REPRODUCTION (LIVE) 09 APRIL 2015

Section A: Summary Notes and Examples

Reproduction in Vertebrates

Reproductive Strategies in Vertebrates

When studying for this section, the key question to ask is: How do reproductive strategies in vertebrates maximize their reproductive success in different environments?

All vertebrates reproduce sexually, this means that a male AND female are needed, the developing offspring must be in a liquid medium and is able to obtain nourishment (food). Reproductive strategies are ways that vertebrates carry out reproduction so that they produce a new generation, hence the continuation of their species.

Types of fertilization

To be able to produce offspring, the egg and the sperm cell (gametes) must fuse and this is called fertilization. The sperm need to swim to get to the stationary female without drying out. Vertebrates have various ways that ensure that the sperm reaches the egg and that fertilization takes place

- **External Fertilization**

  External fertilization occurs when sperm and eggs are released into water. The sperm fertilizes the egg outside the female’s body. Huge quantities of sperm are released as there is a small chance of a sperm fertilizing an egg of the same species. Examples: fish and amphibians

- **Internal Fertilization**

  Internal fertilization occurs when sperm fertilize eggs inside the female’s body. The male deposits sperm into the female body. The penis is usually the specialized organ in vertebrates that transports the sperm into the female reproductive organs. Because the sperm are protected inside the body fewer sperm and eggs are produced because there is a greater chance of fertilization taking place. Examples: birds, humans, elephant etc.

Development of the embryo

When fertilization occurs, the fertilized egg is called a zygote; the zygote divides by mitosis and grows into an embryo. In terrestrial (land) vertebrates the embryo needs to be protected from the environment and it needs nourishment (food). There are THREE ways in which the needs of the developing embryo can be met.

- **Ovipary (oviparous)**

  Ovipary means that the animal lays eggs that develop and hatch outside the body. Example: fish, amphibians, most reptiles and birds. The eggs can have shells (birds and reptiles) or are without shells (fish and amphibians)

- **Oovivipary (ovoviviparous)**

  Oovivipary is a form of reproduction in which embryos develop inside the eggs that are retained within the mother’s body until they are ready to hatch. The eggs do not receive any nourishment from the female’s body. Example: sharks, some snakes and reptiles.

- **Vivipary (Viviparous)**

  Vivipary is a form of reproduction in which the embryo develops inside the mother’s body, where it is nourished through the placenta until it is born. The young are born alive
The Amniotic Egg

Terrestrial animals require specialized structures to protect the egg from desiccation (drying out). Amniotic eggs are adapted to terrestrial life.

You must be able to label the amniotic egg and give the functions of certain of the structures. I have put what is called an annotated diagram below. Which gives the labels and the functions to together and makes remembering much easier.

You must be able to compare the amniotic egg to the developing foetus in the sexual reproduction of humans.

Precocial and altricial development

Once the embryo has developed it either hatches or is born. Fish and amphibians hatch and are able to swim and feed themselves soon after hatching. Birds and mammals vary in the development of the newborn young. There are TWO levels of development of new-born birds and mammals

- Precocial development

Precocial species have well-developed young that can walk and feed themselves soon after birth.
Examples of precocial birds: ostriches, domestic chickens, guinea fowl
Examples of precocial mammals: cattle, sheep, antelopes, giraffes and elephants

- Altricial development

Altricial species have poorly developed young that cannot walk and have to be fed and kept warm some time after their birth i.e. need parental care
Examples of altricial birds: eagles, seagulls, sparrows and doves.
Examples of altricial mammals: humans, rodents, dogs, lions and baboons
Parental care

Parental care is rare in fish, amphibians and reptiles. All birds and mammals care for their young. Birds incubate their eggs, feed their chicks, keep them warm and teach them how to feed. Female mammals feed their young on milk, keep them warm and teach them how to feed. The amount of care is greater in altricial young that precocial young.

Human Reproduction - Anatomy

- When studying for this section you need to make sure that you are able to identify the male and female reproductive organs – DIAGRAMS- and the function of the different structures in the system.
- An annotated diagram is the best way to study the structure of the male and female reproductive systems.

