



COMPULSORY SUBJECT CLINIC REPRODUCTION

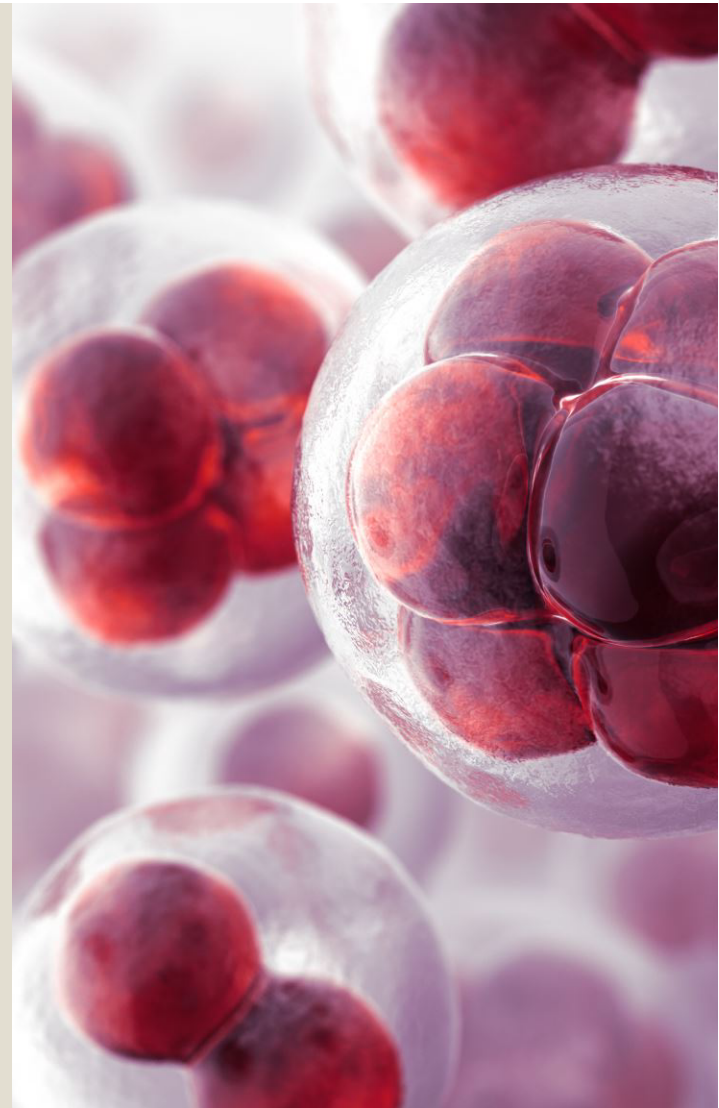
Chap 15 Reproduction

Chap 16 Reproduction in plants

Chap 17 Reproduction in Humans

Chap 15 Reproduction

- ? (a) define asexual reproduction as the process resulting in the production of genetically identical offspring from one parent
- ? (b) state that mitosis is a type of cell division giving rise to genetically identical cells in which the chromosome number is maintained
- ? (c) state the importance of mitosis in growth, repair and asexual reproduction
- ? (d) define sexual reproduction as the process involving the fusion of nuclei of male and female gametes to form a zygote and the production of genetically dissimilar offspring
- ? (e) define the terms haploid and diploid, and explain the need for a reduction division process prior to fertilisation in sexual reproduction
- ? (f) state what is meant by homologous pairs of chromosomes
- ? (g) state that meiosis is a type of cell division that gives rise to genetically dissimilar cells in which the chromosome number is halved due to the separation of homologous chromosomes
- ? (h) state that meiosis is used in the formation of gametes



a) define **asexual reproduction** as the process resulting in the production of genetically identical offspring from one parent

(d) define **sexual reproduction** as the process involving the fusion of nuclei of male and female gametes to form a zygote and the production of genetically dissimilar offspring

Asexual reproduction

Production of genetically identical offspring

Requires one parent

Does not involve fertilisation

Involves mitosis

Relatively quicker method of reproduction

Sexual reproduction

Production of genetically dissimilar offspring

Requires two parents (except for self-pollinated plants)

Involves fertilisation (fusion of nuclei of male and female gametes to form a zygote)

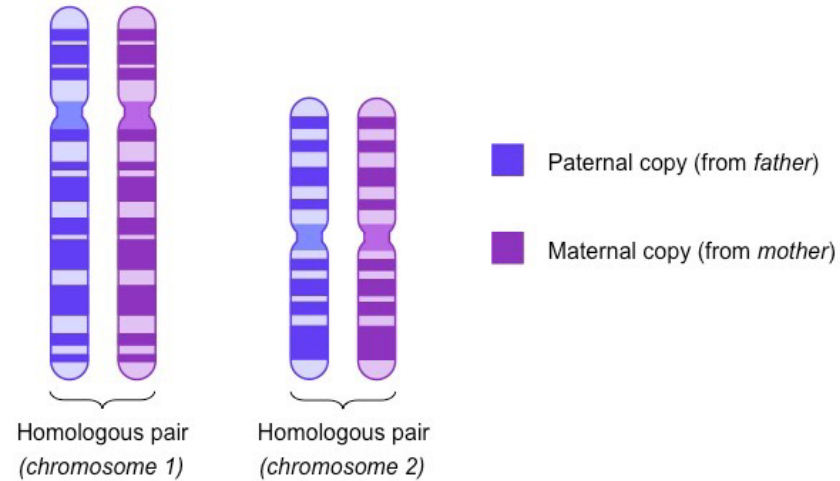
Involves meiosis to produce gametes

Relatively slower method of reproduction

- (b) state that **mitosis** is a type of cell division giving rise to genetically identical cells in which the chromosome number is maintained
- (c) state the importance of mitosis in growth, repair and asexual reproduction
- (g) state that **meiosis** is a type of cell division that gives rise to genetically dissimilar cells in which the chromosome number is halved due to the separation of homologous chromosomes
- (h) state that meiosis is used in the formation of gametes

Mitosis	Meiosis
Produces genetically identical cells	Produces genetically dissimilar cells
Produces diploid cells (chromosome number is maintained)	Produces haploid cells
Produces body cells for growth, repair and asexual reproduction	Produces gametes

(f) state what is meant by homologous pairs of chromosomes



- Pair of chromosomes
 - one inherited from each parent
 - Have same shape, size and same sequence of genes.
- Separate during meiosis to produce haploid cells

Plants like strawberries are able to reproduce through aerial stems called runners, as shown in the diagram below.

