EROH VIVIAN OGHENERABOME

18/MHS01/150

Ovulation

This is the release of an oocyte from the ovarian follicle.In a few days before ovulation, under the influence of **FOLLICLE STIMULATING HORMONE** and **LUTEINIZING HORMONE**, the secondary follicle grows rapidly to a diameter of about 25 mm to become mature vesicular/ mature secondary or Graafian follicle Coincident with final development of the vesicular follicle, there is an abrupt increase in LH that causes;

1. the primary oocyte to complete meiosis I
2. and the follicle to enter the preovulatory mature vesicular stage

Meiosis II is also initiated, but the secondary oocyte is arrested in metaphase approximately 3 hours before ovulation

In the meantime, the surface of the ovary begins to bulge locally, and at the apex, an avascular spot, the stigma, appears

For the oocyte to be released, 2 events occur which are caused by LH surge:

I. it increases **collagenase activity**, resulting in **digestion of collagen fibers** (connective tissue) surrounding the follicle

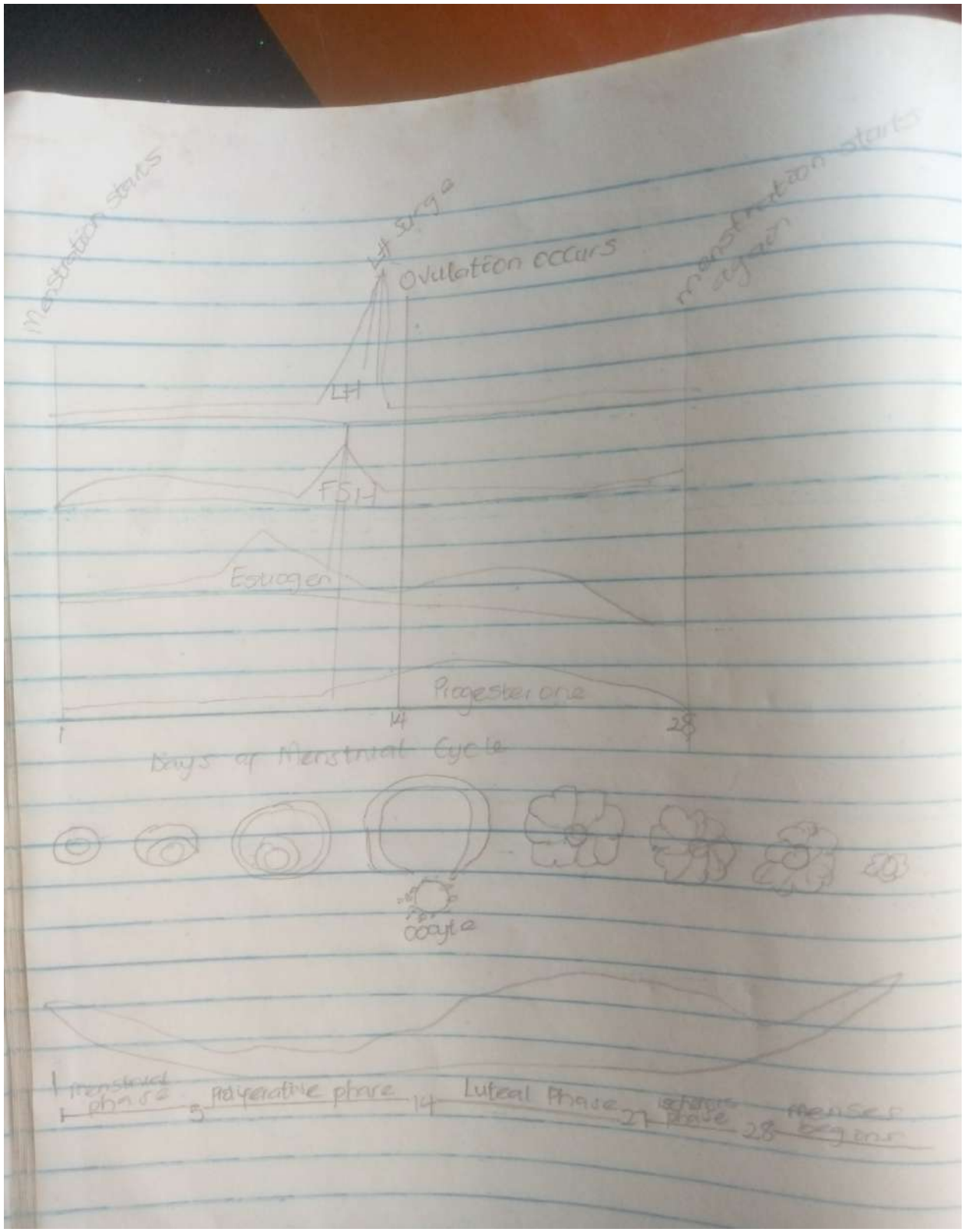
II. Prostaglandin levels also increase in response to the LH surge and cause local muscular contractions in the ovarian wall

