

Embryology

Is the study of the early development of living organisms

Aim of reproduction in animal or plants : to insure the survival of their kind

Reproduction

Asexual •

A single organism splits, buds or fragments to give rise to two or more individuals

Sexual

Fusion of two gametes male gametes or sperm with female gametes or egg (haploid) to form zygote with doubled number of chromosomes $2N$ (diploid)

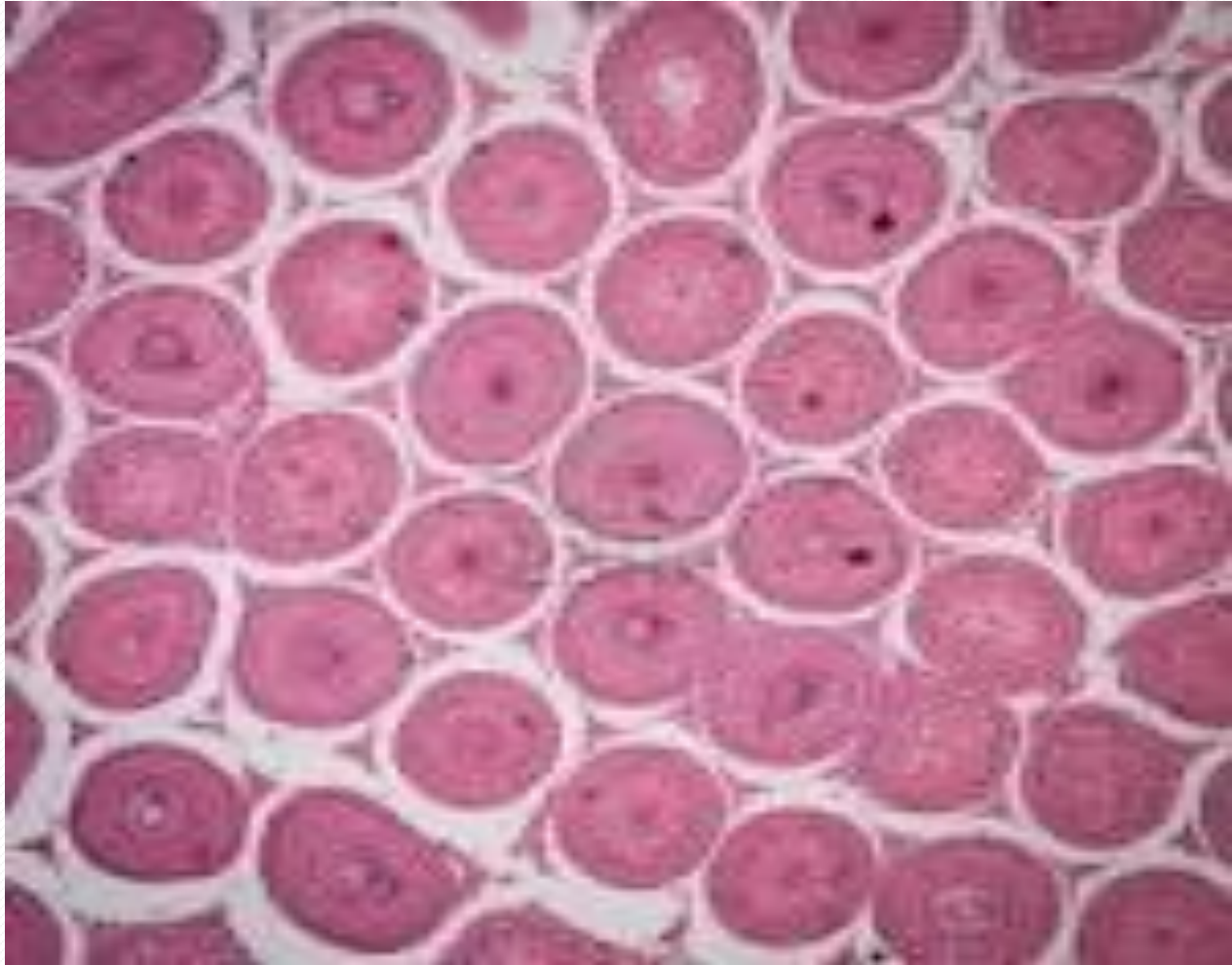
Gametogenesis

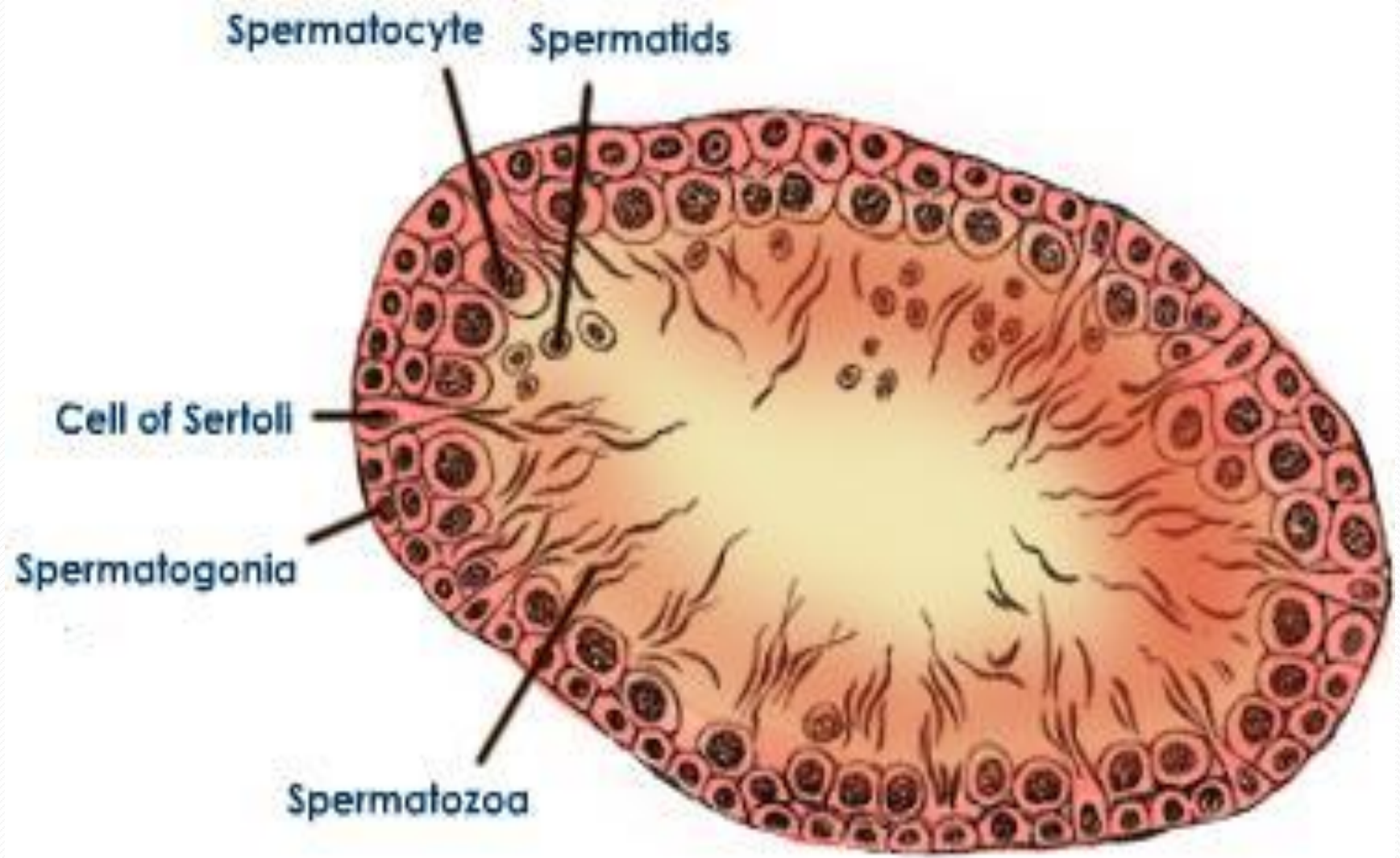
```
graph TD; A[Gametogenesis] --> B[Spermatogenesis]; A --> C[Oogenesis];
```