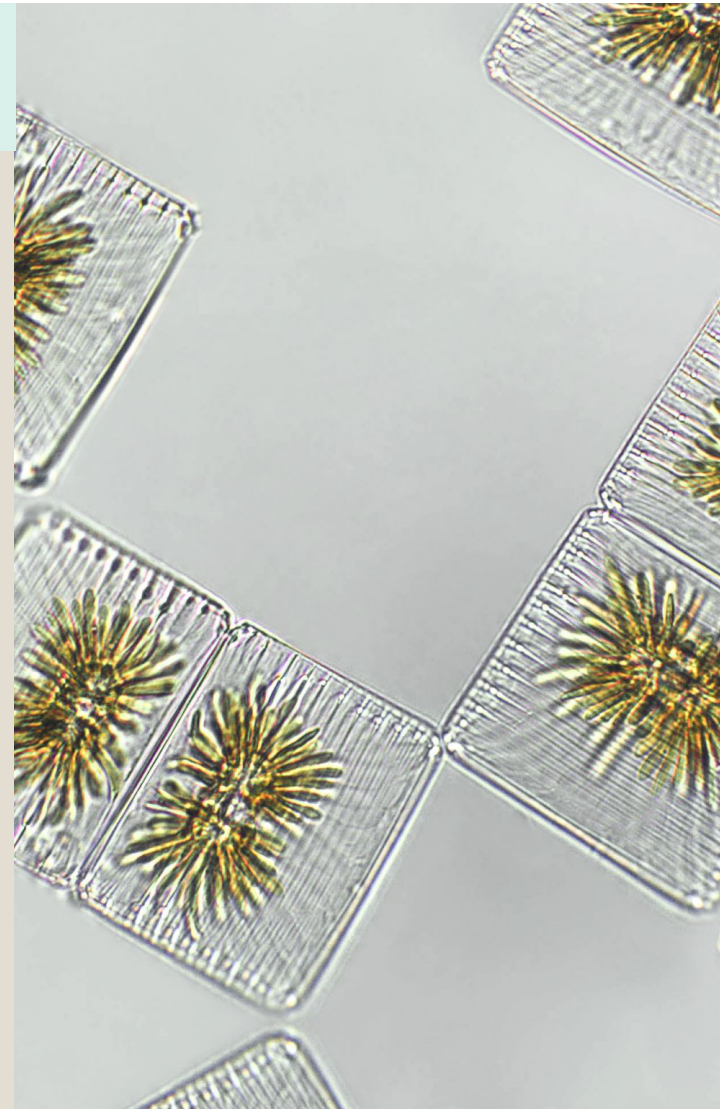


Strawberry plants produced this way would probably

- A. be better adapted to environmental changes than its parents.
- B. bear fruits that are as sweet as those from its parents.
- C. develop more slowly than strawberry plants grown from seeds.
- D. be genetically different from its parents.