The Male Reproductive System

![Diagram of the human male reproductive system]

**External genital organs**

1. Testicle
   - produces sperm and testosterone

8. Penis
   - is the copulatory organ

**Their parts**

Urinary Bladder

4. Seminal vesicle
   - produces seminal fluid that serves as food for sperm

5. Prostate gland
   - produces 40% of seminal fluid

6. Cowper’s gland
   - secretes seminal fluid lubrication of the urethra

7. Urethra
   - permits the passage of semen to the outside

**Internal genital organs**

2. Epididymis
   - store of sperm

3. Vas deferens
   - carry sperm to the seminal vesicle and prostate gland

6. Cowper’s gland
   - secretes seminal fluid lubrication of the urethra

7. Urethra
   - permits the passage of semen to the outside

*Side view of the human male reproductive system*

*Diagram credit:* [Taken from: http://4.bp.blogspot.com/-HldBlWwT66A/Tn5MKDXJLUI/AAAAAAAAC0O/xySyrrfBuS8/s1600/male-reproductive-system-diagram.jpg]
The Female Reproductive System

External genital organs

1. Labia
Folds of skin that protects the vagina

2. Himen
Thin membrane covering the vaginal canal

Female reproductive system

Their parts

6. Ovary
Production of the ova and hormones ovaries

5. Fallopian tube
Conduit through which the ovule is conducted to the uterus

4. Uterus
Place where the embryo develops

3. Vagina
Place where semen from the male is deposited

The Female Reproductive System - Ovary

You need to know the internal structure of the ovary as you are going to link it to oogenesis and especially the menstrual cycle.
Gametogenesis

The functions of the testes and the ovary is to produce sperm and an egg cell respectively. Gametogenesis is the process whereby gametes (sex cells) are produced using the process of meiosis.

- You need to link this section with meiosis - genetic variation
- We will also look at oogenesis more closely when we look at the menstrual cycle in the next chapter
- You do not need to know the individual stages of gametogenesis, how the female produces one egg and the man many sperm

- **Spermatogenesis:**
  Diploid cells in the seminiferous tubules of the testes undergo meiosis to form haploid sperm cells.

![](image1)

- **Oogenesis:**
  Diploid cells in the ovary undergo meiosis to form a primary follicle consisting of haploid cells. One cell develops into an ovum contained in a Graafian follicle.

![](image2)
Meiosis: Reduction Division

The process of Meiosis simplified:

1. Sperm binds to Zona Pellucida.
2. Contents of the acrosome are released by exocytosis (acrosome reaction).
3. The hydrolytic enzymes release help the sperm burrow through the Zona Pellucida, and enables binding and fusion of the sperm with the egg.

Original diploid cell (46 chromosomes)

Reduction division Meiosis I

Haploid gamete (23)

Duplication

Haploid Gamete Haploid Gamete

Meiosis II

Haploid gamete (23)

Duplication

Haploid Gamete Haploid Gamete

Takes place in the male and the female reproductive organs

THEN
Significance of Meiosis

- The process of meiosis takes place to:
  - Produce haploid gametes from diploid chromosome pairs, in preparation for sexual reproduction
  - The formation of haploid sperm cells during meiosis is called spermatogenesis
  - The formation of haploid egg cells during meiosis is called oogenesis
  - Ensure that the chromosome number remains the same in the offspring as in the adult \((n + n = 2n)\)
  - Ensure genetic variation when crossing over takes place during Prophase I

The Production of Sex Cells

The production of sex cells is grounding for Reproduction and Genetics. Meiosis takes place in specialized cells located in the reproductive system, to ensure sexual reproduction:

- **In animals:**
  - Male gametes/spermatozoids are produced in the testes
  - Female gametes/egg cells are produced in the ovaries

- **In plants:**
  - Special cells in the pollen sacs of the anthers and in specialised cells in the ovule

The 23 pairs of chromosomes that result in a zygote are divided as follows:

- 22 pairs of autosomes
- 1 pair of sex chromosomes represented by
  - XX in females
  - XY in males
Human Reproduction – Ovulation and Menstruation

- Understanding of the female hormone cycle is very important. You need to understand it properly.
- You need to be able to link oogenesis – making of the egg cell – with the menstrual cycle.

**Oogenesis:** approximately two million eggs are produced in the female, before birth and only 400 – 450 eggs develop into secondary oocytes.