Spermatogenesis ●

Oogenesis ●

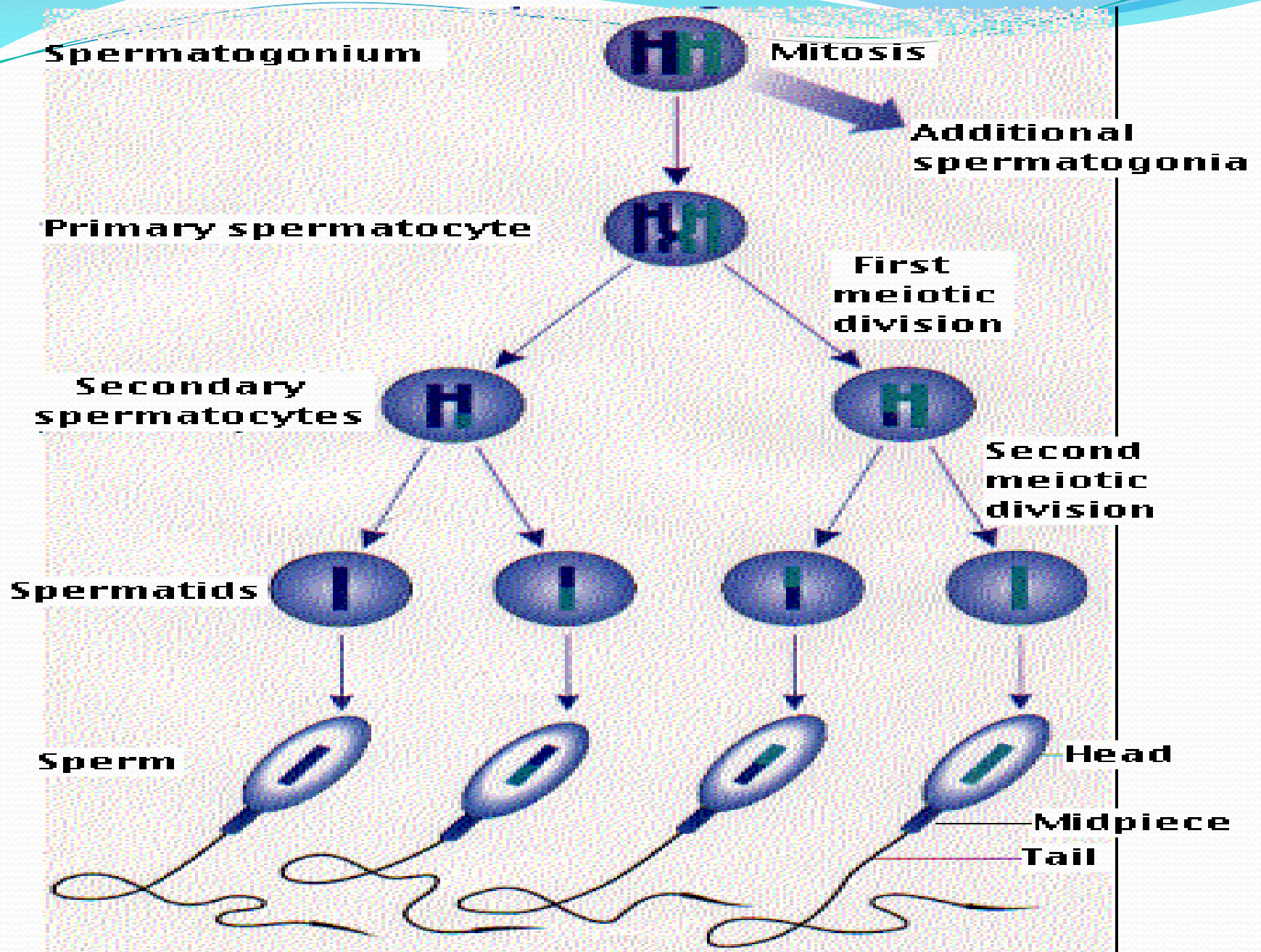
Somniferous tubules





Spermatogenesis

- **Multiplication**: repeated mitotic divisions to produce a large no. of spermatogonia ($2N$)
- **Growth**: primary spermatocytes $2N$
- **Maturation**: meiosis (1^{st} and 2^{nd} mitotic division)



Primordial germ cell in embryo

Mitotic divisions

Spermatogonial stem cell

$2n$

Mitotic divisions

Spermatogonium

$2n$

Mitotic divisions

Primary spermatocyte

$2n$

Meiosis I

Secondary spermatocyte

n

n

Meiosis II

Early spermatid

n

n

n

n

Differentiation (Sertoli cells provide nutrients)