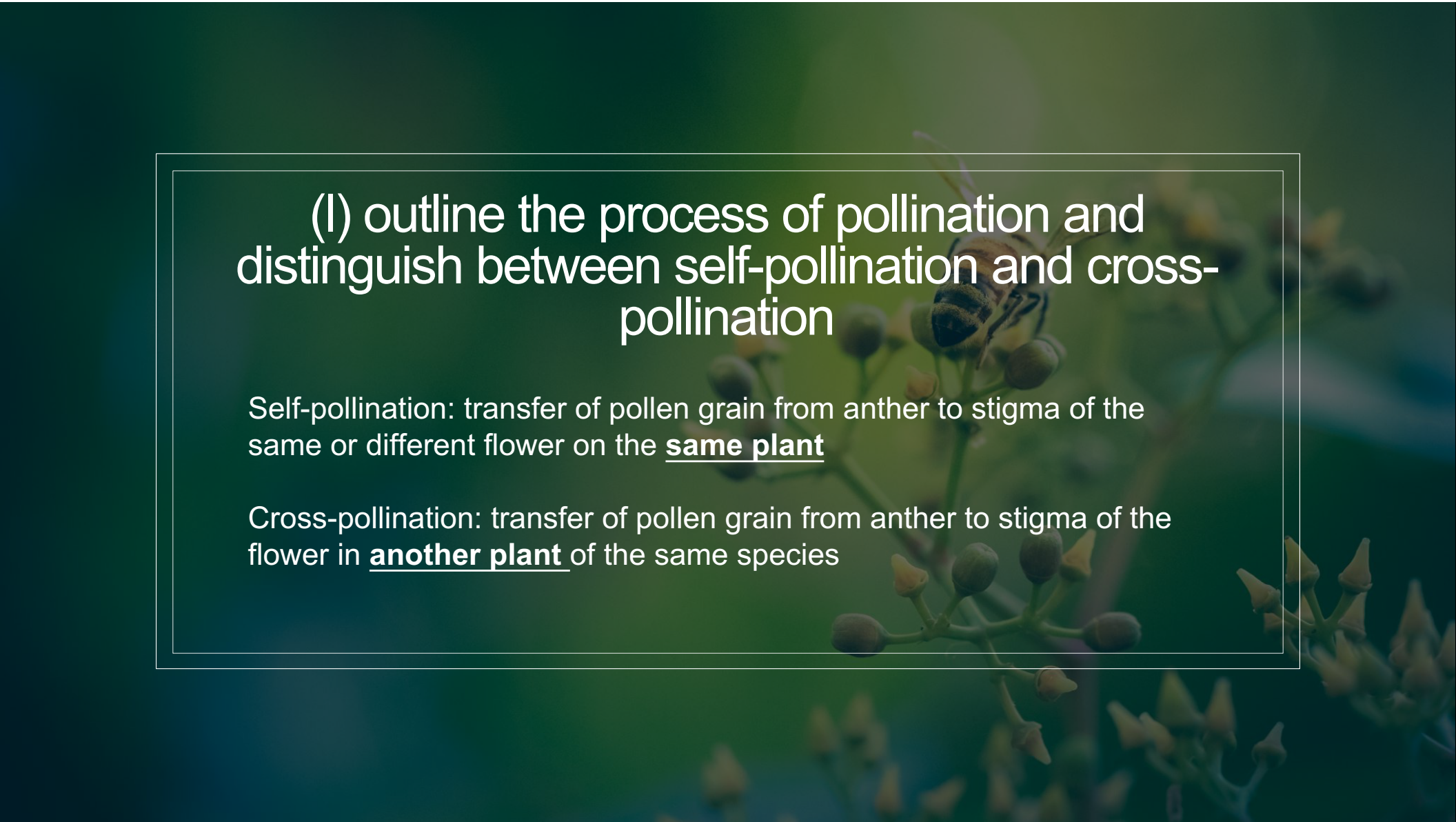
Chap 16 Reproduction in Plants

- ? (i) identify, using a hand lens if necessary, the sepals, petals, stamens and carpels of insect-pollinated, dicotyledonous flowers, and examine the pollen grains under a light microscope
- ? (j) state the functions of the sepals, petals, anthers and carpels
- ? (k) identify, using a hand lens if necessary, the stamens and stigmas of wind-pollinated flowers, and examine the pollen grains under a light microscope
- ? (l) outline the process of pollination and distinguish between self-pollination and cross-pollination
- ? (m) compare, using fresh specimens, an insect-pollinated and a wind-pollinated flower and explain their differences
- ? (n) outline the growth of the pollen tube and its entry into the ovule followed by fertilisation (production of endosperm and details of development are not required)



(j) state the functions of the sepals, petals, anthers and carpels

Structure	Functions
Sepals	Enclose and protect parts of the flower in bud stage
Petals	- Brightly coloured to attract insects - Provide a platform for insects to land - Have nectar guides to guide insect into flower to obtain nectar
Anthers	Produces pollen grain
Carpels	Stigma – receives pollen Style – holds stigma in suitable position to trap pollen grains Ovary – produces ovum

A background image of a bee on a flower branch, partially obscured by a green overlay and a white text box.

(I) outline the process of pollination and distinguish between self-pollination and cross-pollination

Self-pollination: transfer of pollen grain from anther to stigma of the same or different flower on the same plant

Cross-pollination: transfer of pollen grain from anther to stigma of the flower in another plant of the same species

Important: BOTH self and cross pollination are a form a sexual reproduction!

Self-pollination

One parent required

Beneficial qualities are more likely to be passed down to offspring

Offspring have lower genetic variation
Less adapted to changes in the environment

Less viable seeds are produced

Does not depend on external factors

Less pollen and energy is wasted

Cross-pollination

Involves two parents

Beneficial qualities **may** be passed down from both parents

Offspring have higher genetic variation
Increases chance of species surviving changes in the environment

More viable seeds are produced

Depends on external factors eg wind/insects for pollination

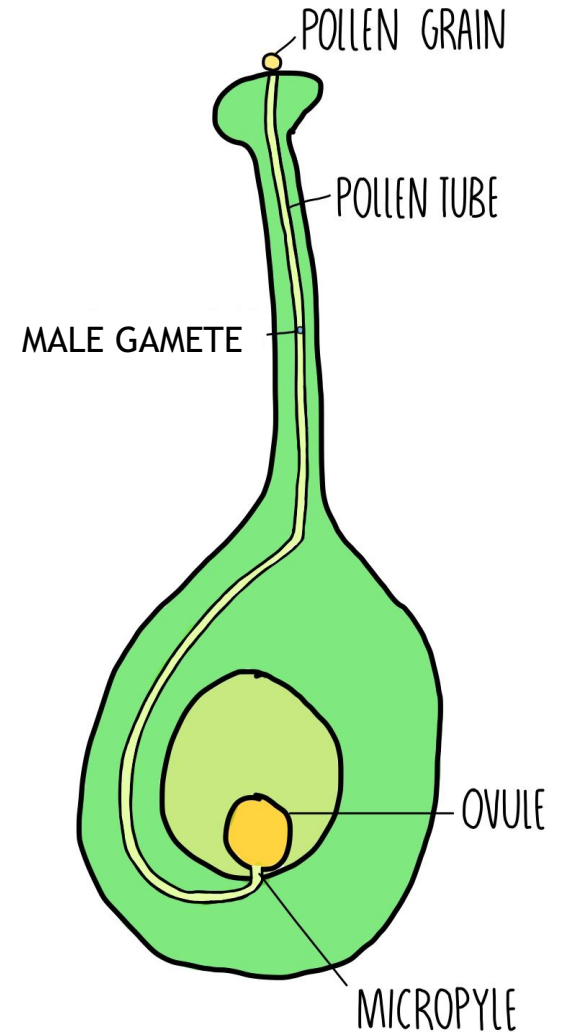
More pollen and energy is wasted

- (i) identify, using a hand lens if necessary, the sepals, petals, stamens and carpels of insect-pollinated, dicotyledonous flowers, and examine the pollen grains under a light microscope
- (k) identify, using a hand lens if necessary, the stamens and stigmas of wind-pollinated flowers, and examine the pollen grains under a light microscope
- (m) compare, using fresh specimens, an **insect-pollinated and a wind-pollinated** flower and explain their differences