A female is fertile from the age of about 12 to 50. Each month, one primordial follicle will develop into a mature Graafian follicle.

The developing follicle moves to the surface of the ovary causing a bulge to develop on the surface. The oocyte now undergoes meiosis I. The bulge bursts as fluid accumulates and the egg cell is released to the exterior of the ovary. This process is called *ovulation*.

The egg cell enters the infundibulum containing the fimbriae of the fallopian tube. When the egg is released, the Graafian follicle changes into the corpus luteum. If the egg cell is fertilized in the fallopian tube, the corpus luteum secretes *progesterone*. If the egg cell is not fertilized, the corpus luteum degenerates.

Hormones control the 28 day menstruation cycle. Usually only one egg is released per cycle. Should both ovaries release an egg cell and both are fertilized, the result is paternal twins (unidentical). The menstruation cycle affects the ovaries and the uterus.

- **Gonadotrophin releasing hormone** (GnRH) stimulates the anterior pituitary gland to release follicle stimulating hormone (FSH) into the blood.
- FSH is transported to the ovaries (target organ) where it stimulates the development of the follicle.
- The developing follicle produce oestrogen. Oestrogen has two target organs namely the uterus and the anterior pituitary gland.
  - Oestrogen causes the thickening of the endometrium in the uterus to prepare it for pregnancy.
  - Oestrogen inhibits the secretion of FSH by the anterior pituitary gland so that no further follicles are produced during the pregnancy. High oestrogen levels will trigger the secretion of luteinising hormone (LH).
- LH is released into the blood and is transported to the ovary, causing ovulation, which results in the Graafian follicle developing progesterone
- The corpus luteum secretes *progesterone*. 
- Progesterone ensures that the thickening of the **endometrium** is maintained and **glandular activity** is stimulated.
- Progesterone **inhibits** the anterior pituitary gland from releasing LH. This is referred to as the negative mechanism. The release of progesterone causes the slight **rise in temperature** just after a female has ovulated.
Human Reproduction—Fertilization, Development and Gestation

Fertilisation

Meiosis takes place in the ovary and testes to produce haploid gametes. Copulation occurs—which is sexual intercourse—the sperm cell must enter the female body and make its way to the egg cell, so that fertilisation can take place to form a diploid zygote. Remember that humans require internal fertilisation for the reproductive process to take place. The zygote will be a combination of the hereditary characteristics of both the male and the female. The zygote will develop into an embryo and then a foetus by mitosis. The foetus will grow inside the uterus of the female’s body for 40 weeks where it is well protected. This is called gestation or pregnancy. At full term, the female will give birth to ensure survival and continuation of the species.

Development of the placenta and amnion

The placenta is a structure that is formed by the chorionic villi and the endometrium. It forms a link between the mother and the developing foetus. It ensures that there is no direct transfer of the mother’s blood to the foetus. The placenta develops about 12 weeks after conception and allows for the safe exchange of a number of substances between the mother to the foetus through the umbilical cord.

The placenta ensures that:

- **Nutrients, oxygen, hormones and antibodies** from mother to foetus
- **Carbon dioxide and wastes** from the foetus to the mother, for excretion by the mother
- **Harmful substances** like nicotine from cigarette smoking, alcohol, drugs and viruses like rubella (German measles), hepatitis B and HIV can also move through the placenta.
- Acts as a barrier between the mother and developing foetus
- It secretes progesterone

The amnion is a membranous bag-like structure that develops around the embryo and is filled with amniotic fluid. It has the following functions:

- to **protect the embryo** by acting as a shock absorber
- regulating the embryo’s **body temperature**.
- Allows for easy foetal movement
## Birth Control