Sperm

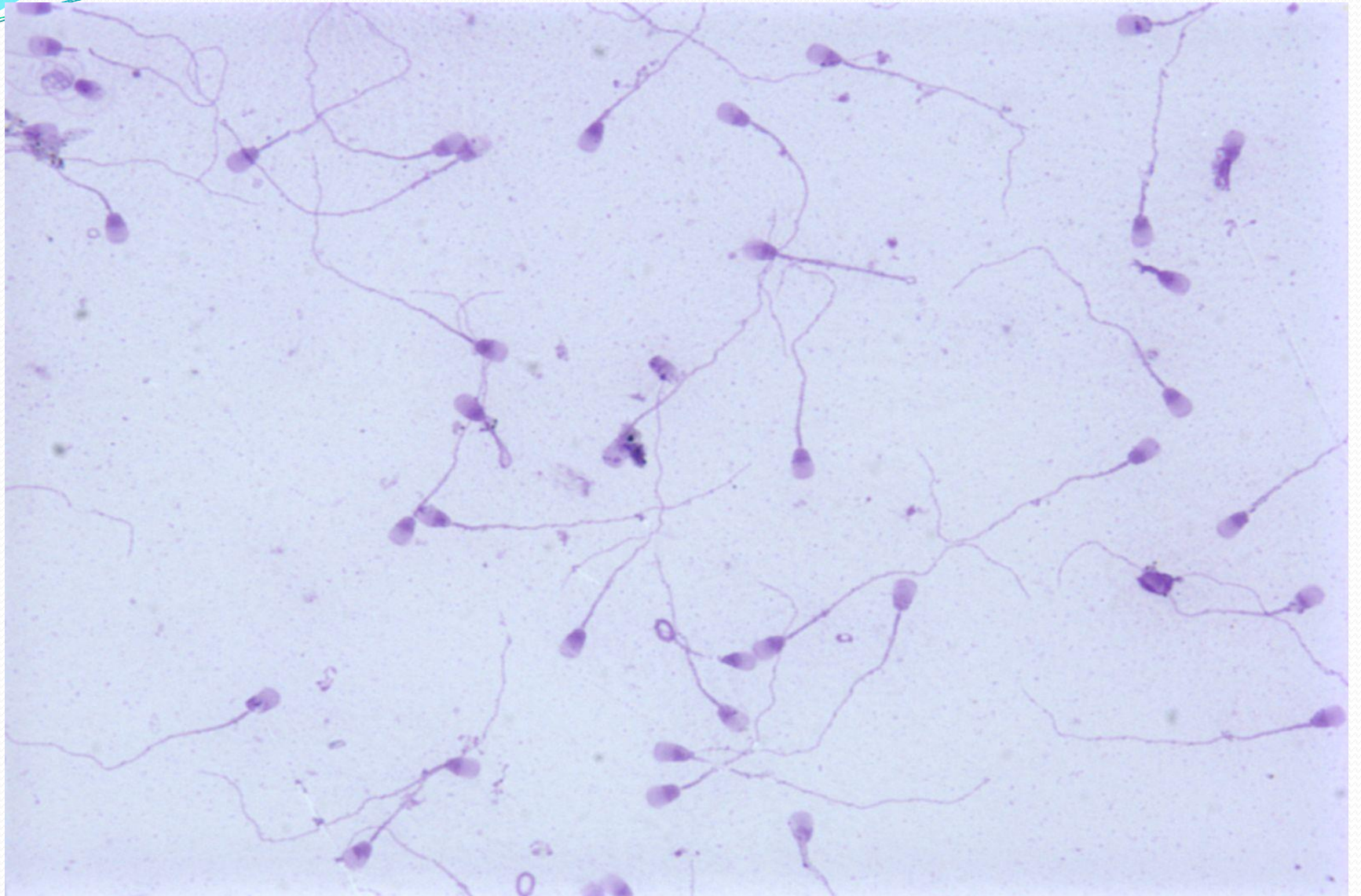
n

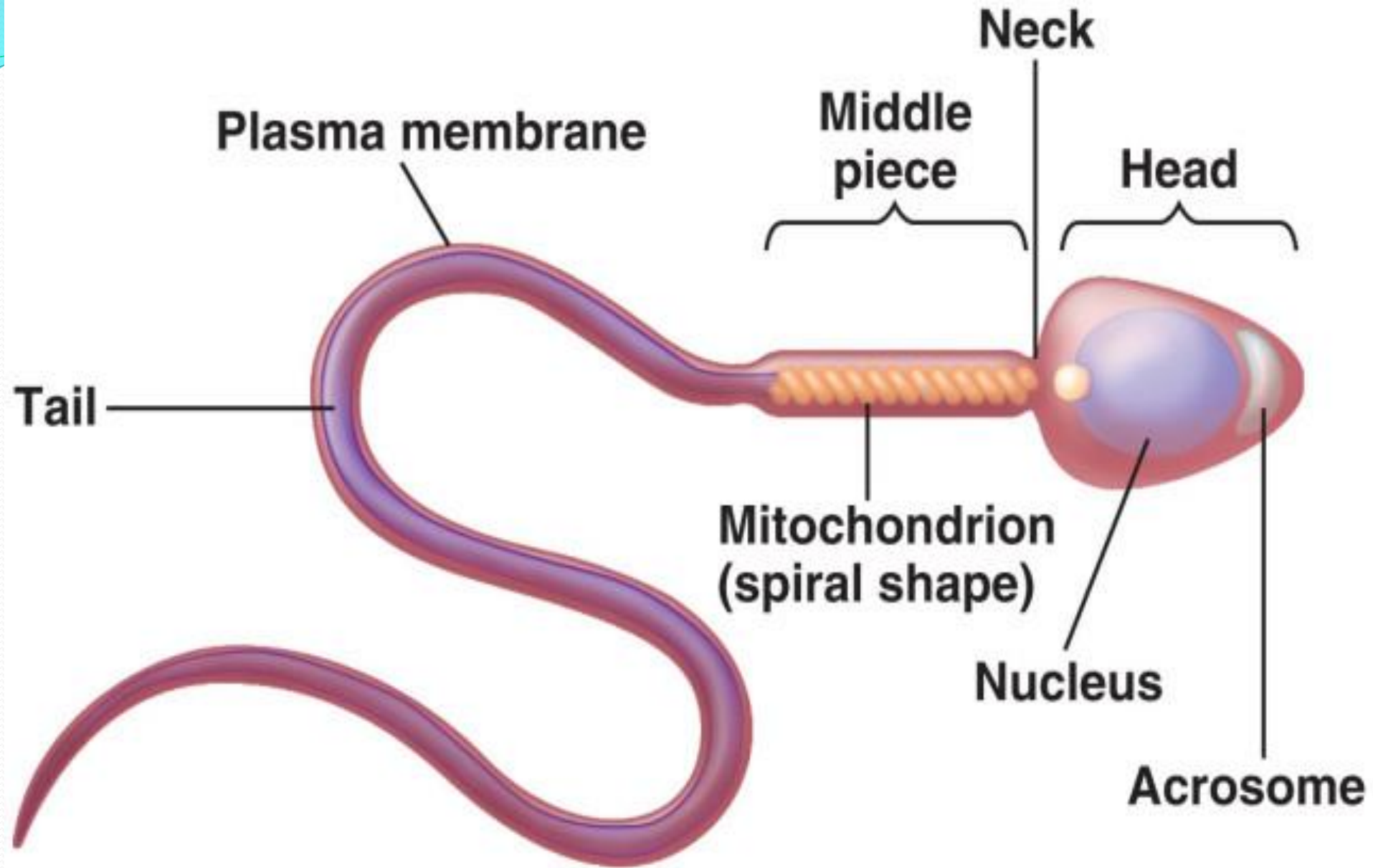
n

n

n

