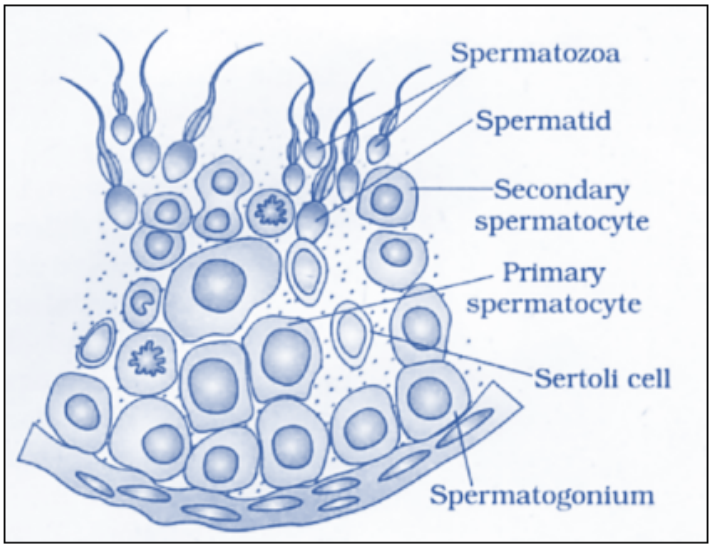
IB Biology

Revision

Topic 11.4 – Sexual Reproduction



Name:

Teacher: Mr Trent

1. *[1 mark]*

Which mechanism prevents polyspermy?

A. Polar body formation

B. The acrosome reaction

C. Spermatogenesis

D. The cortical reaction

2. *[1 mark]* What is the role of HCG in early pregnancy?

A. It prevents the degeneration of the corpus luteum in the ovary.

B. It initiates the development of the uterus lining.

C. It inhibits the production of estrogen.

D. It stimulates uterine contractions.

3. *[1 mark]*

Hormones maintain the thickness of the endometrium during pregnancy. However, insufficient levels of hormones in early pregnancy may cause the breakdown of the endometrium, which leads to miscarriage. What could be a cause of miscarriage in early pregnancy?

A. The embryo does not produce enough HCG.

B. The pituitary gland does not produce enough FSH.

C. The endometrium does not produce enough progesterone.

D. The ovarian follicle does not produce enough estrogen.

4. *[1 mark]*

The pregnancy test for humans is based on detection of the hormone HCG. What is the reason for detection of this hormone indicating pregnancy?

A. HCG is involved in milk production.

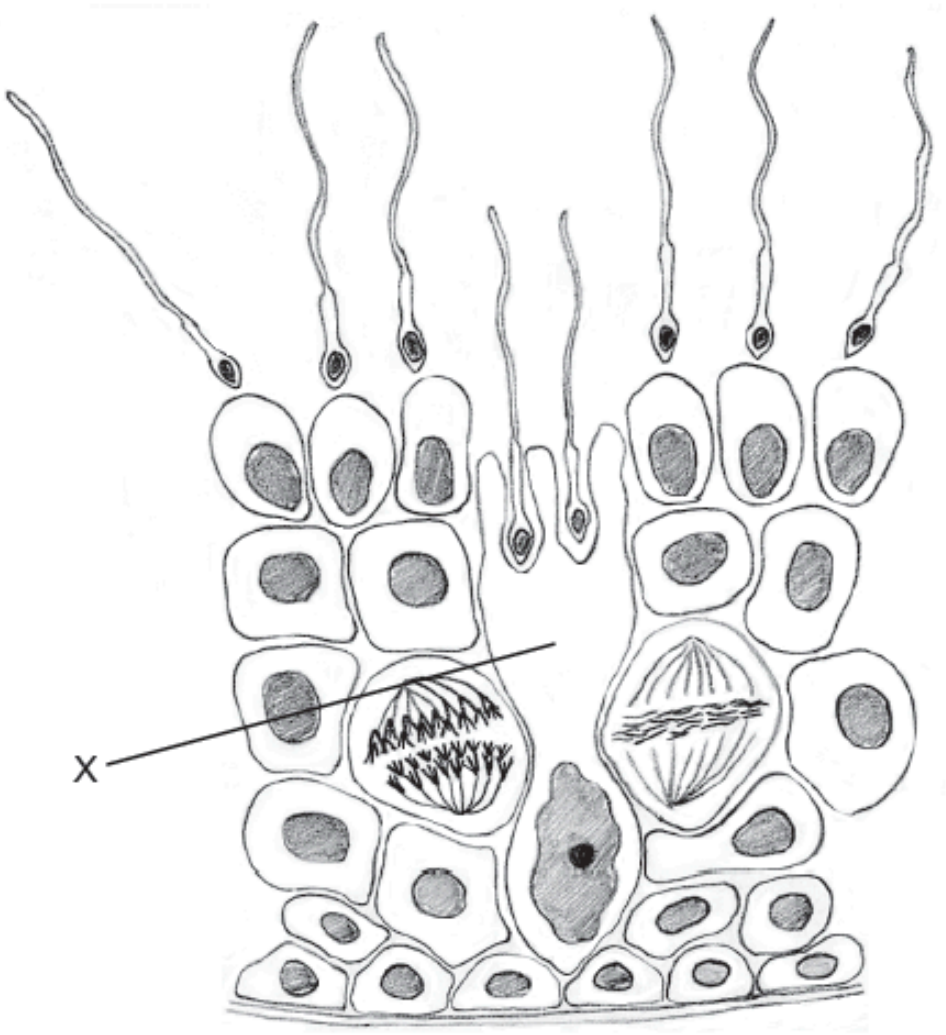
B. HCG production is blocked by negative feedback during menstruation.

