

**GAUTENG DEPARTMENT OF EDUCATION
PREPARATORY EXAMINATION**

**LIFE SCIENCES
(First Paper)**

POSSIBLE ANSWERS

SECTION A

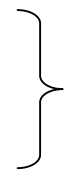
QUESTION 1

- 1.1
- 1.1.1 A ✓✓
- 1.1.2 D ✓✓
- 1.1.3 C ✓✓
- 1.1.4 B ✓✓
- 1.1.5 D ✓✓ 5x2=(10)
- 1.2
- 1.2.1 Endosperm ✓
- 1.2.2 Placenta ✓
- 1.2.3 Urethra ✓
- 1.2.4 Locus/Loci ✓
- 1.2.5 Oxytocin ✓ 5x1=(5)
- 1.3
- 1.3.1 B ✓
- 1.3.2 A ✓
- 1.3.3 C ✓
- 1.3.4 D ✓
- 1.3.5 C ✓ 5x1=(5)
- 1.4
- 1.4.1 A- Spermatogenesis ✓
B- Oogenesis ✓
C- Fertilisation ✓
D- Implantation ✓
E- Gestation ✓ (5)
- 1.4.2 Ovulation ✓ (1)
- 1.4.3 Luteinising Hormone / LH ✓ (1)
- 1.4.4 IUD/(Intra-Uterine Device) ✓
Copper T ✓
Coil ✓
Loop ✓ (1)
- Mark first one

1.4.5 Vasectomy. ✓ (1)

1.4.6

- No prevention against STI's ✓✓
- The method is irreversible ✓✓
- The method is costly ✓✓
- Requires a surgical procedure ✓✓



Mark first one 1x2=(2)

1.5

1.5.1 (a) RR ✓ (1)

(b) Rr ✓ (1)

(c) rr ✓ (1)

1.5.2 (a) Red ✓ (1)

(b) Red ✓ (1)

1.5.3 **P1** Phenotype Red X White ✓

Genotype: RR X rr ✓

Gametes: R r ✓

F1: Rr Rr Rr Rr ✓

Genotype All Rr ✓ / 100% Rr

Phenotype: All Red ✓ / 100% Red

OR

Gametes	R	R
r	Rr	Rr
r	Rr	Rr

1 mark for correct gametes
1 mark for correct offspring
1 mark for P1 and F1

(7)

1.6

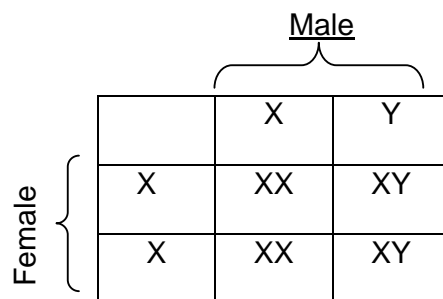
1.6.1 Fraternal / Dizygotic twins ✓ (1)

1.6.2

- Fraternal twins can be the same gender or different gender / sex ✓✓
- Different genetic compositions ✓✓
- Karyotype shows one is male and one is female ✓✓
- One has XX and the other has XY sex chromosomes ✓✓

Mark first one 1x2=(2)

1.6.3



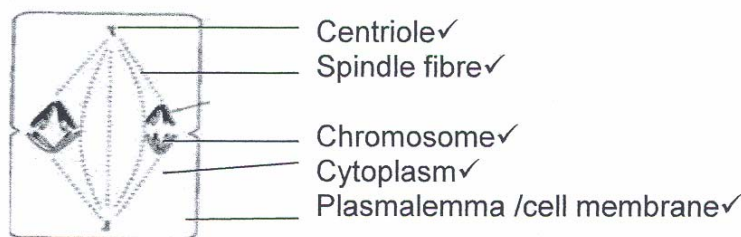
- Correct male gametes (1)
- Correct female gametes (1)
- 2 x XX genotype (1)
- 2 x XY genotype (1)

TOTAL SECTION A: (4)
[50]

SECTION B

QUESTION 2

- 2.1
- 2.1.1 Metaphase 1 ✓ (1)
- 2.1.2 Homologous / Bivalent / Tetrad ✓ (1)
- 2.1.3 Crossing over ✓ (1)
- 2.1.4 It ensures genetic variation ✓✓ (2)
- 2.1.5 Diploid ✓ (1)
- 2.1.6



Anaphase 1 (4)

- Caption – (1)
- Labels – Any 2 (2)
- Drawing – showing four chromosomes – two moving to each pole (1)

2.2

2.2.1 (a) 1952 – 1874 ✓
= 78 years ✓ (2)

(b) Oswald Avery supported the theory of Griffiths

OR

Watson and Crick formulated their three dimensional model based on the photograph taken by Rosalind Franklin.