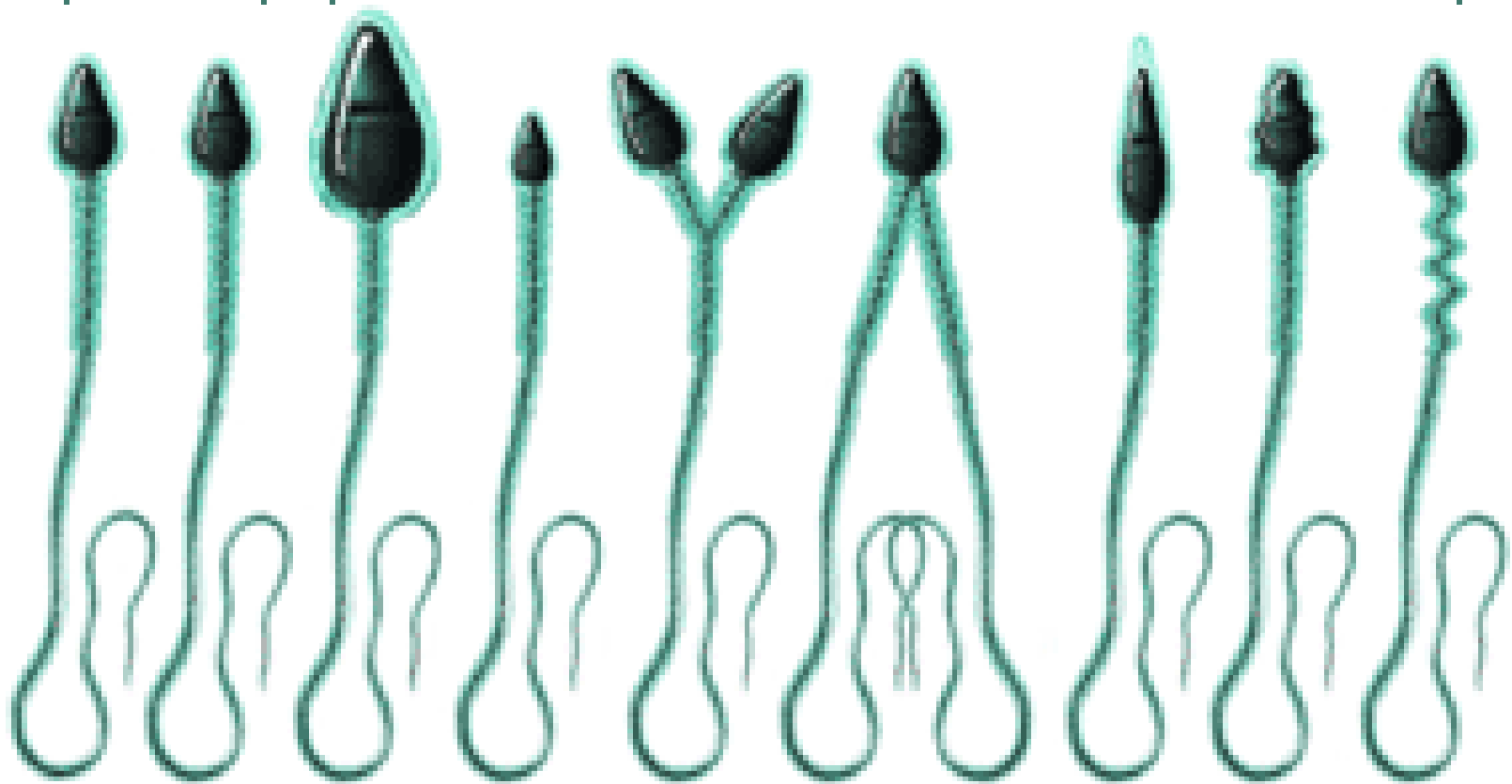




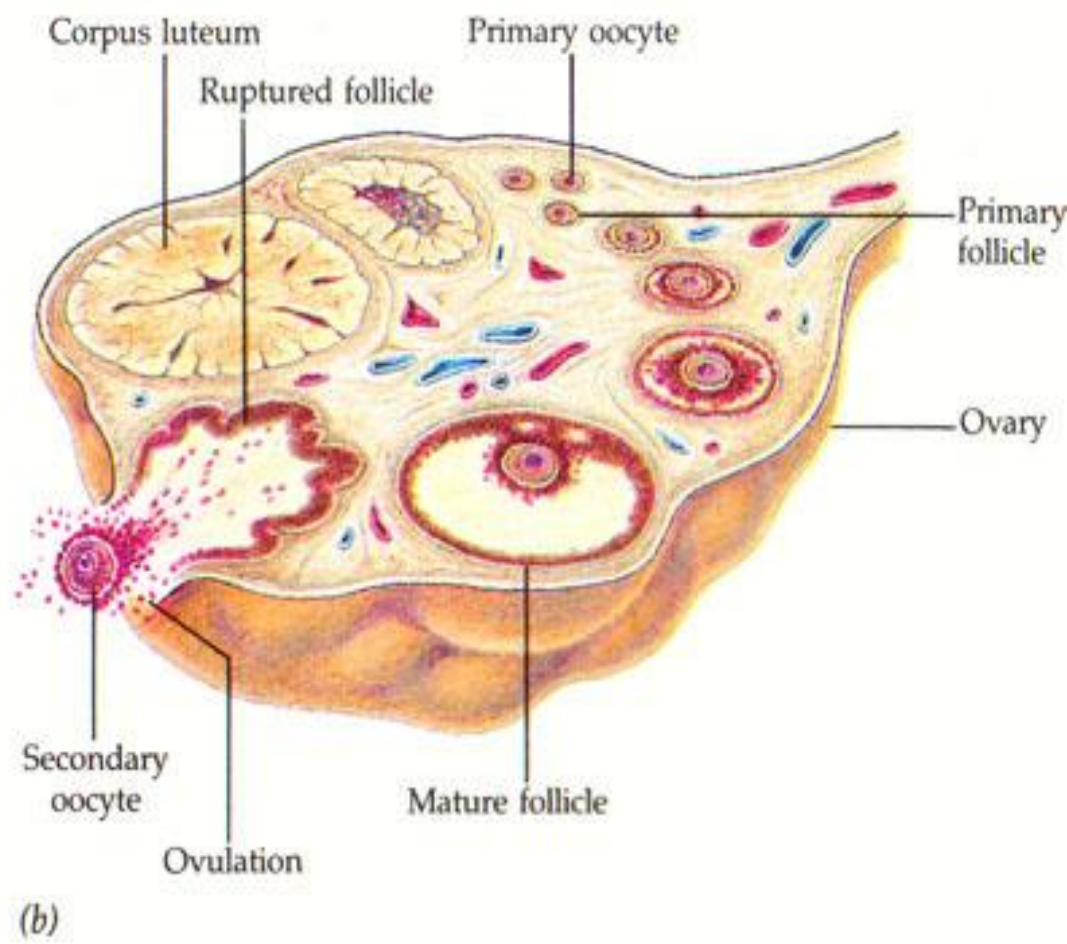
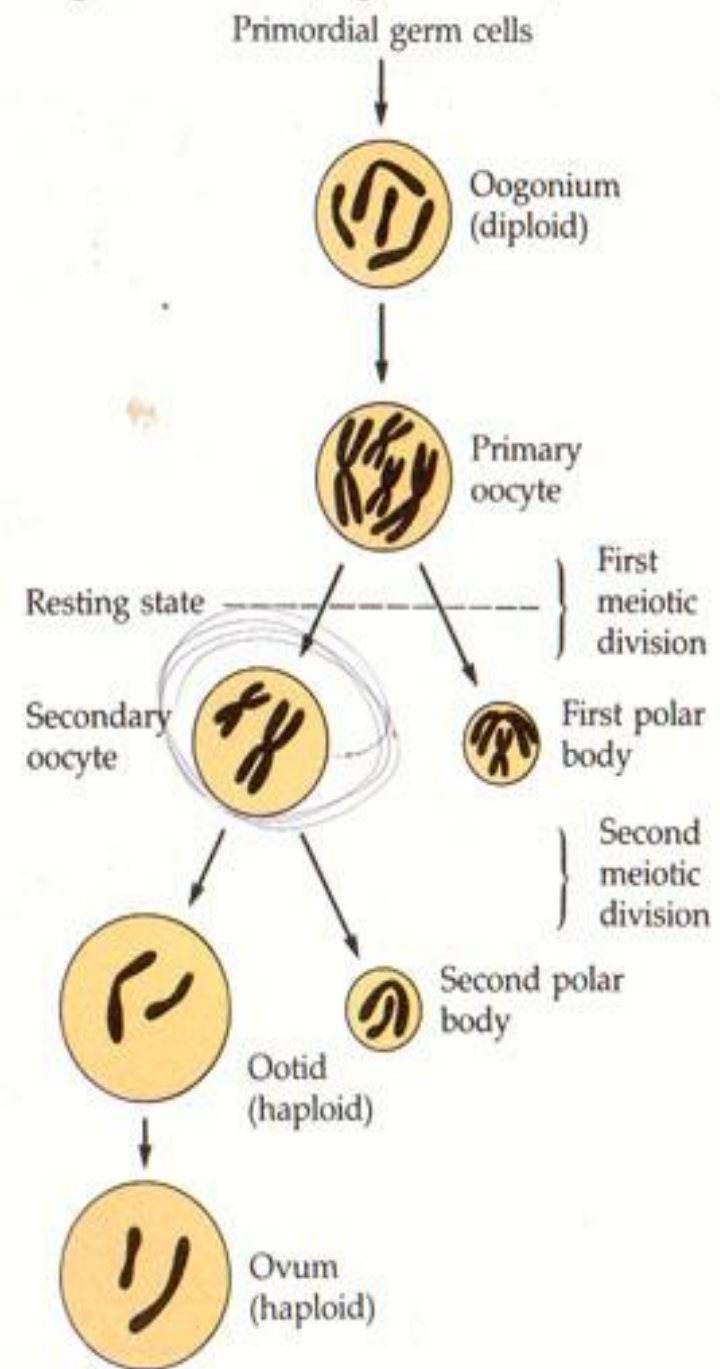