Features	Insect-pollinated flower	Wind-pollinated flower
Petal	Large, brightly coloured, Nectar guide present	Small, dull-coloured, Nectar guide absent
Nectar	Present	Absent
Scent	Fragrant/sweet smelling	Absent
Stigma	Small and compact, non-protruding stigma	Large and feathery, protruding stigma
Stamen	Non-pendulous, non-protruding anthers	Pendulous, protruding anthers
Pollen	Smaller quantity, rough surface	Larger quantity, smooth surface, light

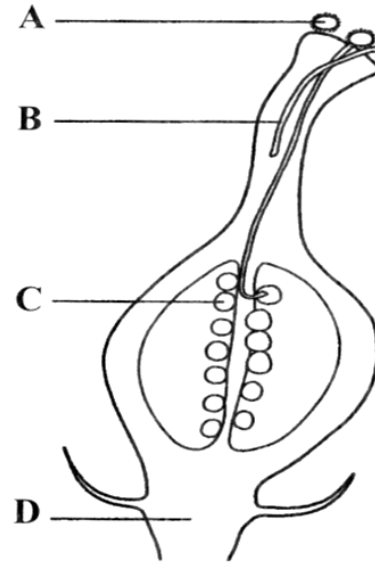
(n) outline the growth of the pollen tube and its entry into the ovule followed by fertilisation (production of endosperm and details of development are not required)

- Pollen grain germinates on the stigma and pollen tube grows out
- Male gametes enter the pollen tube
- Pollen tube grows down style to ovary as it secretes enzymes to digest tissue of stigma and style
- Pollen tube enters ovule through the micropyle
- Within the ovule, tip of pollen tube absorbs sap and bursts to release male gamete.
- Nuclei of male and female gametes fuse to form zygote



New plants may be grown from groups of cells that are taken from other plants. The diagram shows part of a plant, **X**.

From which structure will cell samples grow into new plants that are genetically identical to plant **X** ?



Many flowering plants have structures to ensure cross-pollination rather than self-pollination because cross-pollination

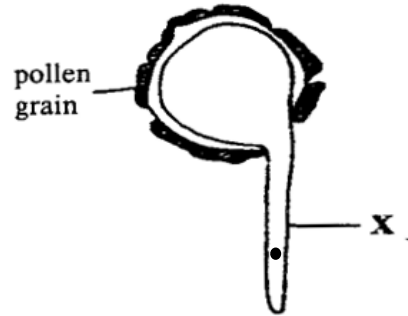
- A. depends on external agents of transfer to occur.
- B. Increases the likelihood that beneficial genes are passed down to the offspring.
- C. does not require as much energy from the plant.
- D. increases the chance of survival of the species in a changing environment.

A cleistogamous flower is a bisexual flower that does not open. Which of the following statements about cleistogamous flowers is/are **always true**?

- I All the offspring are genetically identical.
- II Fruits from this flower do not require either animal or environmental agents for dispersal.
- III Sexual reproduction takes place within the flower.
- IV Either self or cross pollination can take place.

- A. I only
- B. I and II only
- C. III only
- D. I, II, III and IV

The figure below shows a pollen grain taken from a stigma shortly after pollination.



- (a) (i) What process has the pollen grain undergone ?

- (ii) Name structure **X** on the diagram.

- (iii) Show on the diagram where a male gamete would be found.

- (b) (i) Explain how the tip of structure **X** eventually reaches a female nucleus in a flower.

X secretes enzymes to digest away style tissue

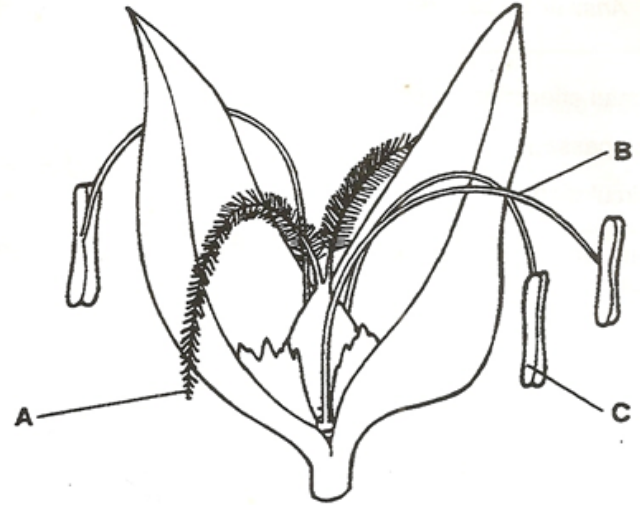
- (ii) When structure **X** reaches the female nucleus, what process will then occur?