C. HCG is produced by an embryo.

D. HCG is released during the acrosome reaction.

5. *[1 mark]*

The diagram shows a section through the seminiferous tubules. What is the cell labelled X?



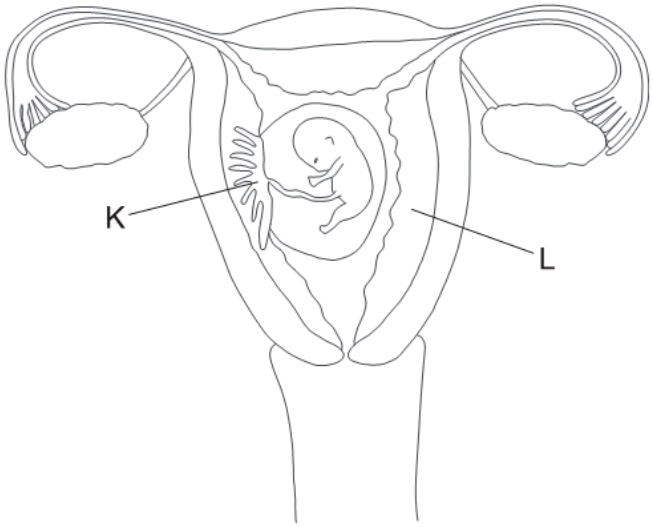
A. Spermatid that will differentiate into sperm

B. Primary spermatocyte that will undergo meiosis to form secondary spermatocytes

C. Sertoli cell that provides nutrients

D. Stem cell that will divide by mitosis to form spermatogonia

6. *[1 mark]* The diagram shows the female reproductive system.



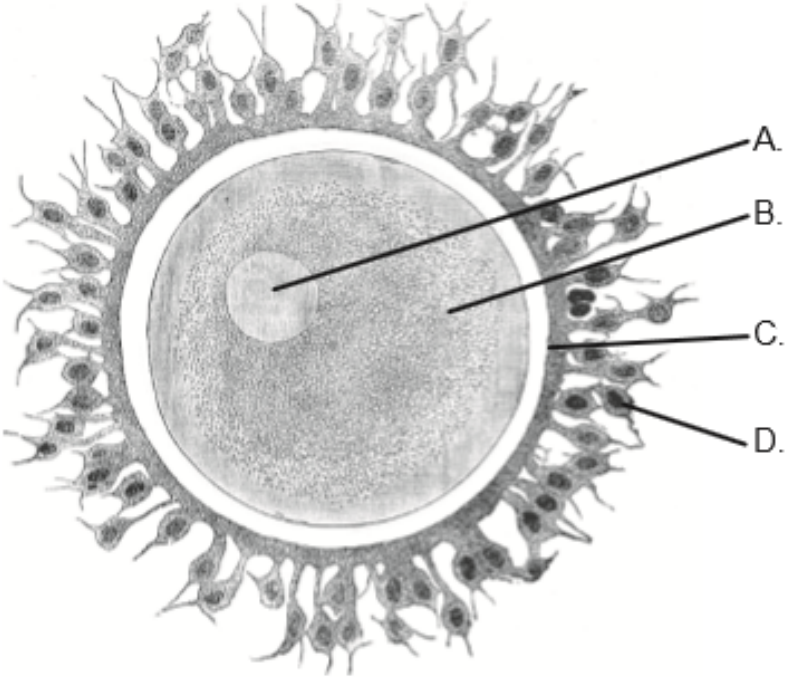
[Source: © International Baccalaureate Organization 2017]

Which structures do K and L identify?