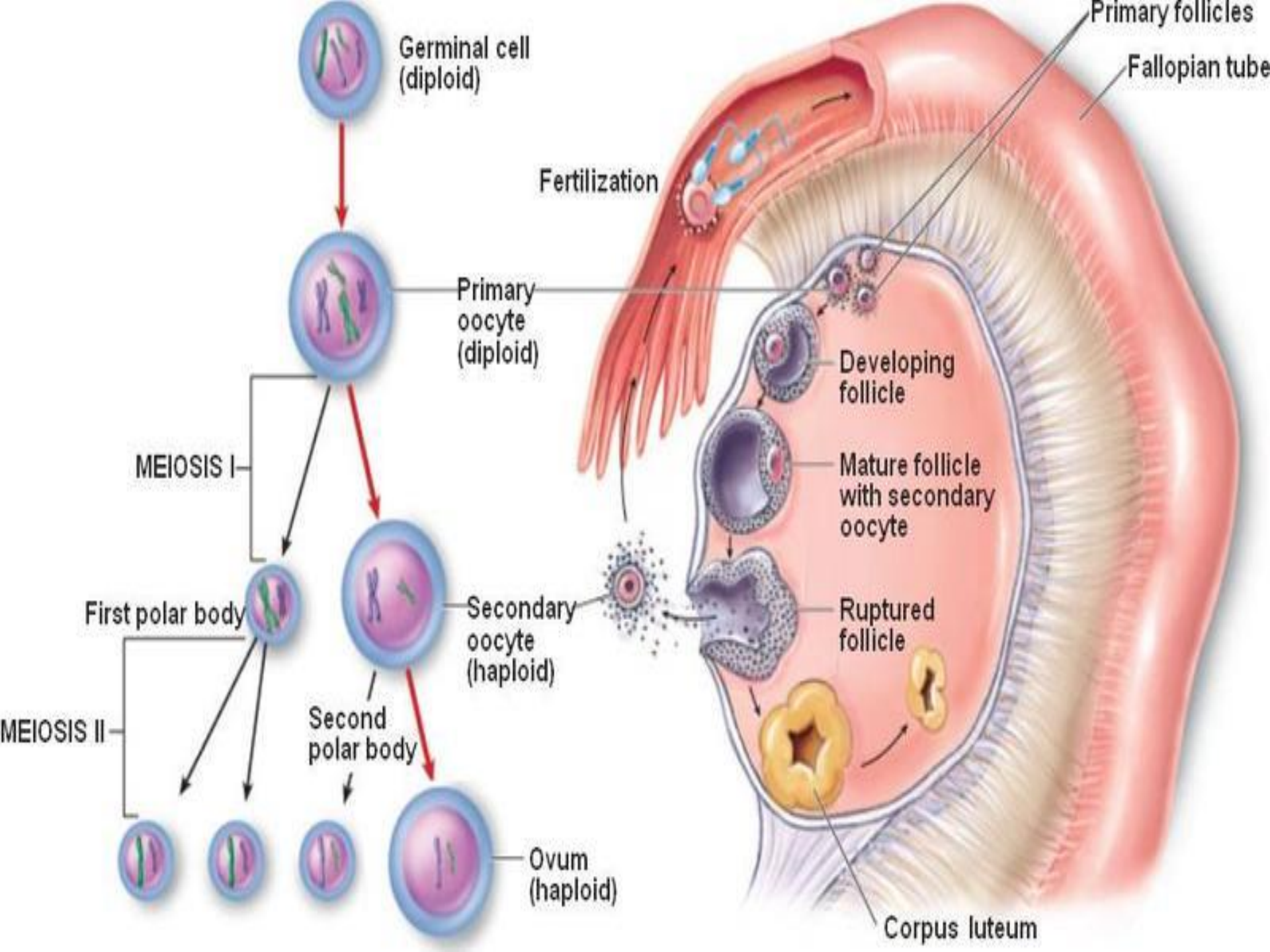
Normal

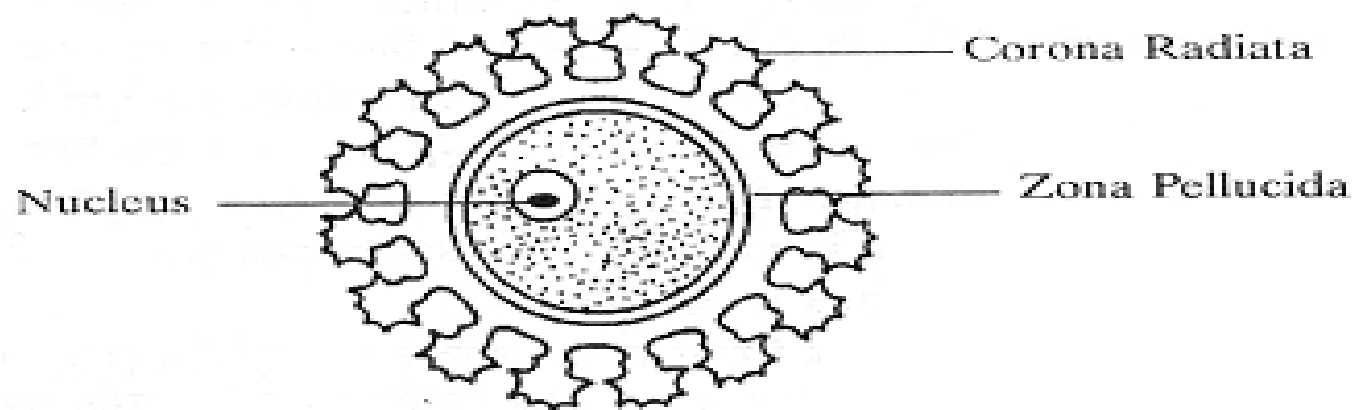
Abnormal



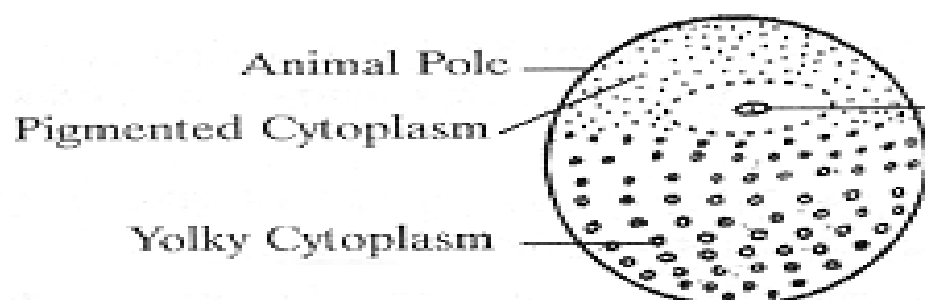
Oogenesis (Figure 42.14)



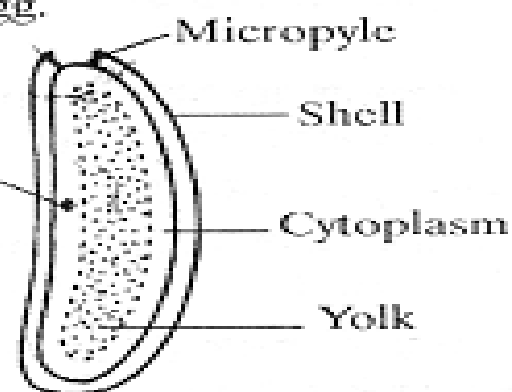




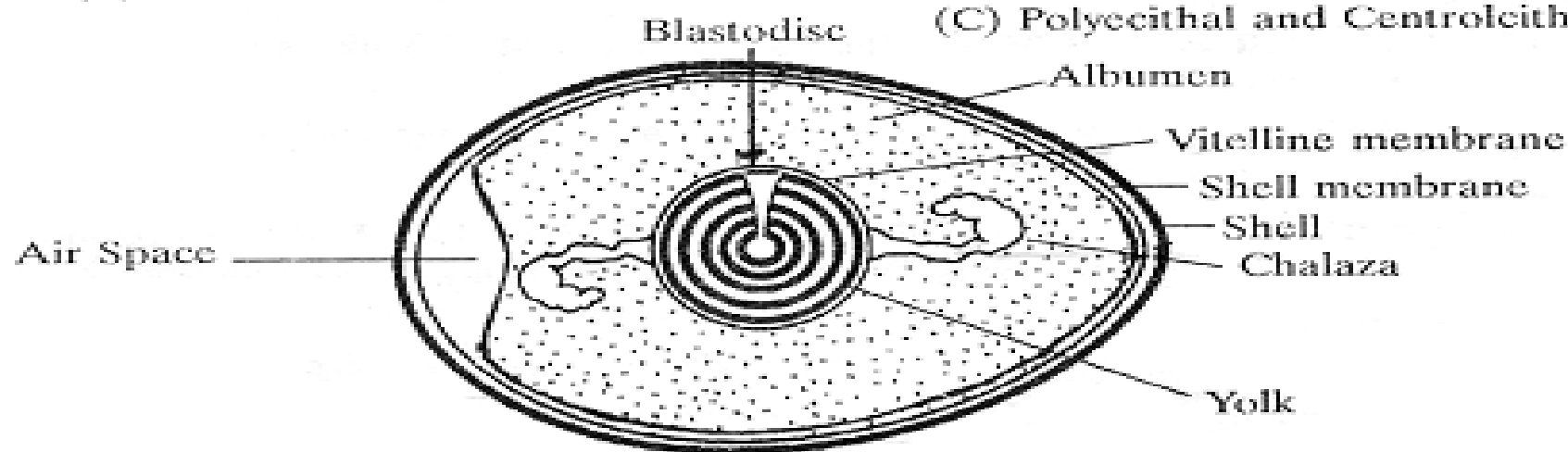
(A) Microlecithal and Isolecithal Egg.



(B) Mesolecithal and Telolecithal Egg.



(C) Polyeccithal and Centrolecithal Egg.



(D) Macrolecithal and Telolecithal Egg.

Following diagrams illustrate types of eggs according to above criteria.

