acetate on acetylation, showing the presence of 1-phenolic OH-group.
- ④ Presence of 3-double bonds. On hydrogenation it takes up four molecules of hydrogen, out of which one molecule would have been used for reduction of a keto group, and other three molecules of hydrogen might have been used for reduction of three double bonds, since it is a phenolic compd so, all the three double bonds are expected to be present in one ring only, only then it will show phenolic properties.
- ⑤ Presence of steroid nucleus. on Zn-dust distillation, it gives chrysene, showing the presence of steroid nucleus. This is confirmed by X-ray analysis, which reveals that ketonic and OH groups are situated at opposite ends of the molecule.
- ⑥ Mono methyl ether of oestron on Wolf-Kishner Redn ^{followed by} ~~followed by~~ se distillation gives 7-methoxy 1,2-cyclopentanophenanthrene (A) The structure of which is prepared from its synthesis -



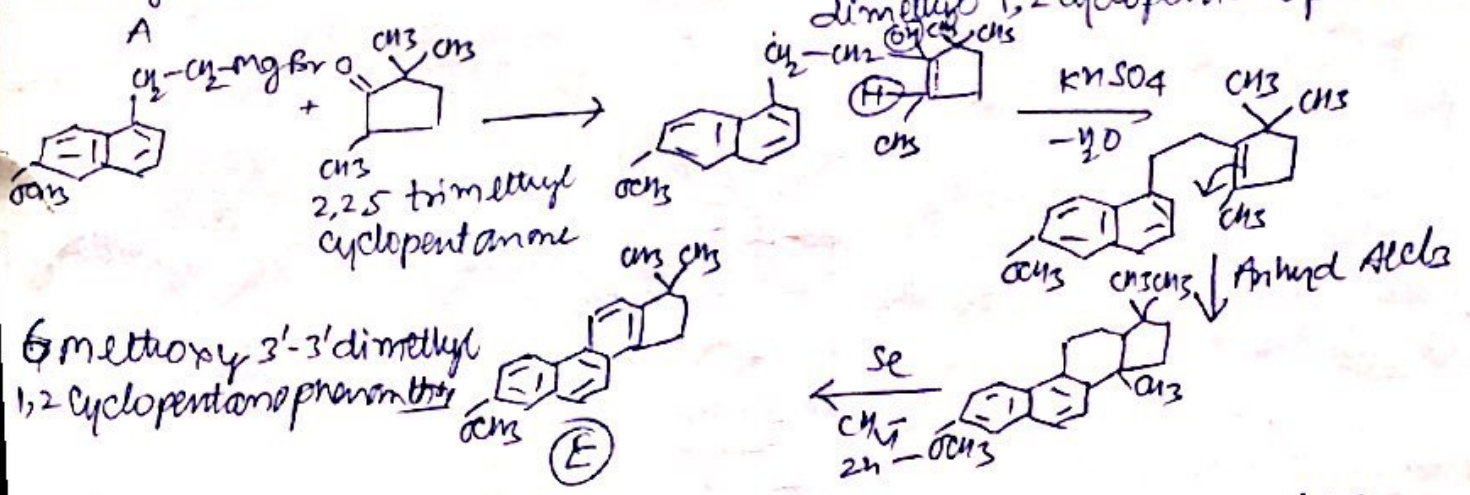
Mono methyl ether of oestrone $\xrightarrow[\text{Redn}]{\text{Wolff-Kishner}}$ B $\xrightarrow{\text{Se}}$ C (7-methoxy 1,2-cyclopentanone)

Formation of (C) shows that oestrone contains steroid nucleus and also that OH group is present at C-3, so part structure of oestrone can be written as:



The proposed structure contains 17 carbon atoms, while oestrone has 18C. Thus one additional carbon atom should be present in the nucleus, moreover one ketonic group is also there in the oestrone, its position too, has to be found out. This is done by following series of reactions -