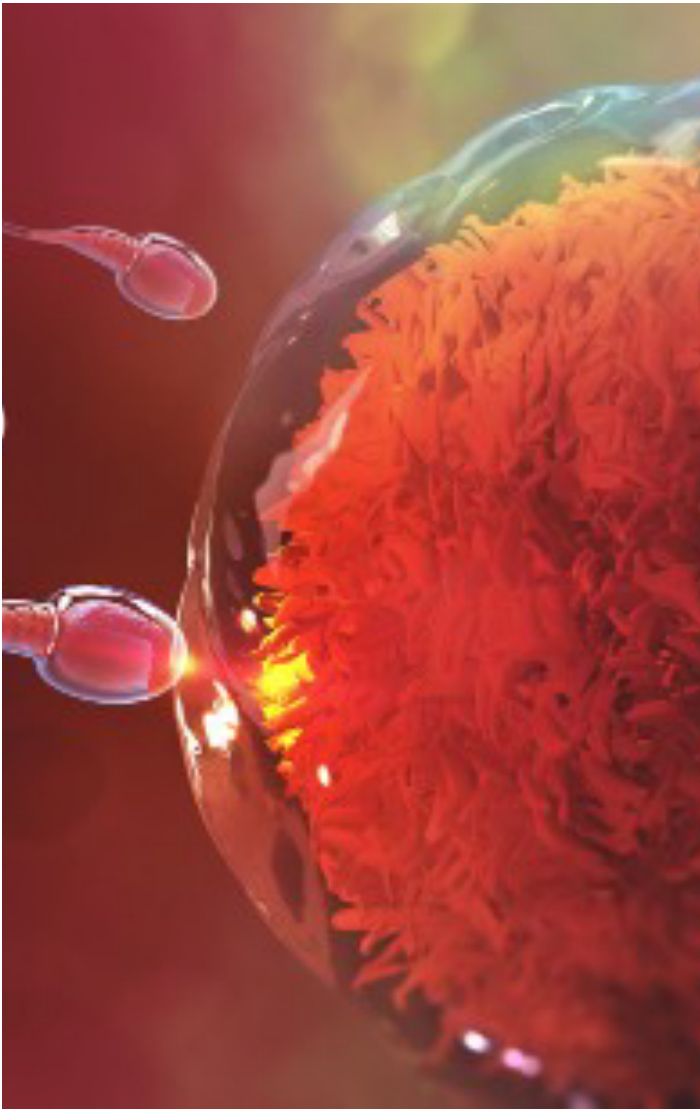
Fertilisation

Section C Free Response Questions

1. The diagram shows the structure of a flower.
 - (a) Describe how the process of pollination is most likely to be carried out in this flower. Your answer should include identification of Structures **A**, **B** and **C**.

[8]



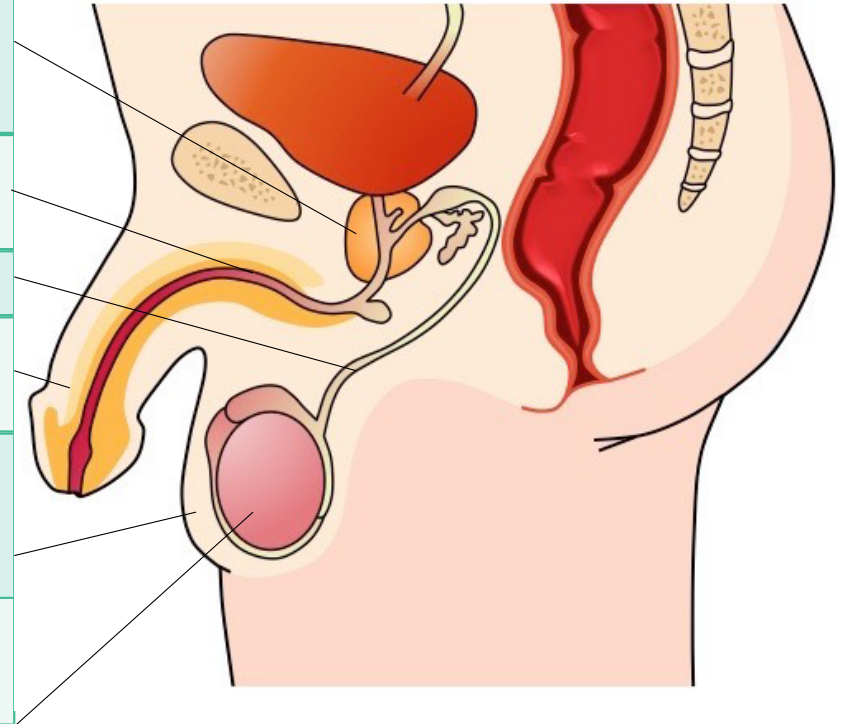


Chap 17 Reproduction in Man

- ? (o) identify the male reproductive system and state the functions of: testes, scrotum, sperm ducts, prostate gland, urethra and penis
- ? (p) identify the female reproductive system and state the functions of: ovaries, oviducts, uterus, cervix and vagina
- ? (q) outline the menstrual cycle with reference to the alternation of menstruation and ovulation, the natural variation in its length, and the fertile and infertile phases of the cycle with reference to the effects of progesterone and oestrogen only
- ? (r) describe fertilisation and early development of the zygote simply in terms of the formation of a ball of cells which becomes implanted in the wall of the uterus (s) state the functions of the amniotic sac and the amniotic fluid
- ? (t) describe the function of the placenta and umbilical cord in relation to exchange of dissolved nutrients, gases and excretory products (structural details are not required)
- ? (u) discuss the transmission of human immunodeficiency virus (HIV) and methods to reduce transmission

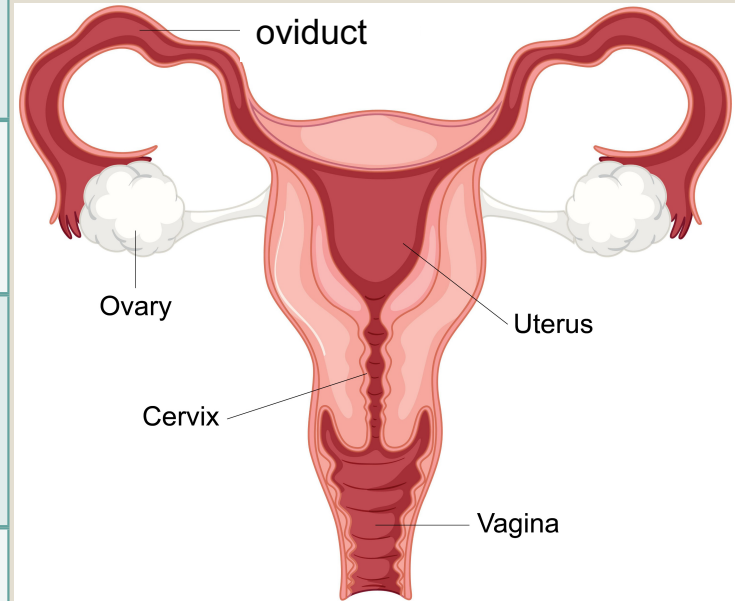
o) identify the male reproductive system and state the functions of: testes, scrotum, sperm ducts, prostate gland, urethra and penis