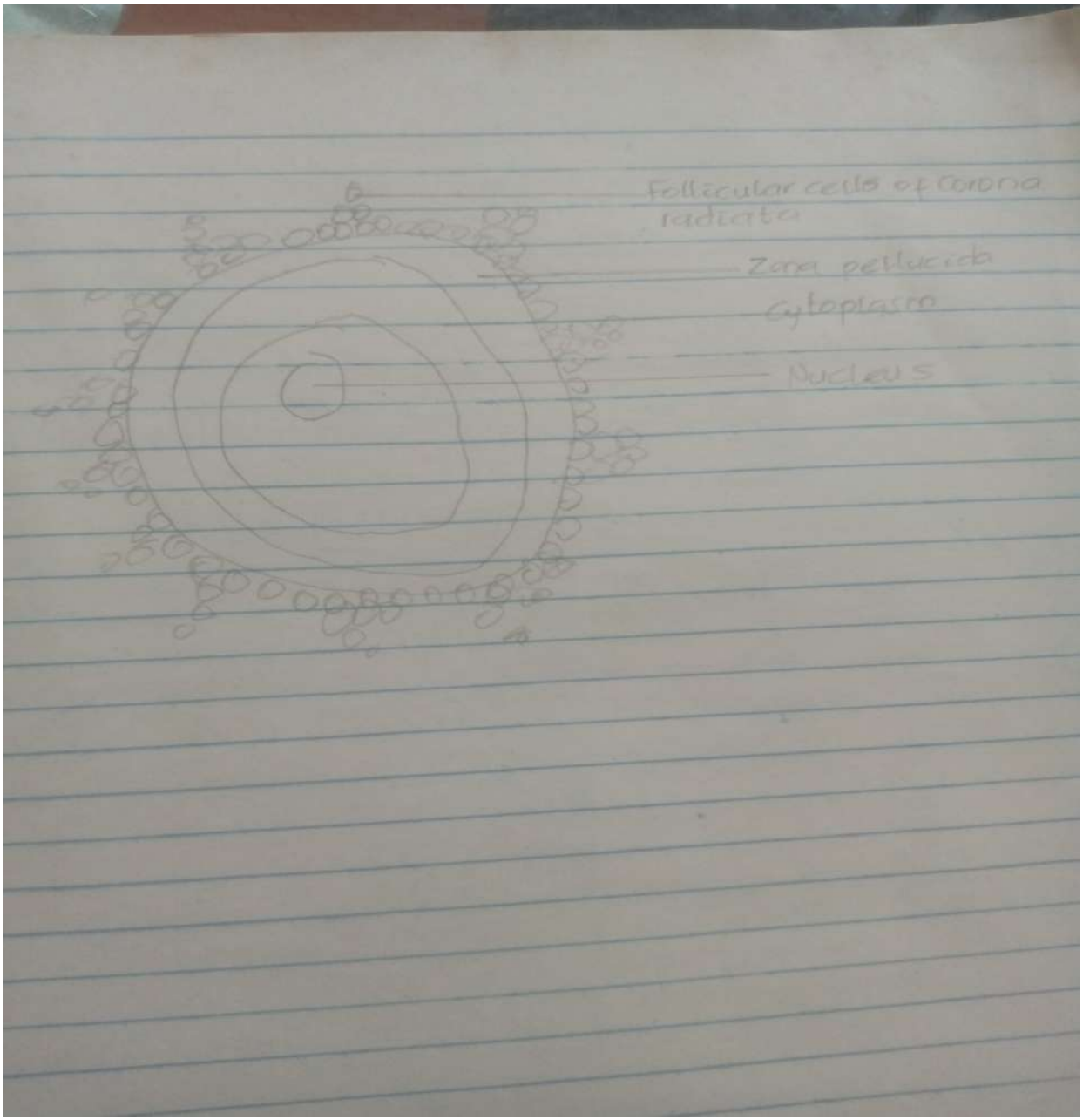
Those contractions extrude the oocyte, which together with its surrounding follicular (granulosa) cells from the region of the cumulus oophorus, this causes **ovulation in which oocyte floats out of the ovary.**