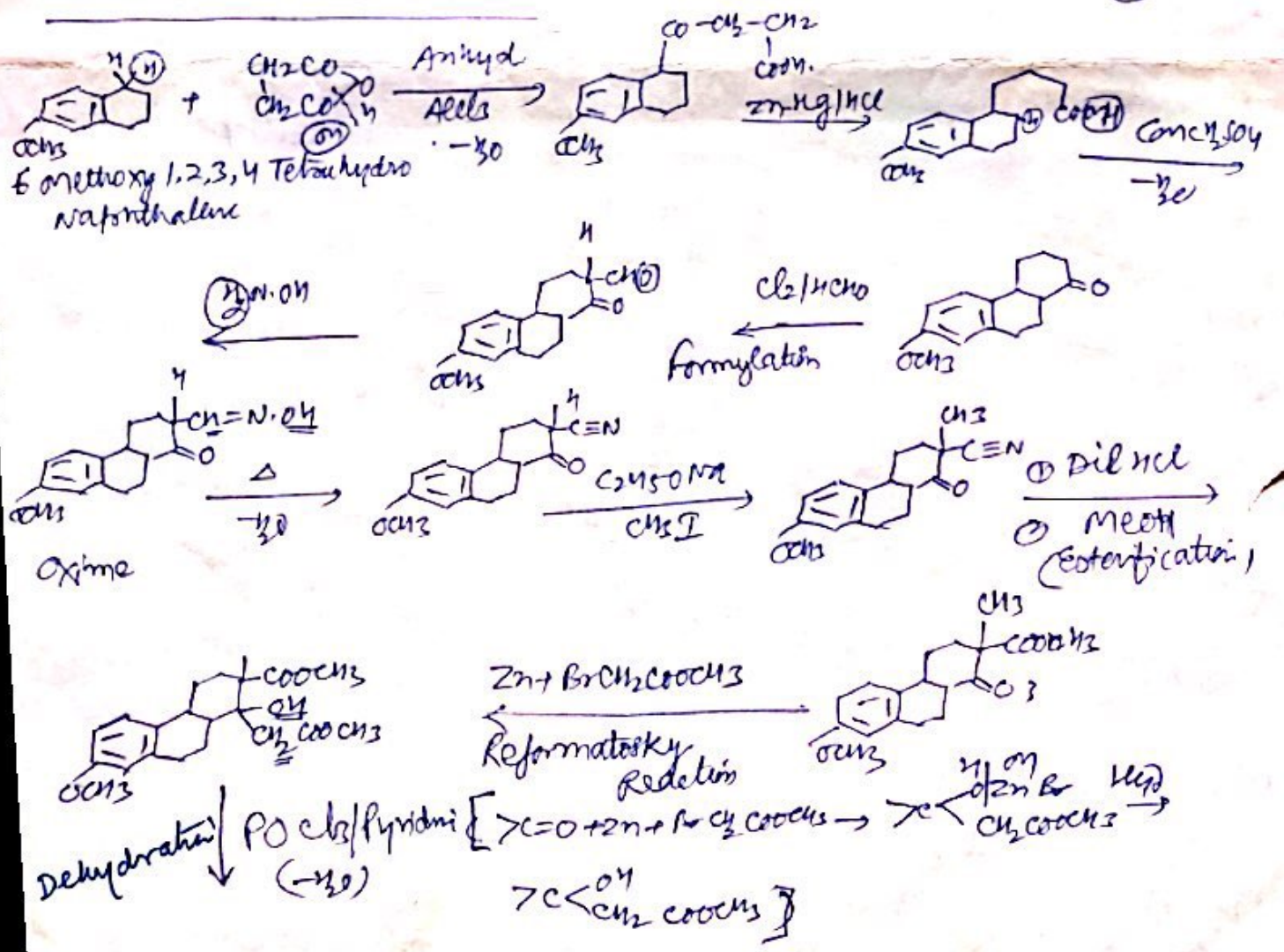
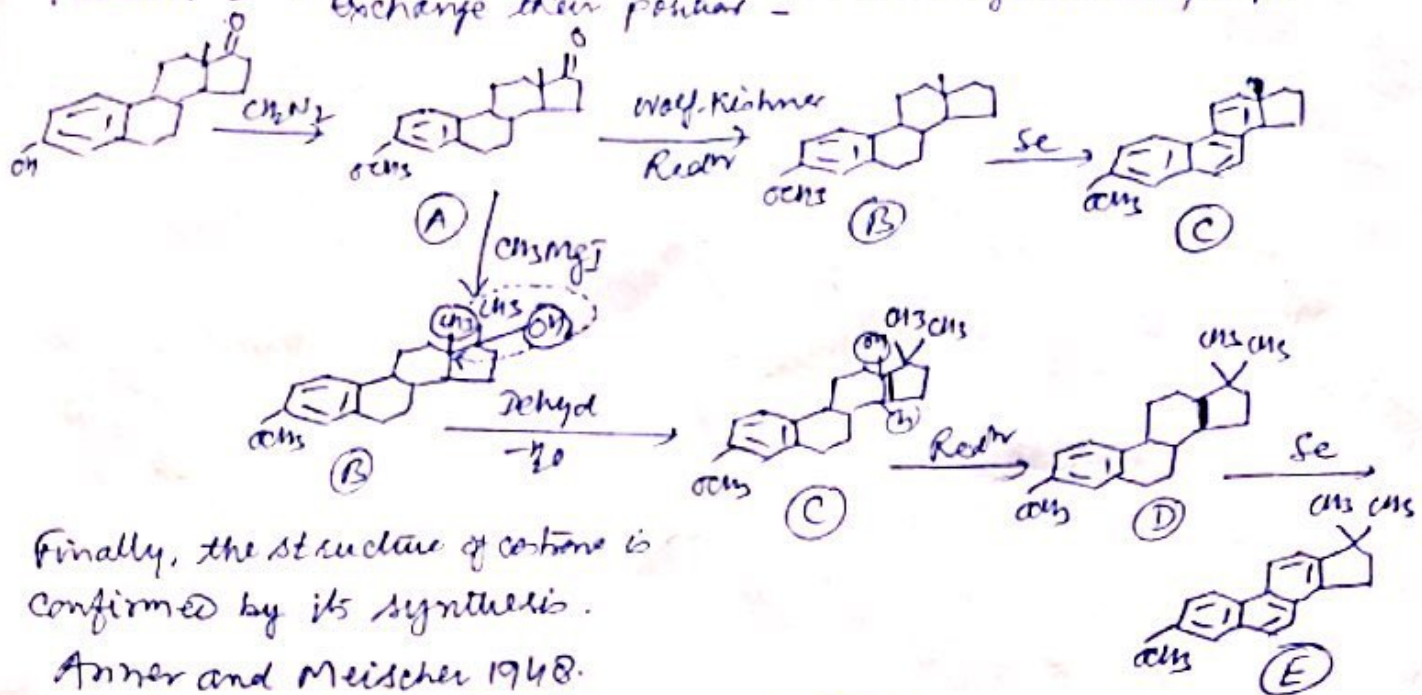
monomethyl ether of oestrone $\xrightarrow{\text{CH}_3\text{MgI}}$ B $\xrightarrow{\text{dehyd}}$ C $\xrightarrow{\text{Redn}}$ D $\xrightarrow{\text{Se}}$ E (7-methoxy 3'-3'-dimethyl 1,2-cyclopentanophenanthrene)