<table>
<thead>
<tr>
<th>Method</th>
<th>Action</th>
<th>Failure rate</th>
<th>Advantages and disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Barrier methods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condom</td>
<td>A rubber sheath, which fits over the penis and prevents sperm from entering the vagina.</td>
<td>3% to 10% depending on whether it is used properly</td>
<td>May slip off or break during intercourse. Must be fitted before intercourse.</td>
</tr>
<tr>
<td>Diaphragm or Dutch cap</td>
<td>A flexible rubber dome which fits over the cervix of the female and prevents sperm from entering the uterus. It must be used with a spermicide, which kills sperm.</td>
<td>3% to 15%</td>
<td>Can be inserted a few hours before intercourse. Must be fitted by a doctor the first time to ensure that it is the correct size.</td>
</tr>
<tr>
<td><strong>Hormonal methods</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>The Pill</td>
<td>Contains oestrogen and progesterone. The pill inhibits the secretion of FSH, thereby preventing the development of the eggs and ovulation.</td>
<td>1%</td>
<td>Very reliable. Side effects like water retention, weight gain, skin pigmentation, headaches and strokes. Not recommended for smokers and women over the age of 40.</td>
</tr>
<tr>
<td>Method</td>
<td>Description</td>
<td>Effectiveness</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------------------------</td>
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</tr>
<tr>
<td><strong>Mini-pill</strong></td>
<td>Contains progesterone only so ovulation takes place but thickened cervical mucus prevents sperm from entering the uterus.</td>
<td>2%</td>
<td>Very reliable with a lower dose of hormones. Can be used by older women. Side effects are breakthrough bleeding between periods, headaches and slight water retention.</td>
</tr>
<tr>
<td><strong>Implantation preventing methods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IUD (intra-uterine device) or coil</td>
<td>A device made of copper or stainless steel which is inserted into the uterine wall by a doctor and which prevents implantation of the fertilised egg.</td>
<td>3%</td>
<td>Can be inserted and left for a long period of time. Side effects are heavy periods and discomfort. The IUD may grow into the uterine wall, or may dislodge and come out.</td>
</tr>
<tr>
<td><strong>Natural methods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abstinence</td>
<td>No sexual intercourse.</td>
<td>0%</td>
<td>Very effective. No sexually transmitted diseases are transmitted. No side effects.</td>
</tr>
<tr>
<td>Rhythm method</td>
<td>Avoid sexual intercourse (abstinence) at time of ovulation.</td>
<td>20%</td>
<td>It is a natural method, but female cycles may vary and periods may be irregular. The Catholic Church accepts this method. No side effects.</td>
</tr>
<tr>
<td><strong>Sterilisation methods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube tying in females</td>
<td>The fallopian tubes are 'tied' or cut. This prevents the sperm from reaching the egg.</td>
<td>1%</td>
<td>The process is difficult to reverse. In some cases the 'tied' tubes come undone and fertilisation can take place. There are no side effects.</td>
</tr>
<tr>
<td>Vasectomy in males</td>
<td>Both vas deferens are cut.</td>
<td>1%</td>
<td>This is a simple procedure with no side effects. Semen is still released but sperm are absent. The process is very difficult to reverse.</td>
</tr>
<tr>
<td><strong>Termination methods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morning-after Pill</td>
<td>The pill contains an anti-progesterone drug and must be taken no more than 48 hours after sexual intercourse.</td>
<td>20%</td>
<td>This pill may have long-term effects. A doctor prescribes it after a rape or when other means of protection were not used. This pill should only be used as a last resort.</td>
</tr>
</tbody>
</table>
Section B: Practice Questions
Reproduction in Vertebrates

Question 1
Study the representation of an amniotic egg below and answer the questions that follow.

1.1 The eggs of fish and amphibians are simply covered by a layer of jelly. Explain why it was advantageous for early reptiles to develop amniotic eggs in terms of the evolutionary theory.

1.2 Explain how an amniotic egg develops, protects and supports the developing embryo.

1.3 Identify parts of an amniotic egg labeled A-G.

1.4 Write down the letter of the extra-embryonic membranes, describe AND give the function of each.

1.5 State the functions of the:

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**Hormonal methods**

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a.) yolk sacs  
b.) albumen layer  
c.) shell

**Human Reproduction - Anatomy**

**Question 2**

The diagram below shows the chromosome number of cells formed during the development of abnormal human sperm.