Structure	Function
Prostate gland	Secretes fluid containing nutrients and enzymes to nourish sperm and stimulate them to swim
Urethra	Transports both urine and semen out of the body
Sperm Ducts	Transports sperm from testis to urethra
Penis	Becomes erect to enters the vagina during sexual intercourse to deposit sperm
Scrotum	Contains testes outside the main body cavity for a slightly lower than body temperature which is essential for development of sperm
Testes	- Produces sperms - Produces testosterone



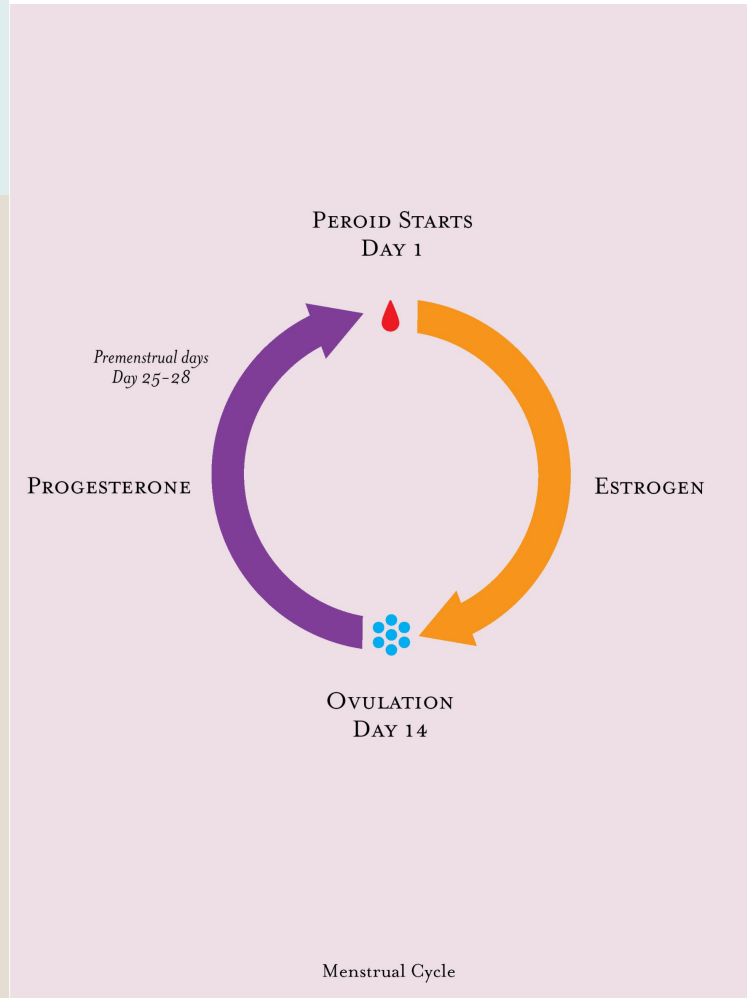
(p) identify the female reproductive system and state the functions of: ovaries, oviducts, uterus, cervix and vagina

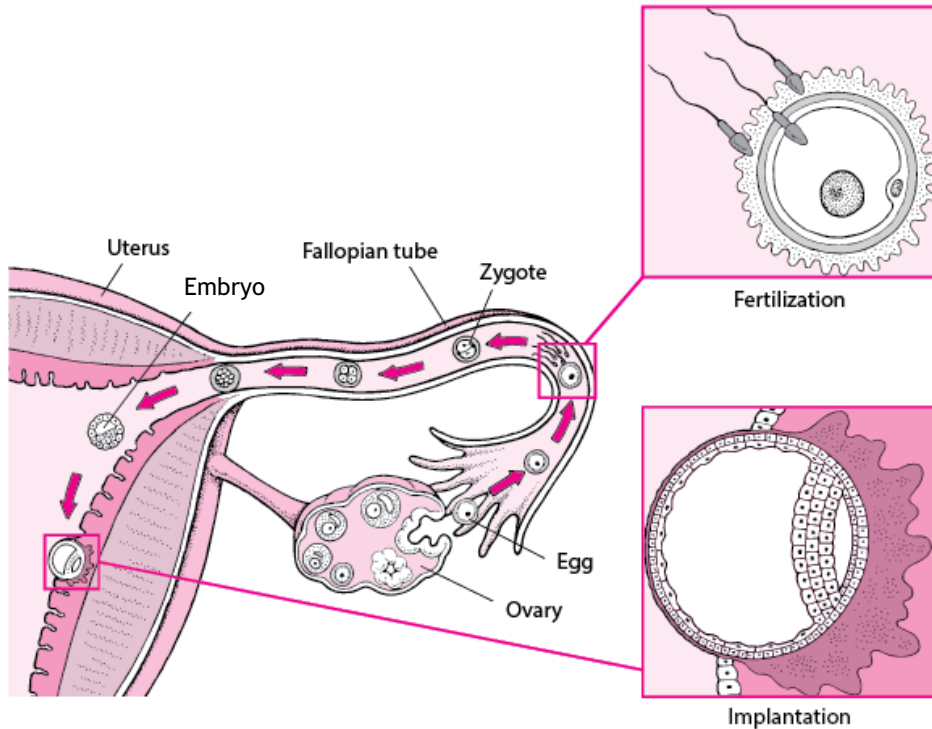
Structure	Function
Ovary	- Produces egg - Produces oestrogen and progesterone
Oviduct	- Site of fertilisation - Transports zygote by movement of cilia to the uterus
Uterus	- Site where fetus develops - Has uterine lining where embryo is implanted - Has smooth muscle tissue to contract and push fetus out during birth
Cervix	Ring of muscles which relax to open to allow menstrual blood to flow out of vagina during menstruation
Vagina	Site where sperms are deposited during sexual intercourse