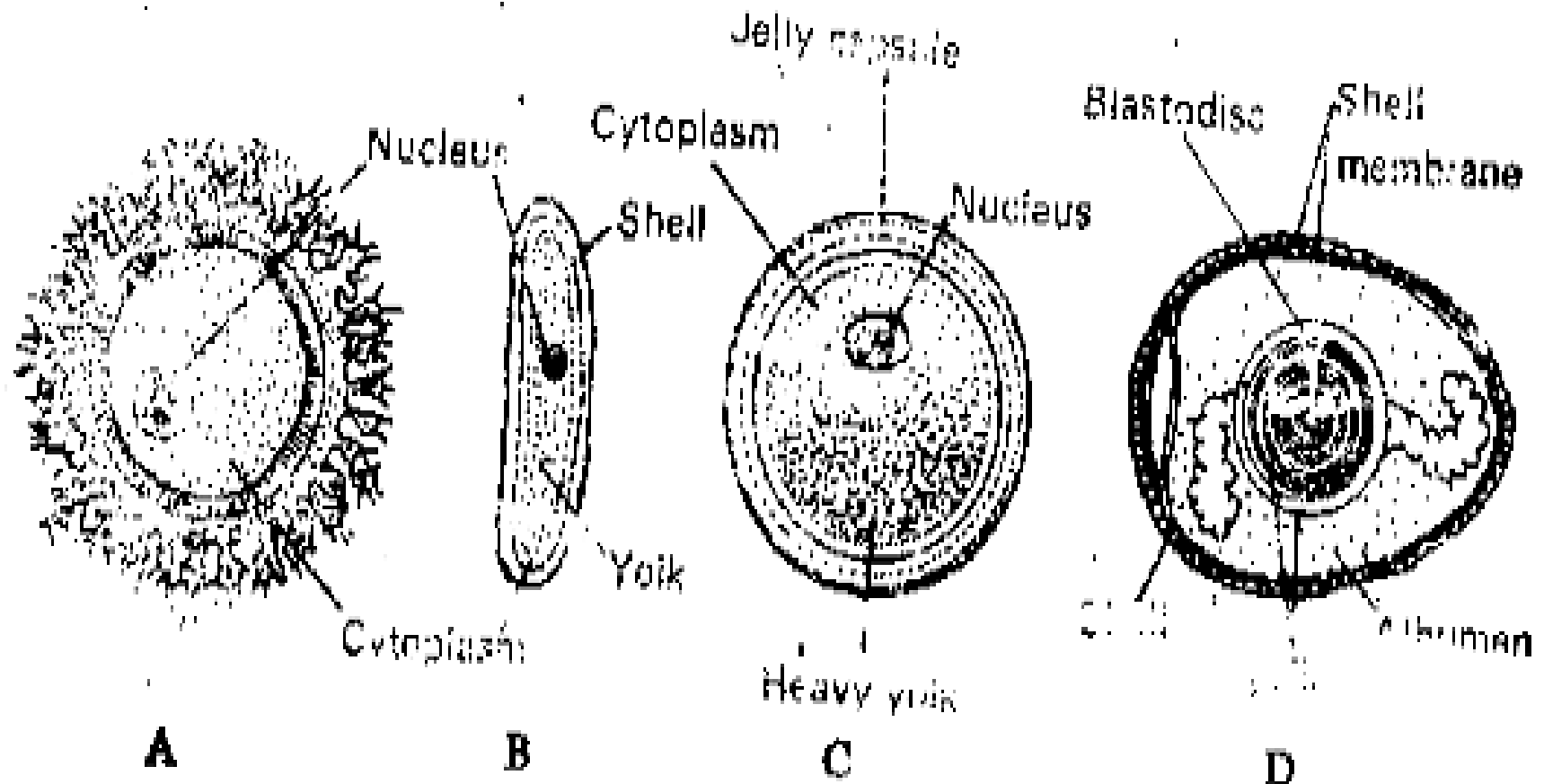
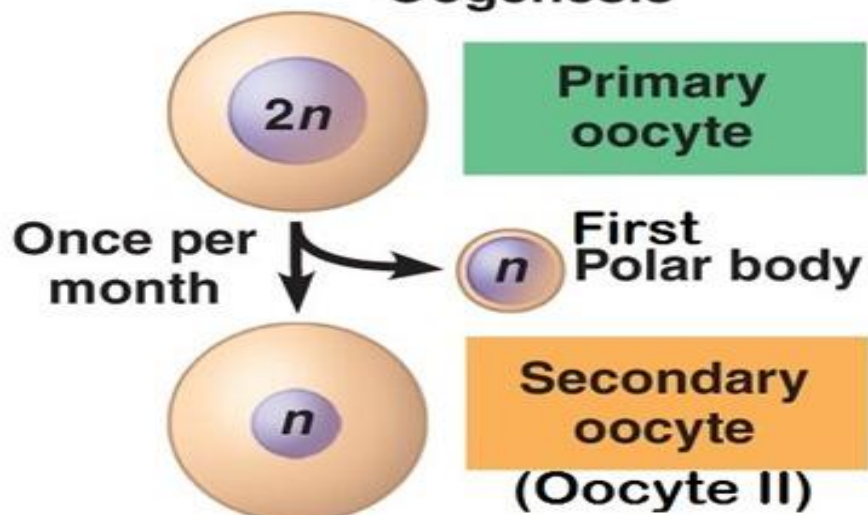


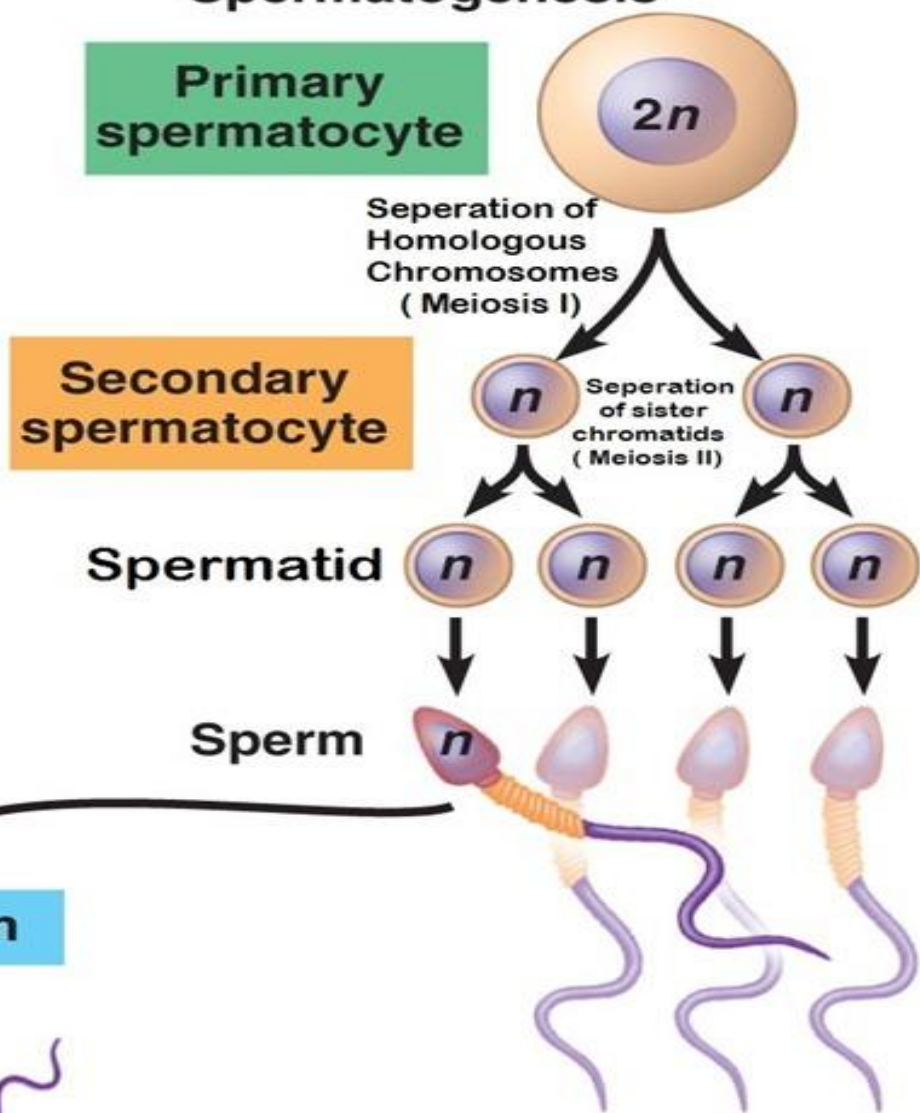
Fig. 36.4 Types of eggs

A = Microlecithal or almost alecithal (mammals); **B = Centrolecithal** (insects); **C = Mesolecithal** (amphibians); **D = Highly telolecithal** (birds).