2.1 State the name of the biological process which produces sperm cells in males. (1)

2.2 In which organ in the human body are sperm produced? (1)

2.3 If a sperm with a chromosome complement of 23 + X fertilized a normal ovum, what is the sex and the number of chromosomes in the resulting zygote? (2)

2.4 Explain what could have gone wrong in the process mentioned in Question 2.3 that resulted in the sperm being produced with the incorrect chromosome number. (2)

**Question 3**

Study the diagram below and answer the questions that follow:

3.1 Provide labels 1 to 5. (5)

3.2 Where are the testes located at the time of birth? (1)

3.3 If a male has a vasectomy which numbered part is cut? (1)
3.4. Why is it necessary for a male to produce such a large quantity of sperm cells? (2)
3.5. Name one function of the epididymis. (1)
3.6. Why is it important that the testes are located outside of the abdominal cavity? (1)
3.7. When a boy/man contracts mumps (which affects the glands in the neck area) there is often a concern that the virus will spread to the testes. The virus causes damage to the Sertoli cells (cells in the seminiferous tubules that help with the development of the sperm). What do you think the result of testicular mumps will be? (2)

Human Reproduction – Ovulation and Menstruation

Question 4

Study the graph below, which shows the menstrual cycle and the influence of the different hormones on it.

4.1 On which day does ovulation take place? (1)
4.2 Between which days does menstruation take place? (1)
4.3 State ONE function of luteinizing hormone (LH). (1)
4.4 Describe the changes in the level of LH shown in the graph. (3)
4.5 Describe the relationship between the level of oestrogen and the endometrium from day 7 to day 14. (2)
4.6 Explain why it is necessary for the level of progesterone in the blood to increase after ovulation. (2)
4.7 Did fertilisation take place in the 28-day cycle illustrated in the graph? (1)
4.8 Explain your answer to QUESTION 4.7. (2)
Human Reproduction—Fertilization, Development and Gestation

Question 5

Study the diagram of the developing foetus below.

5.1. Label structures A, B and D.  

5.2. Give TWO functions of the fluid found in C.  

5.3. Name the process by which some of the fluid from C is withdrawn by doctors to test for abnormalities in the foetus.  

5.4. Describe the function of E during the birth process.  

Question 6

The diagram below illustrates what happens during in vitro fertilisation (IVF).
6.1 What process takes place at A?

6.2 Give TWO reasons why a couple may not be able to have children normally.

6.3 In IVF more embryos are produced than can be implanted in the woman's uterus. Explain whether each of the following uses of the spare embryos is ethical or not:
   a. It could be sold to couples that cannot have children
   b. It could be used to enhance research in embryology

6.4 State ONE way in which IVF differs from cloning.

Question 7

Read the paragraph below and answer the questions that follow.

MALE CONTRACEPTIVE CHEMICAL

Gossypol is a chemical which is extracted from the seeds of cotton plants. When gossypol was given to rats, mice, dogs and monkeys, it caused a reduction in the fertility of the male animals by reducing their sperm count.

Scientists wanted to investigate the idea that gossypol could be used as a human male contraceptive. [Adapted from: Liffen and Liffen, 1987]

7.1. State a hypothesis for the investigation that scientists wanted to do.

7.2. State FOUR planning steps that must be followed by researchers before the investigation above is undertaken on humans.

7.3. In the investigation above, name the following:
   a. Dependent variable
   b. Independent variable

7.4. Explain ONE reason why some people might:
   a. Support research on male contraception
   b. Object to research on male contraception

Section C: Solutions

Reproduction in Vertebrates

Question 1

1.1. Reptiles were the first vertebrates to inhabit land therefore natural selection ensured that features that favoured terrestrial conditions were retained in the population the amniotic egg protects the embryo from desiccation (drying out) whereas the eggs of the fish/amphibians are supported by water.

1.2. Amniotic eggs develop after fertilization. The developing embryo is surrounded by a shell and extra-embryonic membranes filled with fluid. These membranes prevent dehydration of the embryo and provide nutrients, water and oxygen to the embryo, while waste products are removed/stored.