Some of the cumulus oophorus cells then rearrange themselves around the zona pellucida to form the **corona radiata**

❖ **Note:**

- Ovulation is triggered by a surge of LH *productions*
- Ovulation usually follows the LH peak by 12 to 24 hours
- *The* **LH surge**, elicited by the high estrogen level in the blood, appears to cause the stigma to balloon out, forming a vesicle


Menstruation starts
LH surge
Ovulation occurs
menstruation starts again
LH
FSH
Estrogen
Progesterone
1
14
28
Days of Menstrual Cycle
oocyte
Menstrual phase
5
Proliferative phase
14
Luteal Phase
21
Secretory Phase
28
menses begins



Clinical correlates

- Mittelschmerz may be used as a symptom of ovulation, but there are better symptoms, such as the slight drop in basal body temperature
- Some women fail to ovulate, this is called **anovulation**, because of a low concentration of gonadotropins
  - In these cases, administration of an agent to stimulate gonadotropin release

and hence ovulation can be employed

Although such drugs are effective, they often produce multiple ovulations, so that the risk of multiple pregnancies is 10 times higher in these women than in the general

2. Differentiate between meosis1 and meiosis2

Meiosis is the cell division that takes place in the germ cells to generate male and female gametes. We have meiosis 1 and meiosis 2.

Meiosis 1;

Prophase 1

Metaphase 1

Anaphase 1

Telophase 1

In prophase 1, chromatin condenses into chromosomes

Nucleolus dissolves

Nuclear membrane is disassembled

And spindle apparatus forms. Major events that takes place in prophase 1;

i. Synapsis of 46 homologous duplicated chromosome

ii. Crossing over of 46 homologous duplicated chromosome

iii. Chiasma formation.

In Anaphase 1, centromere do not split

At the end of telophase 1, two secondary gametocytes is formed.

WHILE

MEIOSIS 2

In prophase 2;

Nuclear membrane dissolves

Spindle fibers form

No synapsis

No crossing over

No chiasma formation

In Anaphase 2, centromere split

At the end of telophase 2,four gametes are formed (1n)

3. DISCUSS THE STAGES OF FERTILIZATION

Fertilization; This is the union of the sperm and oocyte, which takrs place at the ampulla of the uterine tube. The fertilization process takes approximately 24 hours

It is a sequence of coordinated events which include the following stages

I Passage of a sperm through the corona radiata: For sperms to pass through the corona radiata, they must have been capacitated (removal of the glycoprotein coat and seminal plasma proteins from the plasma membrane that

overlies the acrosomal region of the spermatozoa)

II. Penetration of the zona pellucida: The zona is a glycoprotein shell surrounding the egg that facilitates and maintains sperm binding and induces the acrosome reaction. The intact acrosome of the sperm binds with a zona glycoprotein (ZP3/ zona protein 3) on the zona pellucida

- Release of acrosomal enzymes (acrosin) allows sperm to penetrate the zona pellucida, thereby coming in contact with the plasma membrane of the oocyte
- As soon as the head of a sperm comes in contact with the oocyte surface, the permeability of the zona pellucida changes
- When a sperm comes in contact with the oocyte surface, lysosomal enzymes are released from cortical granules lining the plasma membrane of the oocyte
- In turn, these enzymes alter properties of the zona pellucida to :

✓ prevent sperm penetration and

✓ inactivate binding sites for spermatozoa on the zona pellicida surface

- only one sperm seems to be able to penetrate the oocyte

III. Fusion of plasma membranes of the oocyte and sperm

- The plasma or cell membranes of the oocyte and sperm fuse and break down at the area of fusion
- The head and tail of the sperm enter the cytoplasm of the oocyte, but the sperm's plasma membrane remains behind