OR

Watson and Crick formulated their three dimensional model based on Erwin Chargaff's findings that there is an equal amount of Adenine and Thymine bases as well as Guanine and Cytosine. Any one (1)

2.2.2 (a) Yes. (✓)
They did a lot more extensive research, the photo only steered them in the right direction. (✓).

or

No. (✓)
They might have never concluded the model they did, if they hadn't used the photo by Franklin. (✓) (2)

(b) Genetic information (✓) is passed from parent to offspring (✓) via this molecule. (2)

(c) Three-dimensional model (✓) (1)

2.3

2.3.1 This is a procedure where a small amount of amniotic fluid (✓) is drawn from the uterus (✓), that is surrounding the baby. (2)

2.3.2 40 (✓) (1)

2.3.3 Table showing the results of the survey on amniocentesis.

Outcomes of the questions on amniocentesis											
Question 1				Question 2				Question 3			
YES		NO		YES		NO		YES		NO	
Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
10	16	10	4	5	7	15	13	12	15	8	5

OR

QUESTION	YES		NO	
	Boys	Girls	Boys	Girls
1	10	16	10	4
2	5	7	15	13
3	12	15	8	5

Caption ✓

Data in table: All correct entries ✓✓

Correct column/row headings ✓

Some correct entries ✓

Draw table ✓

(5)

2.3.4 $\frac{13(✓)}{20(✓)} \times 100(✓)$
= 65 (✓) %

(4)

[30]

QUESTION 3

- 3.1
- 3.1.1 DNA/Deoxyribonucleic acid (✓) (1)
- 3.1.2 1 – Sugar/deoxyribose (✓)
2 – Cytosine (✓)
3 – Thymine (✓) (3)
- 3.1.3 Nucleotide (✓) (1)
- 3.1.4 Replication (✓) (1)
- 3.2
- 3.2.1 ACU(✓) CCU(✓) GAA(✓) *Sequence is important* (3)
- 3.2.2 Ribosome (✓) (1)
- 3.2.3 Threonine (✓) }
Proline (✓) } *Sequence is important*
Glutamate (✓) } (3)
- 3.3
- 3.3.1 X^hY (✓✓) (2)
- 3.3.2 P1: X^hY X $X^H X^h$ (✓)
Gametes: X^h Y X^H X^h
F1: $X^H X^h$ (✓) $X^h X^h$ (✓) $X^H Y$ (✓) $X^h Y$ (✓)
50 % (✓) probability of having haemophilia (6)
- 3.4
- 3.4.1 Suspect 2. (✓) (1)
- 3.4.2 The bar code pattern of suspect 2 correlates exactly with that of the documentary evidence (✓). (1)
- 3.4.3 Yes (✓). He/she can argue that the dry blood came from the victim him-/herself. (✓✓) (3)
- 3.4.4 The forensic team should also have made a DNA print of the victim's DNA (✓) in order to compare it with the evidence. (✓) (2)

3.4.5 Yes. (✓) If he/she knows he/she is innocent, they would not have a problem giving his DNA, so the suspect is most probably guilty and should therefore be forced to give DNA sample (✓). / By committing a murder, you have taken the life of another person and have therefore surrendered your own rights to privacy (✓). (2)

OR

No. (✓) His right to privacy cannot be violated (✓) / He cannot be forced to do anything against his will (✓). (2)

TOTAL SECTION B: [60]

SECTION C

QUESTION 4

4.1

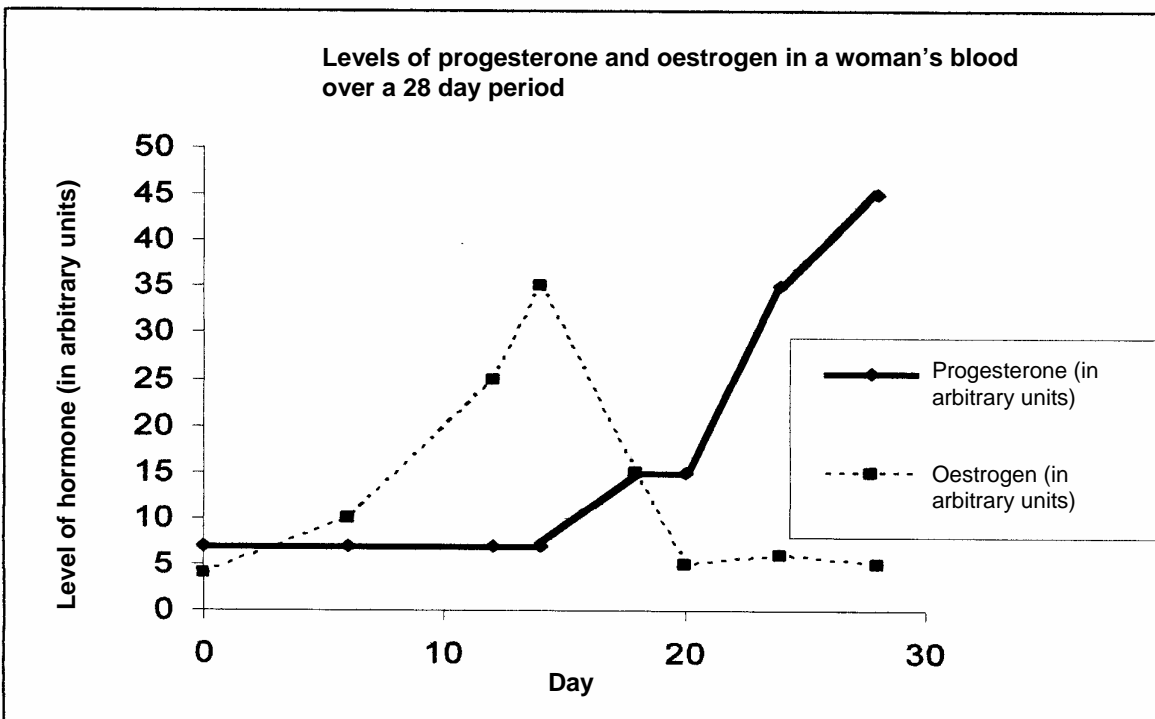
4.1.1 Prevalence of Down's syndrome increases with the mother's age
OR
An older mother is more likely to have a baby with Down's syndrome. Any one (2)