Oogenesis



Spermatogenesis



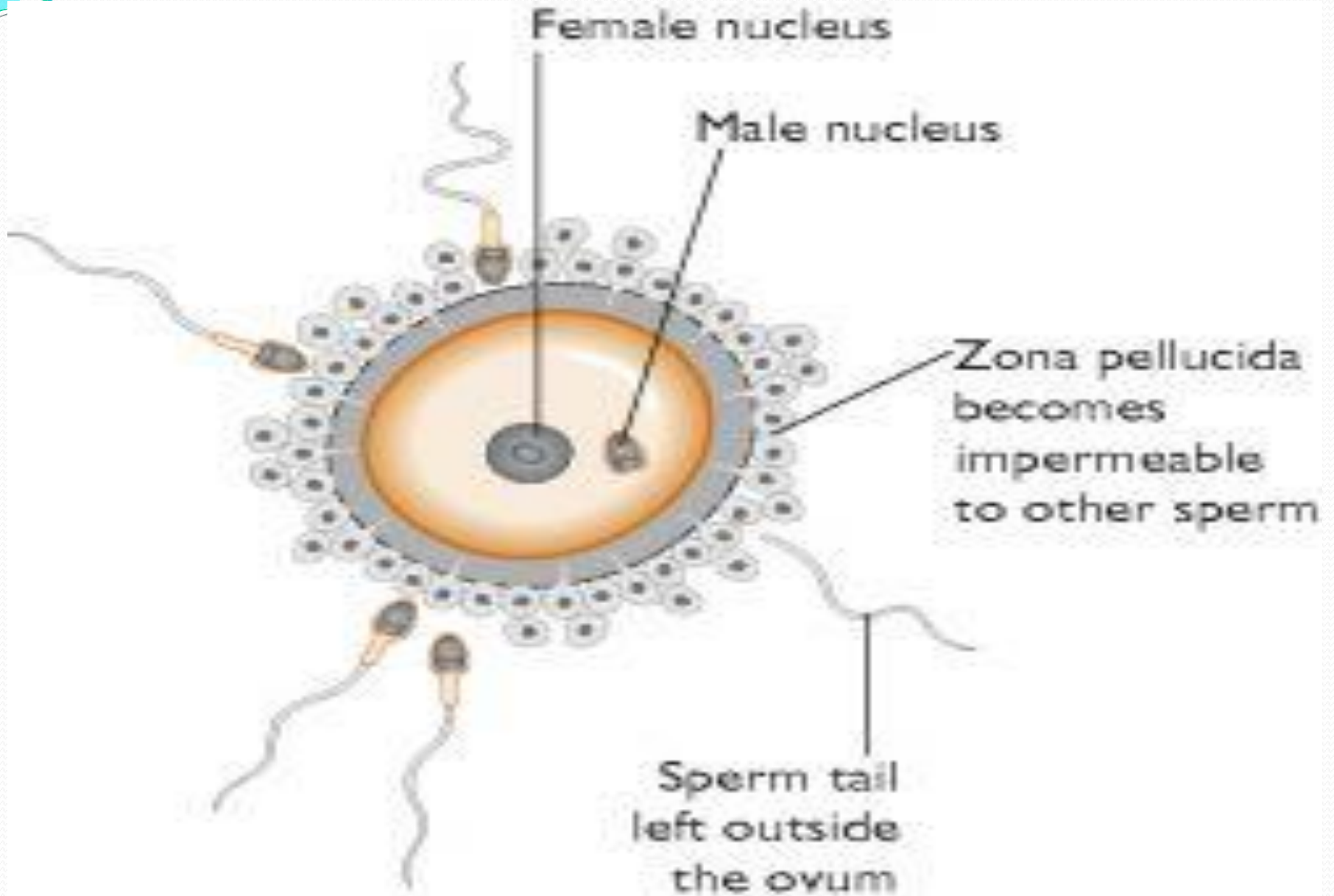
Fertilization

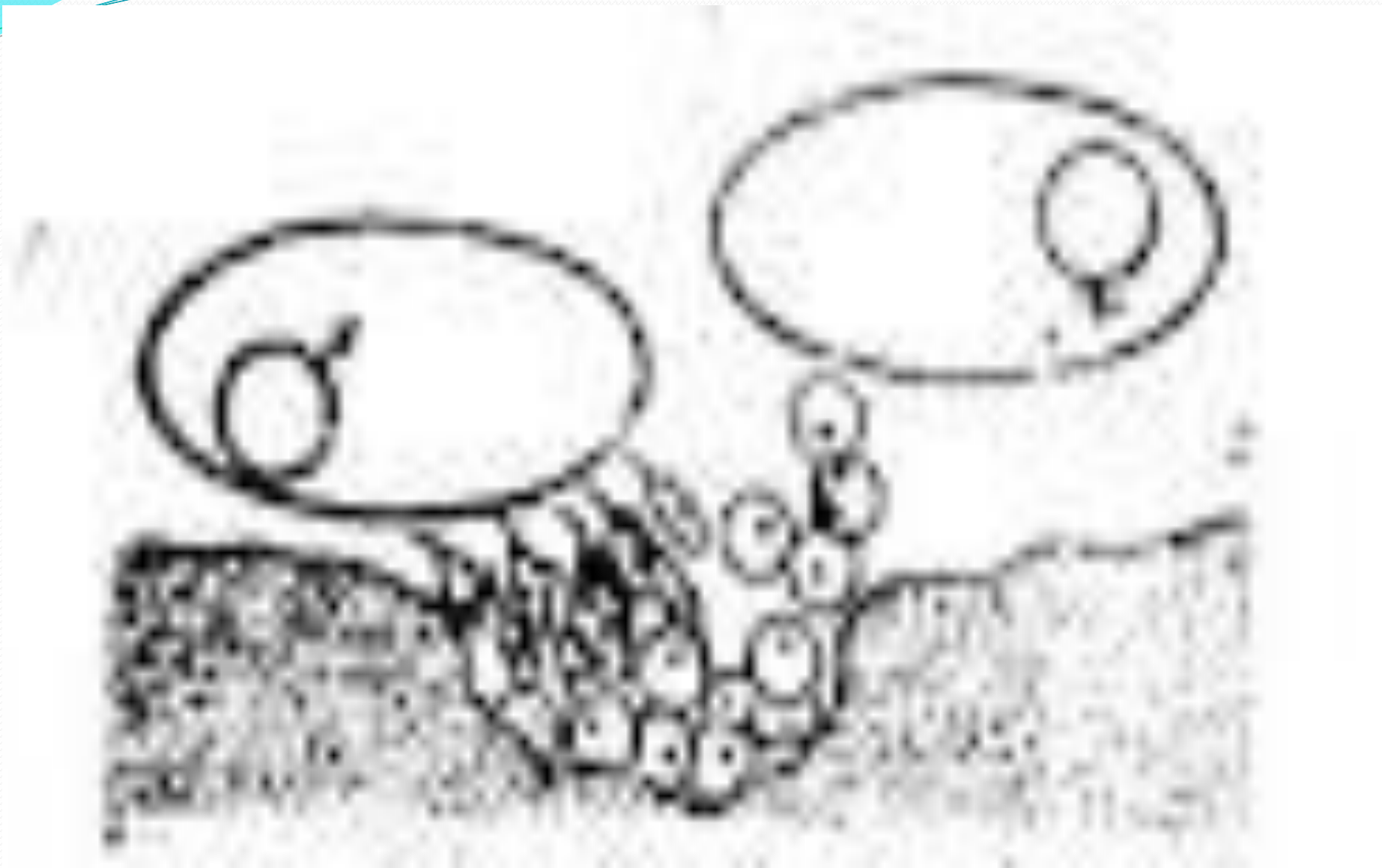
Second Polar body (n)