IV. Completion of the second meiotic division of oocyte and formation of female pronucleus

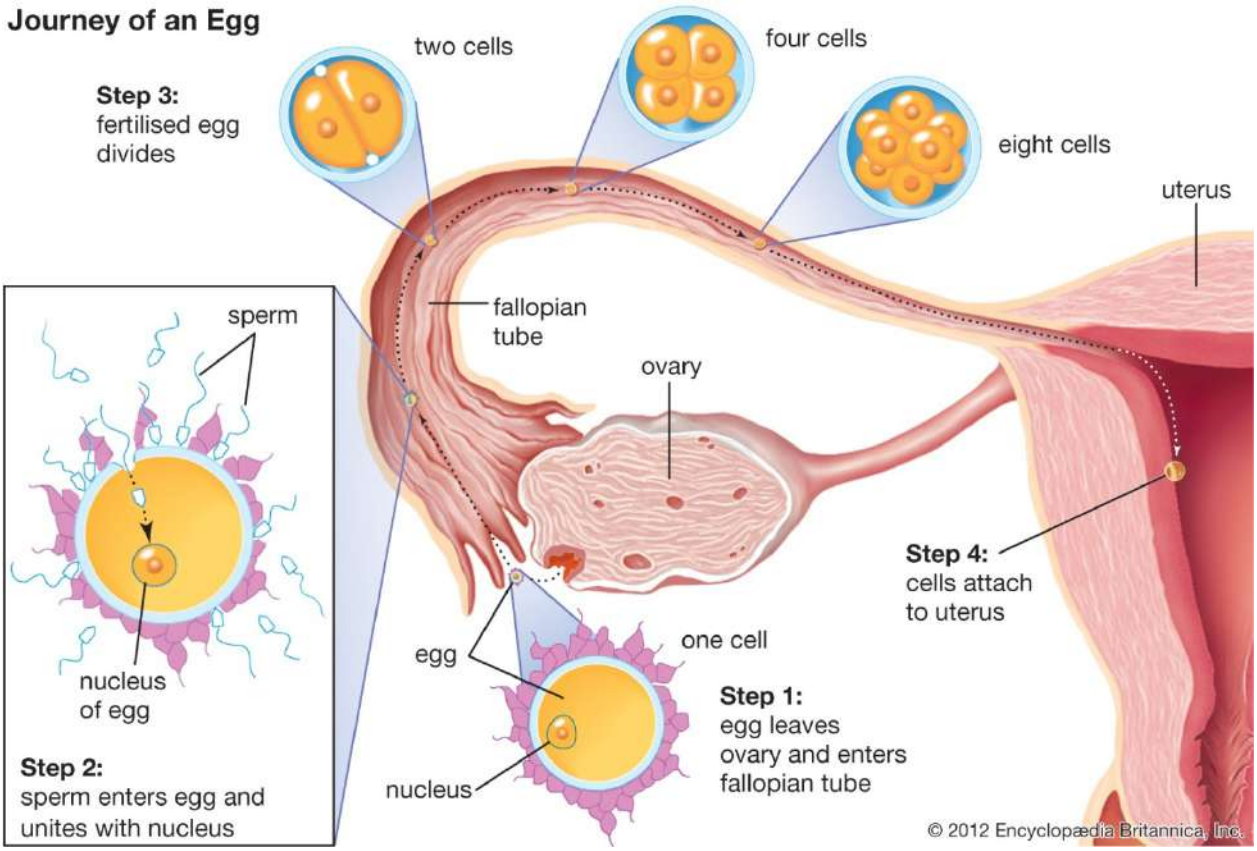
- Penetration of the oocyte by a sperm activates the oocyte into completing the second meiotic division and forming a mature oocyte and a second polar body

- The nucleus of the mature ovum/oocyte is now called the female pronucleus

V. Formation of the male pronucleus

- Within the cytoplasm of the oocyte, the nucleus of the sperm enlarges to form the male pronucleus and the tail of the sperm degenerates
- The 2 pronuclei fuse into a single diploid aggregation of chromosomes, the ootid becomes a zygote

  The chromosomes in the zygote become arranged on a cleavage spindle in preparation for cleavage of the zygote