1.3. A - embryo
    B - amnion
    C - chorion
    D - yolk sac
    E - shell
    F - albumen
    G - allantois
1.4. B □ the amnion encloses a fluid-filled cavity around the embryo □ protects the embryo against shocks, injuries, temperature changes and dehydration □
C □ the chorion is the outermost membrane that surround all the other membranes □ in birds and mammals it allows for gaseous exchange □
G □ the allantois is a sac that arises from the embryos intestine □ it collects waste products and helps with gaseous exchange □

1.5
a. filled with energy-rich yolk and serves as food for the developing embryos of reptiles and birds □
b. reserve source of food □
c. protects the developing embryo/is porous for gaseous exchange/ prevents dehydration □

Human Reproduction - Anatomy

Question 2
2.1. spermatogenesis □ (1)
2.2. testis □ □ (1)
2.3. female □ and 47 □ (2)
2.4. During the process of meiosis □ the chromosome pair does not separate/non disjunction occurs □ with the result that there is an extra chromosome/trisomony □ (2)

Question 3
3.1 1- vas deferens □
2 - urethra □
3 - penis □
4 - testis □
5 - scrotum □
3.2 Abdominal cavity □
3.3 □
3.4 The larger the quantity of sperm produced the greater the chance □ that fertilization will occur □
3.5 To store sperm □
3.6 To keep the temperature cooler for ideal sperm production □
3.7 Cells of Sertoli nourish the sperm □ if they are infected the boy/man could become in fertile □

Human Reproduction – Ovulation and Menstruation

Question 4
4.1 Accept day 14 or day 15 □ (1)
4.2 Days 0 - 7 □ (1)
4.3 Causes the follicle to burst open □ /stimulates ovulation
Stimulates the formation of the corpus luteum □
(Mark first ONE only)
4.4 LH levels remain low up to day 12/13 □
Then it increases sharply up to day 14 □
After which it decreases and remains low □ (3)
4.5 As the oestrogen level increases □ the thickness of the endometrium also increases □
4.6 Maintain the increase in the thickness of the endometrium □ for greater chance of implantation □ also to suppress FSH so no more follicles develop (2)
4.7 No □ (1)
4.8 The progesterone level □ has dropped □ /not maintained/corpus luteum has started to degenerate (2)
Human Reproduction–Fertilization, Development and Gestation

Question 5

5.1 A Placenta ✓ B Umbilical cord ✓ D Vagina ✓ (3)

5.2 Acts as a shock absorber ✓
   Regulates embryo’s body temp / keeps temp constant / allows for easy foetal movement ✓ (2)

5.3 Amniocentesis ✓ (1)

5.4 Hormones released by Pituitary gland ✓. Causes uterine contractions, push baby out through the birth canal ✓ (2)

Question 6

6.1 Fertilisation ✓ (1)

6.2 Couple could not conceive normally due to any of the following:
   Man has low sperm count/ infertile ✓
   Blocked Fallopian tubes ✓
   Irregular menstrual cycles ✓
   Imbalance of the hormones concerned with ovulation ✓
   Sexually transmitted diseases ✓ any (2)
   (Mark first TWO only)

6.3 (a) Ethical since it allows couples to have children if one of them might be infertile ✓
   OR
   Unethical since only those that are rich ✓ would be able to take advantage of the opportunity ✓ any 1 x 2 (2)
   (b) Ethical since it can be used to develop treatment ✓ for defects in foetuses ✓
   OR
   Unethical since this is experimentation with human life ✓ any 1 x 2 (2)

6.4 IVF involves fusion of 2 haploid nuclei ✓/gametes
   Where as in cloning no fusion takes place ✓/diploid nucleus from a somatic cell is used.
   OR
   IVF can lead to variation ✓ in the offspring
   Where as cloning produces identical ✓ offspring OR
   IVF mimics natural sexual reproduction ✓ whereas cloning no sexual reproduction ✓ (2)
   (Mark first ONE only)

Question 7

7.1 Gossypol ✓ acts as a contraceptive ✓ in males ✓
   OR
   Gossypol ✓ does not act as a contraceptive ✓ in males ✓
   OR
   Gossypol ✓ has no effect ✓ on male fertility ✓
   OR
   (Gossypol ✓ has an effect ✓ on male fertility ✓)
OR

(Gossypol increases male fertility)

OR

(Gossypol decreases male fertility)

7.2 Determine the sample size

Find volunteers

and a comparable group as a control

Design a way of recording the data

7.3 a. Number of sperm

b. Amount of Gossypol

7.4 a. Men can also take the responsibility for contraception

Men don't have to use a condom during intercourse

Control/lower population growth

(Mark first TWO only)

b. Could have side effects/effects not yet known

Against some people's religion to use contraceptive

Some men don't want to take responsibility for contraception/women are responsible for contraception

(Mark first TWO only)