	K	L
A.	endometrium	uterine wall
B.	placenta	endometrium
C.	amnion	placenta
D.	fetus	uterine wall

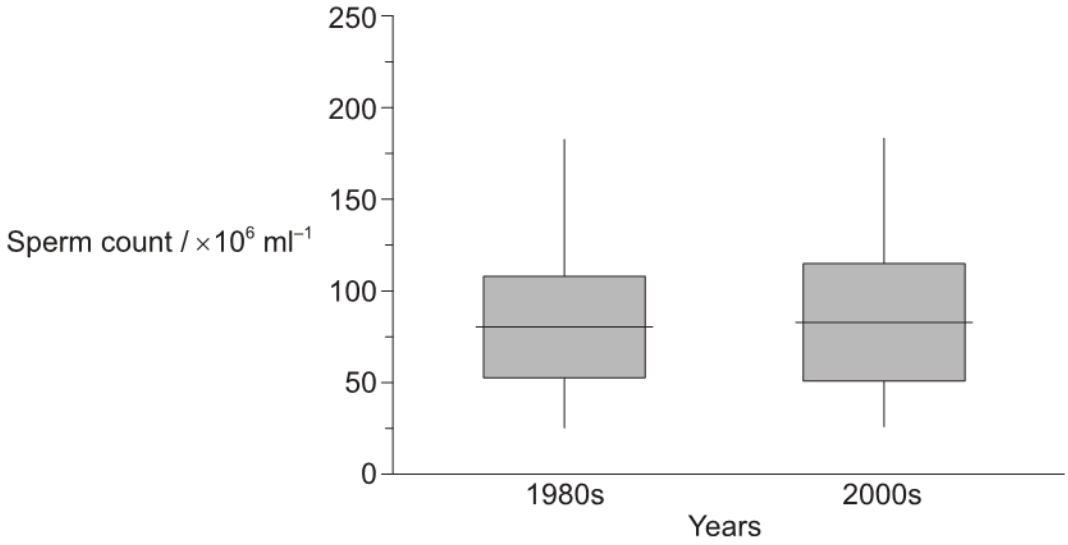
7. *[1 mark]*

Where does the acrosome reaction occur?



8a. *[3 marks]*

Concerns have been raised about the effect of rising pollution levels on sperm production in men. To investigate the possible effects of pollution on spermatogenesis, sperm samples from men of similar ages were collected in Kolkata in the 1980s and 2000s. The box plot represents the mean and range of sperm counts in the 1980s and 2000s.



A hypothesis has been suggested that pollution may have a negative effect on spermatogenesis. Evaluate whether the data support this hypothesis.

. . . . . .

. . . . . .

. . . . . .

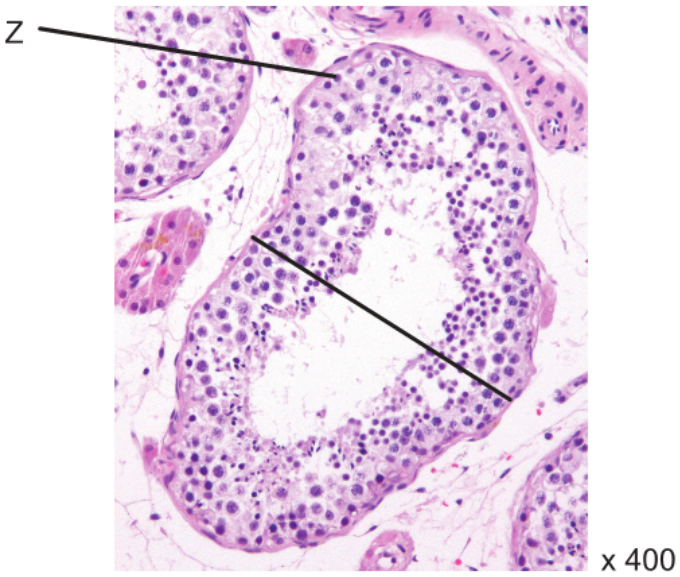
. . . . . .

. . . . . .

. . . . . .