(q) outline the menstrual cycle with reference to the alternation of menstruation and ovulation, the natural variation in its length, and the fertile and infertile phases of the cycle with reference to the effects of progesterone and oestrogen only

- Day 1 – 5: Menstruation
 - uterine lining and unfertilised egg break down and are shed
- Day 6 – 13: After menstruation
 - Oestrogen level increases to repair uterine lining. High level of oestrogen leads to ovulation
- Day 14: Ovulation
 - egg is released into oviduct
- [Fertile period Day 10 – 15]
- Day 15 – 28: After ovulation
 - progesterone level increases to prevent ovulation and thicken uterine lining further
 - oestrogen level decreases
 - If fertilisation occurs: progesterone level stays high
 - If NO fertilisation occur: progesterone level decreases and uterine lining starts to break down





(r) describe fertilisation and early development of the zygote simply in terms of the formation of a ball of cells which becomes implanted in the wall of the uterus

Fertilisation

- Only 1 sperm nucleus enters the egg and fuses with the egg nucleus to form a zygote
- Once sperm enters, no other sperm can enter and remaining sperm will die

Implantation

- Cilia sweep and peristalsis move the zygote from oviduct to the uterus
- Zygote divides by mitosis to form the embryo
- Embryo implants into uterine lining



(s) state the functions of the amniotic sac and the amniotic fluid

- Supports and cushions fetus before birth / act as shock absorber / cannot be compressed
 - to protect fetus from physical injury
- Allows fetus a certain degree of movement
 - Which promotes muscular development
- During birth, lubricates and reduces friction in the vagina

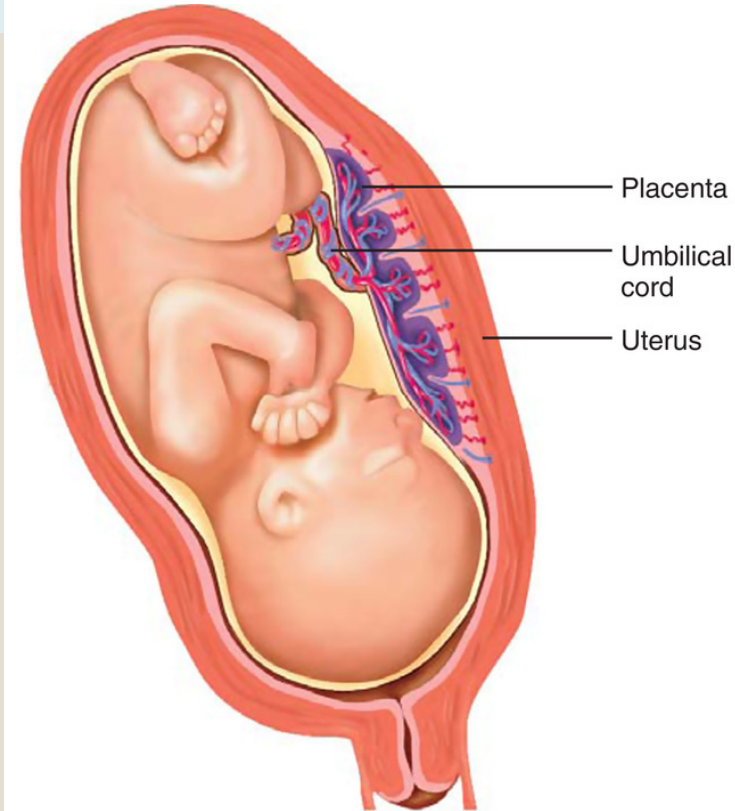
(t) describe the function of the placenta and umbilical cord in relation to exchange of dissolved nutrients, gases and excretory products (structural details are not required)

Placenta

- Allows oxygen and dissolved food substances (eg glucose, amino acids and mineral salts) to diffuse from maternal to fetal blood
- Allows metabolic waste (eg urea and carbon dioxide) to diffuse from fetal to maternal blood
- Allows protective antibodies to diffuse from maternal to fetal blood
- Produces oestrogen and progesterone to maintain the uterine lining in a healthy state

Umbilical cord

- Umbilical artery transports deoxygenated blood and metabolic waste from fetus to placenta
- Umbilical vein transports oxygenated blood and dissolved food substances from placenta to fetus



(u) discuss the transmission of human immunodeficiency virus (HIV) and methods to reduce transmission

Transmission of HIV

- Through **semen** when it comes in contact with mucous membrane in the vagina
- Through **fluid in the vagina** when it comes in contact with the mucous membrane of the urethra
- When **blood from an infected person** gets into the bloodstream of an uninfected person

Methods to reduce transmission

- Keep to one sexual partner
- Males should wear a condom if they are unsure whether their partner or themselves are infected
- Do not share instruments which break skin and be contaminated with blood eg razors and toothbrush
- Go to reliable operators and ensure needles used are sterilised or are disposable eg acupuncture, ear-piercing, tattooing

A woman's menstrual period started on 23rd March. In which week was an egg most likely to have been released?

Week	March						
	Sun	Mon	Tue	Wed	Thu	Fri	Sat
A	-	-	-	1	2	3	4
B	5	6	7	8	9	10	11
C	12	13	14	15	16	17	18
D	19	20	21	22	23	24	25
	26	27	28	29	30	31	

The diagram shows the thickness of the lining of the uterus during the menstrual cycle. During which part of the cycle is the woman most fertile?