4.1.2 Accept range 2.4 to 2.6 % ✓✓ (2)

4.1.3 No. ✓ Down's syndrome results from an unequal division of chromosomes ✓ during anaphase 1 of meiosis ✓. This may occur during the formation of either of the gametes (sperm or ova) ✓ (4)

4.2

4.2.1



RUBRIC FOR GRAPH

CRITERIA		MARK ALLOCATION
Caption	Includes both variables	(2)
X-axis	Label	(1)
	Scale	(1)
Y-axis	Label (with units)	(1)
	Scale	(1)
Key	Present	(1)
Plotting (progesterone)	1 to 4 correct points	(1)
	4 to 8 correct points	(2)
Plotting (oestrogen)	1 to 4 correct points	(1)
	4 to 8 correct points	(2)
Joining (progesterone)		(1)
Joining (oestrogen)		(1)
Total		(13)

4.2.2 (a) Menstruation ✓
(b) Ovulation ✓ (2)

4.2.3 The progesterone levels remain high. ✓ This will serve to maintain the endometrium / to maintain the foetus ✓ (2)

4.3 ESSAY

Causes of infertility

- A woman does not ovulate. Due to genetic / physiological / hormonal reasons, the ovaries do not release mature ova.
- A blockage of the Fallopian tubes. Ova are produced at the ovaries, but due to blockage in the Fallopian tubes / Oviducts, the sperm cannot reach the ova for fertilization to occur.
- Male sperm count may be too low. The actual number of viable sperm in the semen may not be enough to allow for fertilization to occur.
- Abnormal sperm due to hormones / mutations / infections / radiation
- Sperm are unable to survive the conditions in the female reproductive tract. Reduced sperm motility / quality.
- Damage to the oviducts / uterus / cervix, resulting in no implantation. Endometriosis.
- The female body may produce antibodies to the male sperm.
- Uterine damage may result in inability of zygote to implant. (Any 2) (4)

Fertility treatments

- **Fertility drugs:** A woman may be given synthetic hormones to promote the production and release of ova.
- **In-vitro fertilization (IVF)**
Ova are removed from the female and fertilized with the male sperm in a Petri dish / test tube. The resulting embryos are then implanted into the uterus.
- **Gamete Intra Fallopian Transfer (GIFT):** If there is a blockage in the oviducts / fallopian tubes. This is similar to IVF, except that the sperm and eggs are transferred into the uterus before fertilization occurs.
- **Surgery:** this may be done to bypass or remove a blockage in the oviducts, thereby allowing the passage of the ova (fertilized to the uterus / passage of the sperm to the oviducts).
- **Artificial insemination:** where viable sperms are introduced into the cervix / uterus by a medical worker.
- **Sperm/ova banks.** Individuals who have healthy sperm / ova donate these for use by individuals who cannot ovulate or who produce defective sperm. The treatment usually involves artificial insemination or in-vitro fertilization
- **Surrogacy:** Is an alternative for a female who cannot carry an embryo in her own uterus due to damage thereof. This method involves in-vitro fertilization and the subsequent implantation of the embryo into another female, who will carry the baby to term. Any 2 (4)

Advantages

- Couples who could not previously have children are afforded the opportunity to become parents.
- Single / unmarried individuals will have the opportunity to parent a child.
- Post menopausal women are able to have children.
- Partners with different sexual preferences are able to become parents. Any 1 (2)

Disadvantages

- Infertility treatment is time consuming and expensive.
- Legal issues of paternity and ownership may arise (especially in cases of surrogacy).
- Where sperm / ova donors are concerned, genetic abnormalities may be passed onto the offspring.
- Multiple births may occur as a result of infertility treatments.
- Post menopausal women may not be fit to raise children. Any 1 (2)
Synthesis (3)

Description	Marks
1. Ability to recognize causes of infertility	1
2. Ability to identify respective reproductive technologies	1
3. Ability to classify relevant advantages and disadvantages	1

TOTAL SECTION C: [40]

TOTAL: 150