The first polar body also divides into 2 new polar bodies

Ootid --> Ovum

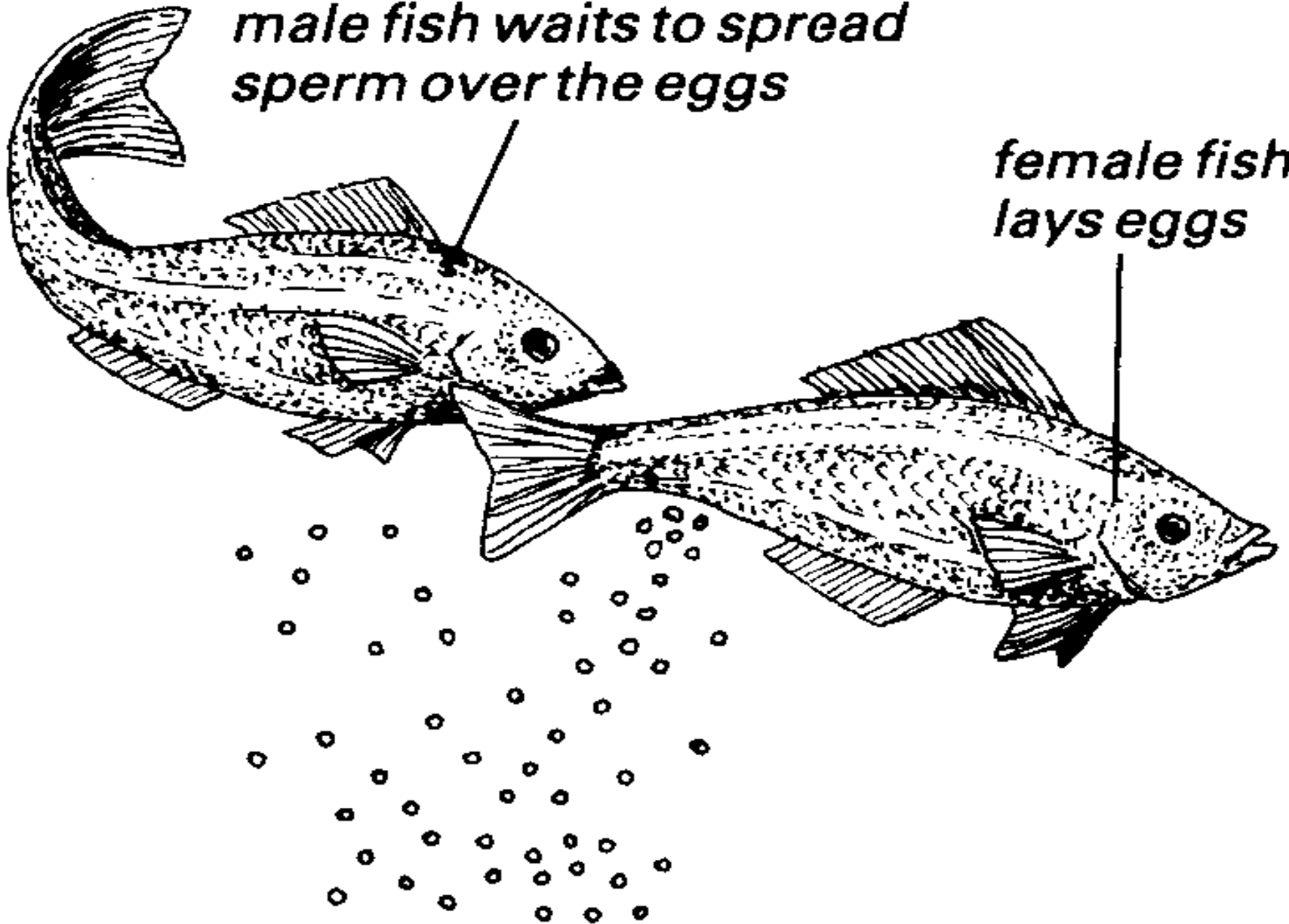




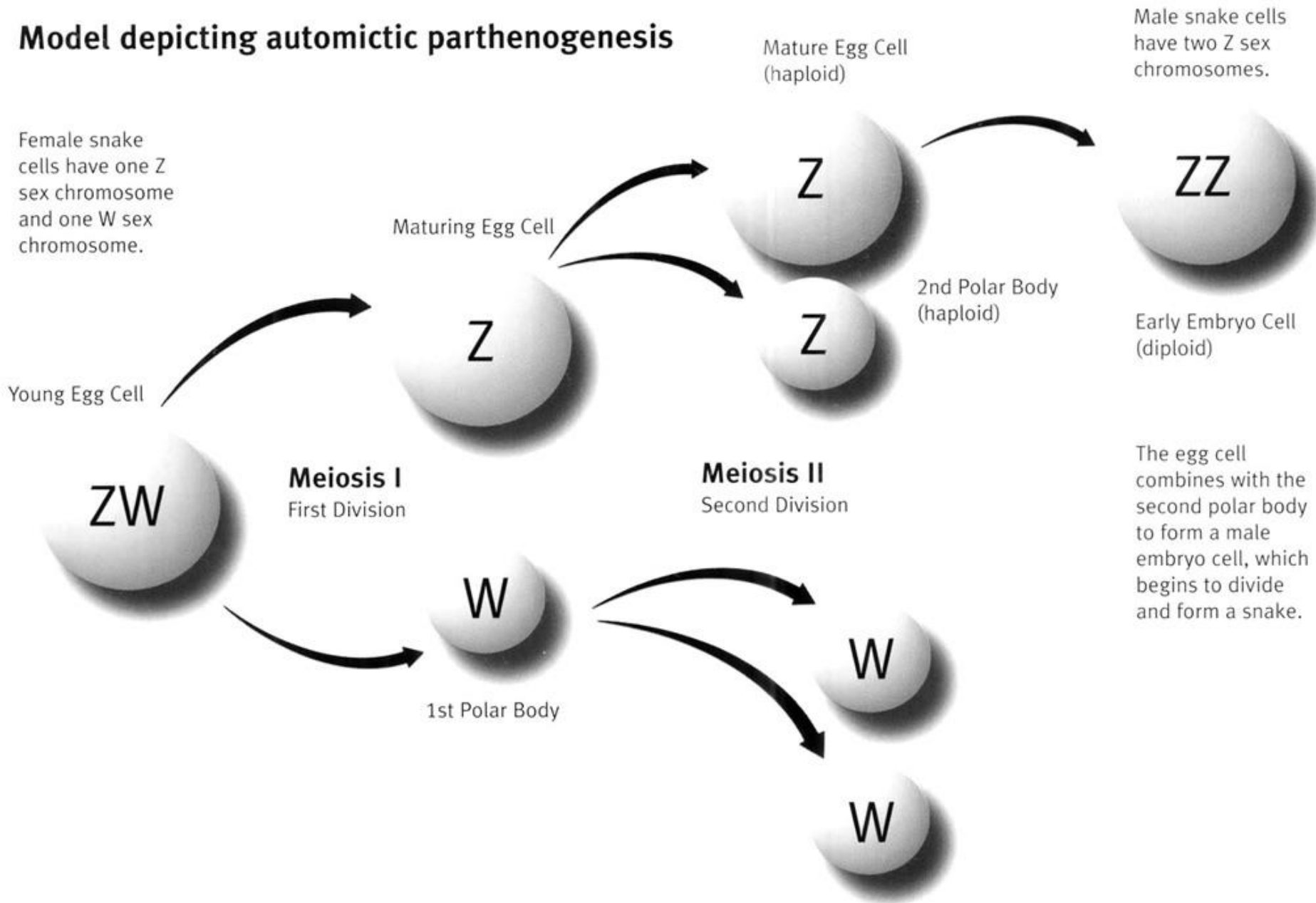


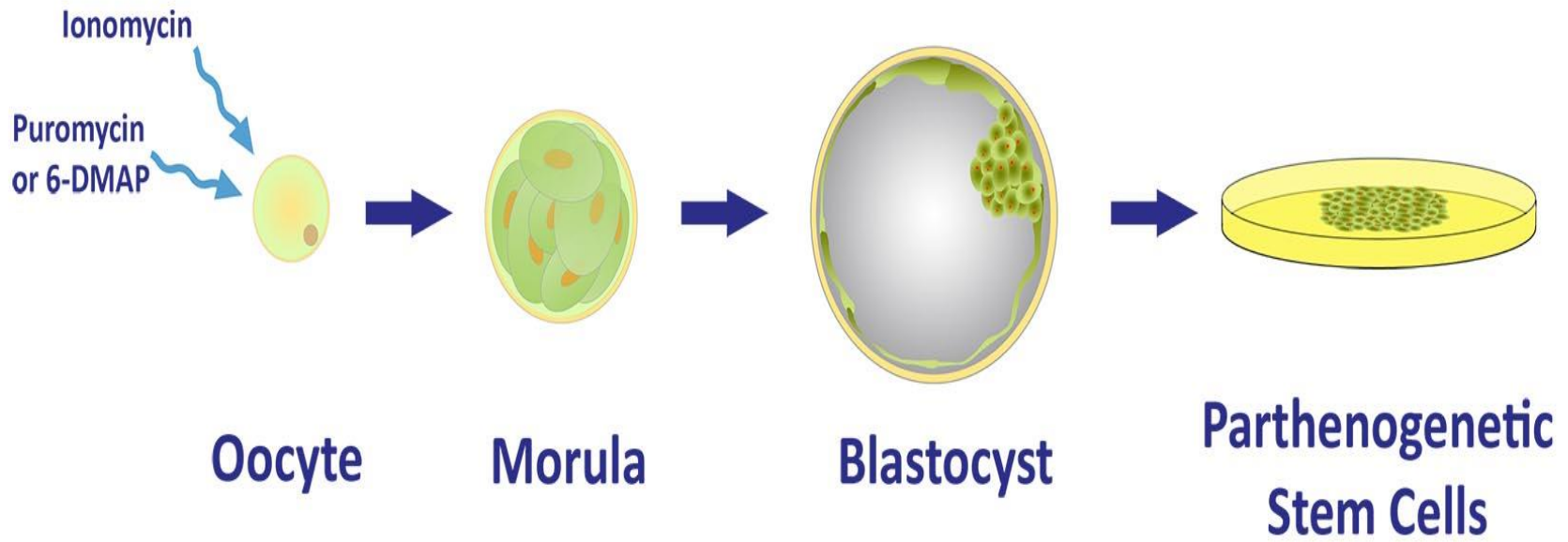
**male fish waits to spread
sperm over the eggs**

**female fish
lays eggs**



Model depicting automictic parthenogenesis





PARTHENOGENESIS