8b. *[1 mark]*

The light micrograph shows a cross section of seminiferous tubules.



Calculate the actual size of the seminiferous tubule in the area indicated by the line across it, giving the units.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

8c. *[1 mark]*

Identify the type of cell labelled Z.

9a. *[4 marks]*

Describe the process of spermatogenesis leading to the production of four sperm cells in a human male.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

9b. *[4 marks]* Outline the roles of estrogen and progesterone in females during human reproduction.

10b. *[4 marks]*

Describe the different cell types in the seminiferous tubules that are involved in the process of spermatogenesis.

10c. *[8 marks]*

Explain the roles of specific hormones in the menstrual cycle, including positive and negative feedback mechanisms.

1. *[1 mark]*

D

2. *[1 mark]*

A

3. *[1 mark]*

A

4. *[1 mark]*

C

5. *[1 mark]*

C

6. *[1 mark]*

B

7. *[1 mark]*

C

8a. *[3 marks]*

a. hypothesis not supported as there is a «slight» increase/not much difference in sperm count between the 1980s and the 2000s

OR

hypothesis not supported as similar means/values for both groups

b. no information on sample size

c. no information/data provided on pollution levels/types of pollution

d. other factors affecting sperm count not considered

OR

other elements than sperm count could be affected

e. data limited to Kolkata/one country/one city

OR

pollution may affect spermatogenesis elsewhere

[Max 3 Marks]

8b. *[1 mark]*

Markscheme

62 mm Y400 = 0.155 mm/155 µm/micrometers/10^{-6} m

OR

61 mm Y400 = 0.153 mm/153 µm/micrometers/10^{-6} m

Calculation and units required. Accept correct answers expressed in cm

8c. *[1 mark]*

Markscheme

spermatogonium

OR

primary spermatocyte

9a. *[4 marks]*

Markscheme

a. in the seminiferous tubule

b. diploid cells/spermatogonia grow/enlarge

c. two divisions of meiosis

d. primary spermatocyte carries out the first division and secondary spermatocytes carry out the second division

e. meiosis produces haploid cells/spermatids

f. haploid cells/spermatids differentiate into spermatozoa/sperm cells
OR
develop tail/flagellum/helical mitochondrion/acrosome/sac of enzymes

g. Sertoli cells help sperm to mature/differentiate

Allow answers presented in a clearly annotated diagram.

9b. *[4 marks]*

Markscheme

a. estrogen/progesterone for repair/thickening/development/vascularisation of uterus lining/endometrium

b. estrogen (at high levels) stimulates LH secretion (which stimulates ovulation)

c. progesterone maintains the uterus lining/endometrium during pregnancy/prevents miscarriage

d. progesterone/estrogen inhibits FSH/LH secretion

e. progesterone for development of breast tissue during pregnancy

f. fall in progesterone/rise in estrogen leads to labour/contractions/childbirth

g. estrogen/progesterone cause pre-natal development of female reproductive organs
OR
h. estrogen/progesterone cause secondary sexual characteristics

10b. *[4 marks]*

Markscheme

a. spermatogonia «2n» are undifferentiated germ cells *OWTTE*

b. spermatogonia mature and divide «by mitosis» into primary spermatocytes «2n»

c. primary spermatocytes divide by meiosis I into secondary spermatocytes «1n»

d. secondary spermatocytes divide by meiosis II into spermatids «1n»

e. spermatids differentiate/mature into spermatozoa/sperm

f. Sertoli/nurse cells provide nourishment/support to these developing cells

g. Leydig/interstitial cells produce testosterone

10c. *[8 marks]*

Markscheme

a. anterior pituitary/hypophysis secretes FSH which stimulates ovary for follicles to develop

b. follicles secrete estrogen

c. estrogen stimulates more FSH receptors on follicle cells so respond more to FSH

d. increased estrogen results in positive feedback on «anterior» pituitary

e. estrogen stimulates LH secretion

f. estrogen promotes development of endometrium/uterine lining

g. LH levels increase and cause ovulation

h. LH results in negative feedback on follicle cells/estrogen production

i. LH causes follicle to develop into corpus luteum
OR
follicle cells produce more progesterone

j. progesterone thickens the uterus lining

k. high progesterone results in negative feedback on pituitary/prevents FSH/LH secretion

l. progesterone levels drop and allow FSH secretion

m. falling progesterone leads to menstruation/degradation of uterine lining

*Award **[5 max]** if no reference to feedback is made*.