Journey of an Egg
two cells
four cells
eight cells
Step 3:
fertilised egg
divides
uterus
fallopian
tube
ovary
sperm
nucleus
of egg
Step 2:
sperm enters egg and
unites with nucleus
Step 4:
cells attach
to uterus
one cell
egg
nucleus
Step 1:
egg leaves
ovary and enters
fallopian tube
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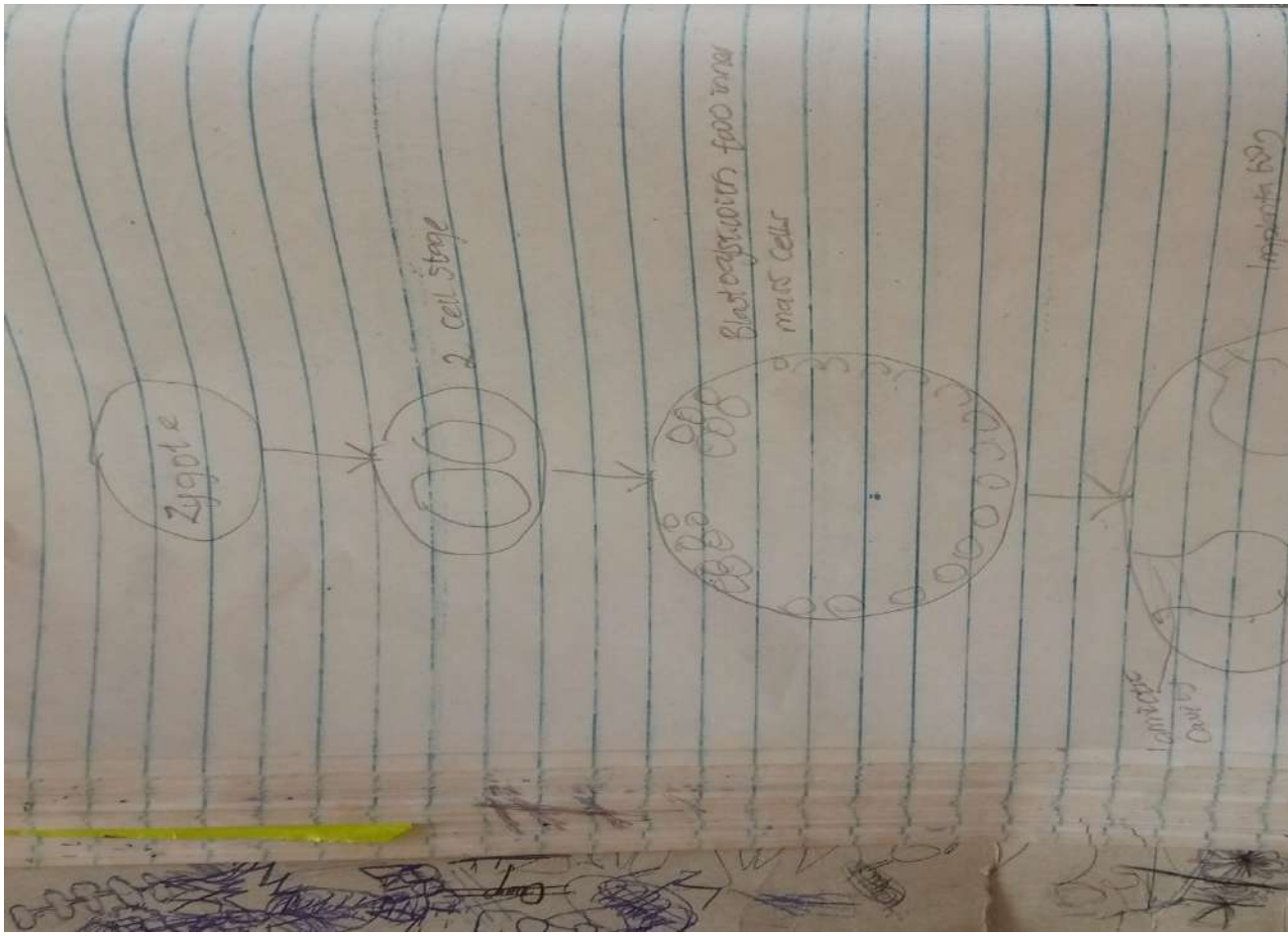
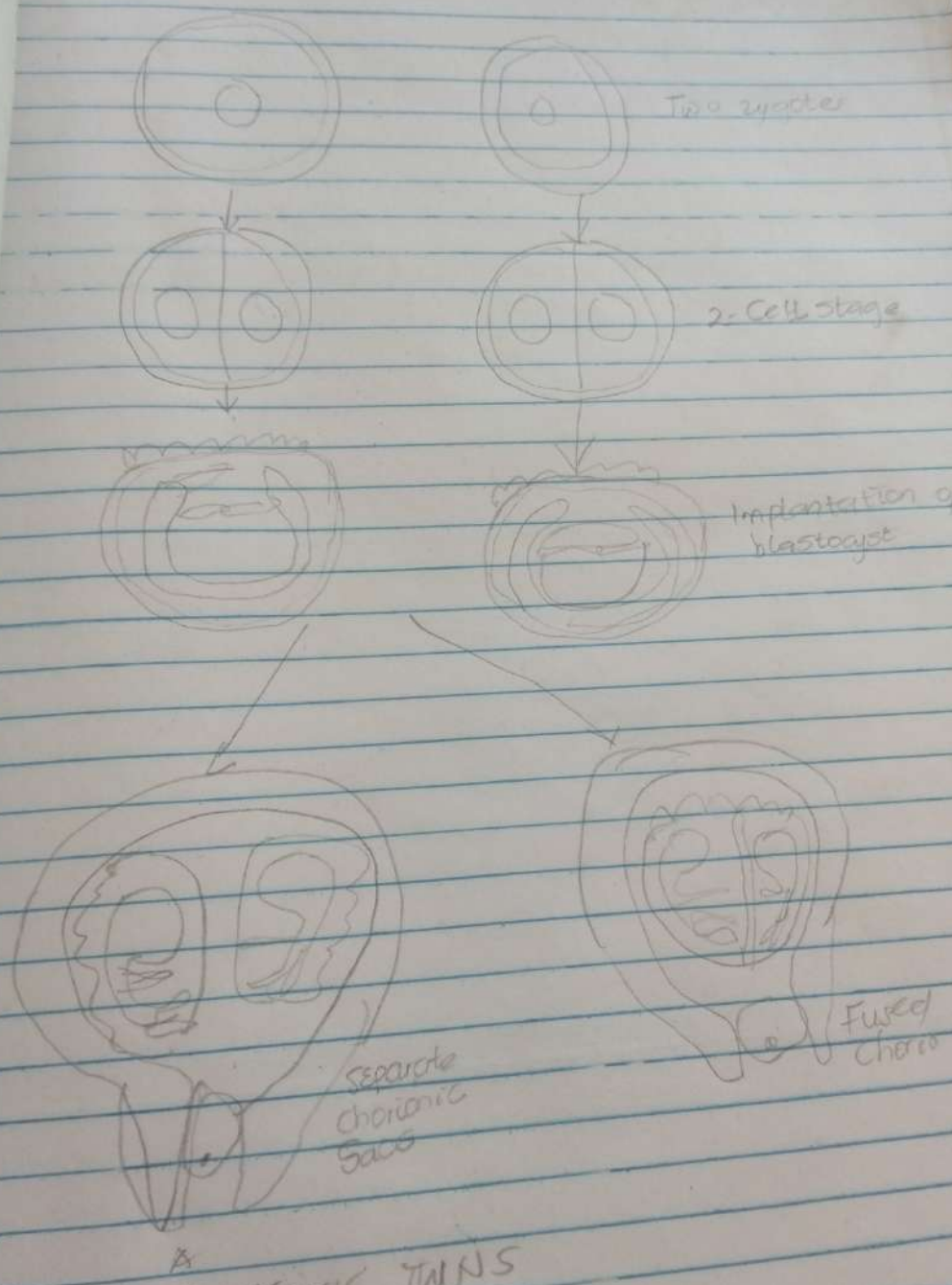
4. DIFFERENTIATE BETWEEN MONOZYGOTIC TWINS AND DIZYGOTIC TWINS

Monozygotic twins; this is as a result of the fertilization of one secondary oocyte by one sperm. The resulting blastocyst in which the inner cell mass splits into two. Therefore, monozygotic twins are genetically identical. They are of same sex. They have a common chorionic and amniotic sac, a single placenta and 2 umbilical cords.


Zygote
2 cell stage
Blastocystwith 100 inner mass cells
Implantation
Inner cell mass
Outer layer

WHILE,

DIZYGOTIC TWINS; this is as a result of fertilization of two secondary oocyte by two sperms. Dizyogotic twins are not genetically identical, they might be of different sex. The placenta, chorionic and amniotic sacs are separate and independent but the chorions and placentas may be fused



DIZYGOTIC TWINS

CLINICAL CORRELATE

I. CONJOINT TWINS;

-CRANIOPHAGUS

-THORACOPHAGUS

-CEPHALOTHORACOPHAGUS

-PYGOPHAGUS

II. PARASITIC TWINS; occurs when one twin remains rudimentary due to diminished blood supply and grows like a parasite on the well developed co-twin

III. Superfecundation; is the fertilization of two or more oocytes at different times