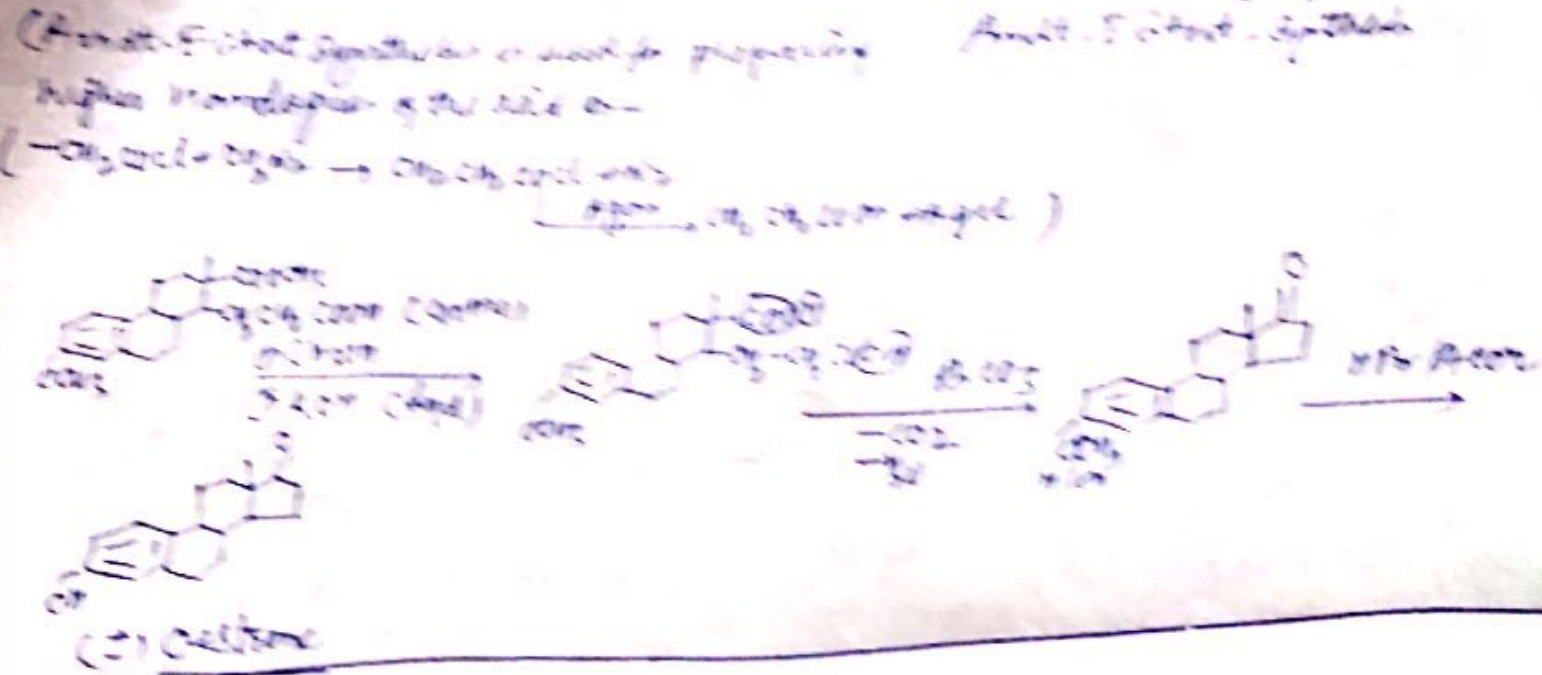


We see that in the formation of (E) from A, one methyl group has been introduced at C-17 of steroid, so it should be the site for ketonic group, thus ketonic group is present at C-17.

Moreover, only one methyl group has been introduced by above

reactions, while compound (D) contains two methyl groups, it means that one methyl group must be present at C-13, which during the process of dehydration, would have migrated to C-17. Thus we can assign following structure to testosterone, which explains above reaction - In this dehydration reaction, methyl and OH groups exchange their position -





2. Gestagens
PROGESTERONE



Hormone is mainly secreted by corpus luteum in yellow body of the ovary. It occurs in human placenta, adrenal cortex, pregnancy urine. At the time of puberty (sexual maturity) it forms in the ovary, which is called corpus luteum in yellow body. Its main function is to prepare for and maintain pregnancy.

Contradictorily brings about growth of uterine mucosa. Secretion of progesterone stimulates it in size, which is now ready to receive the fertilized ovum. If fertilization does not take place, the excess of uterine mucosa is carried away in the form of menstrual cycle. If fertilization occurs, then instead of undergoing degeneration, it has to perform following functions -

① Embryo formation