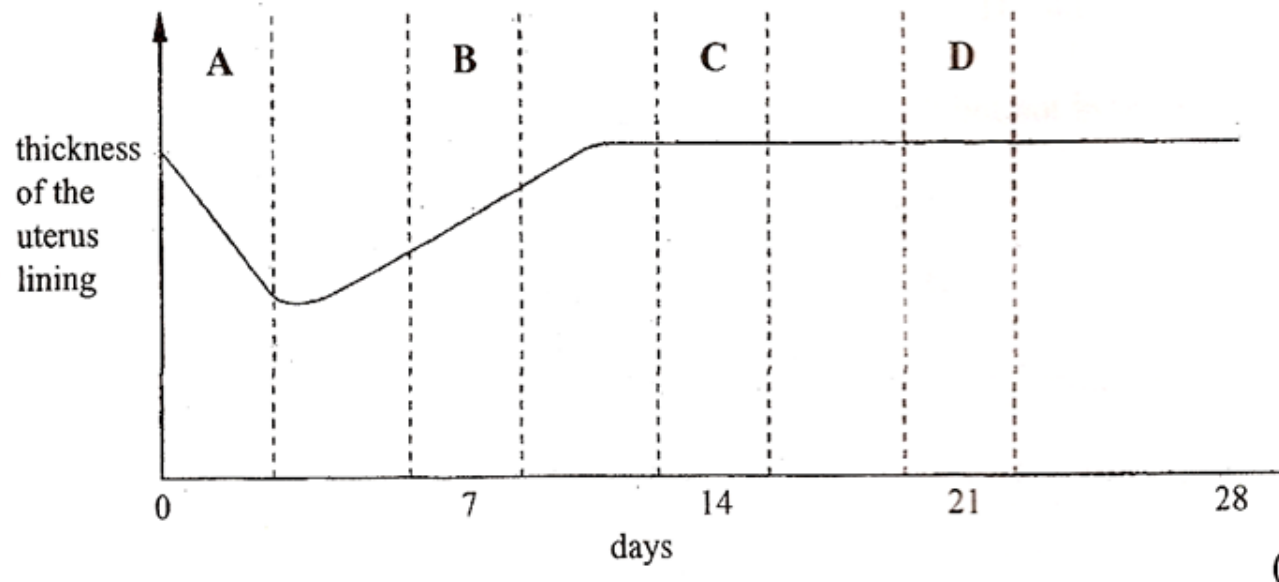


Fig. 1 is a diagram of a developing mammalian fetus and part of the uterus wall.

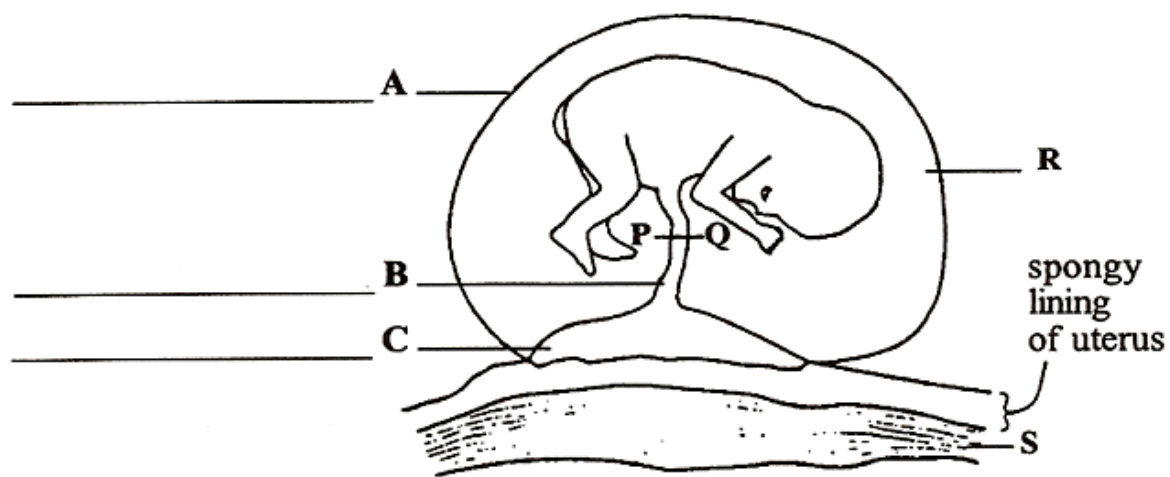


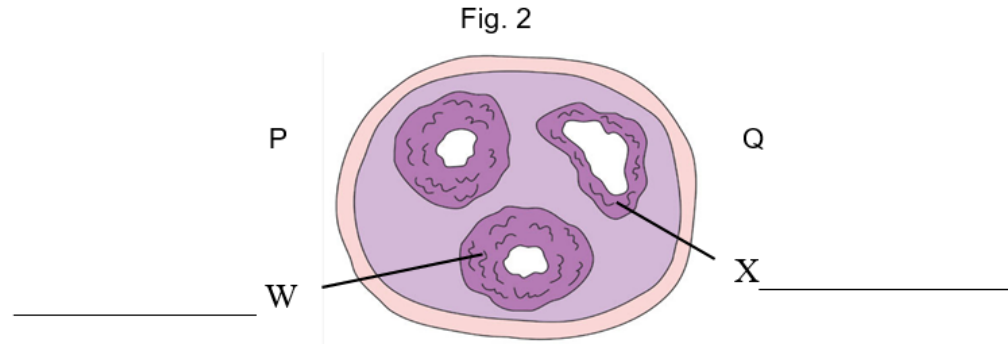
Fig. 1

(a) On the diagram, label structures **A**, **B** and **C**.

(b) State two functions of **R**.

(c) What type of tissue is found at **S**? _____

(d) Fig. 2 shows a section through structure **B** taken at P – Q shown in Fig. 1.



- (i) On the diagram, label **W** and **X**.
- (ii) With reference to structures **W** and **X**, state how they are involved in the nutrition, excretion and exchange of the fetus.

Nutrition : _____

Excretion : _____

Gas Exchange : _____
