CHAPTER 2 - MEIOSIS

MEIOSIS I

QUESTION 1

1. B

2. C

3. A

4. B

5. C

QUESTION 2

1. Chiasma

2. Autosomes

3. Karyokinesis

4. Prophase I

5. Non-disjunction

6. Anaphase I

7. Downs syndrome

8. Metaphase I

9. Gonosomes

10. Centriole

QUESTION 3

1. Prophase I

2. Homologous chromosomes pair together. Pairs of chromatids of each chromosome over- lap at a point called the chiasma. A break occurs at the chiasmata and the chromosomes separate. Each has one chromatid from its homologue partner with genetic material and one original chromatid.

3. Crossing over results in an exchange of genetic material ensuring that the gametes produced have genetic variation.

4. Metaphase I

 Bivalents arrange themselves randomly at the equator of the cell.

 Spindle fibres become attached to the centromeres.

QUESTION 4

1. X – chiasma Y - centromere

2. A pair of chromosomes that are similar in length/ carry genes for the same characteristics/ have alleles at the same loci/ have the same centromere position/ one is obtained from each parent

3. Chromatin network shortens to form chromosomes

 Homologous chromosomes come together in pairs

 An exchange of genetic material occurs between chromatids of a homologous pair-this process is called crossing over-the point of crossing over is called the chiasma

 The nucleolus and nuclear membrane disintegrate

 Each centriole moves to a pole of the cell

 Spindle fibres radiate from the centrioles

4. Random arrangement of chromosomes

5. 2 X 20 = 40 chromosomes

QUESTION 5

1. Telophase I

2. a) D centriole

 b) B chromosome

 c) E centromere

 d) C spindle fibres

3. a) 4

 b) 2

4. Anaphase I

 Spindle fibres shorten and the chromosomes in each bivalent separate ad move to opposite poles

 A cleavage furrow forms at the equator of the cell, which starts to divide the cytoplasm

5. Animal cell.

 Presence of spindle fibres or presence of centrioles

MEIOSIS II

QUESTION 1

1. D

2. D

3. C

4. D

5. A

QUESTION 2

1. a) chromosome

 b) spindle fibre

 c) centromere

2. Metaphase II

 Chromosomes are arranged along the equator singly

3. Prophase II

 Nuclear membrane and nucleolus disappear

 The centrosome splits into two centrioles which moves to opposite poles

 Spindle fibres radiate from the centrioles

4. Drawing of Anaphase I

QUESTION 3

1. Telophase II

 4 cells present/single stranded chromosomes present

2. a) 2

 b) 4

3. Anaphase II

 Chromosomes split and each daughter chromosomes is pulled to opposite poles

 Cleavage furrow appears at the equator of the cell, marking the beginning of cytokinesis

MEIOSIS I AND MEIOSIS II

QUESTION 1

1. W – homologous chromosome X – cell membrane

2. a) 4

 b) 2

3. D

4. Y – holds two chromatids together after DNA replication

 Z –attached to the centromere of the chromosome it shortens and the chromosome separate and move to opposite poles during anaphase

5. Telophase II

6. Table showing differences between Meiosis and Mitosis

Meiosis Mitosis

Occurs in all somatic cells Occurs in sex organs when gametes are formed

Nucleus divides once Nucleus divides twice

Two cells are genetically identical to each other and the parent cell

 Four cells are genetically different from each other and the parent cell

QUESTION 2

1. Metaphase I

2. Crossing over of homologous chromosomes has occurred in prophase I

3. Testis

4. Random arrangement of the chromosomes at the equator of the cell causing the chromosomes of the gametes to be different

5. Table showing differences between Meiosis I and Meiosis II

Meiosis I Meiosis II

Crossing over takes place at prophase No crossing over takes place at prophase

In metaphase the chromosomes align at the equator in homologous pairs In metaphase the chromosomes align singly at the equator

During anaphase whole chromosomes move towards the pole During anaphase the chromatids move towards the pole

Reduction division No reduction division

6. a) During meiosis the chromosome pair 21 does not separate/there is non- disjunction. Two gametes (A and B) will have an extra copy of chromosome 21 and therefore the other gametes (C and D) do not have a copy of chromosome 21

(b) Down’s syndrome/Trisomy 21

 If this gamete fuses with a normal egg cell having 1 copy of chromosome 21 the resulting zygote will have 3 copies of chromosome number 21/47 chromosomes

QUESTION 3

1. Meiosis

2. Chromosomes arranged at the equator in homologous pairs-evidence seen in diagram 2

 Exchange of genetic material-evidence seen in all 3 diagrams

3. During prophase I, the homologous chromosomes pair/come together in pairs. The chromatids of each chromosome overlaps/crossing over occurs, at the chiasma which is the point of crossing over genetic material is exchanged

4. 2-metaphase I 1-anaphase I 3-anaphase II

5. Chromosome number is halved which results in the production of gametes

 Halving the chromosome number balances out the doubling effect of fertilisation

 Each cell produced is genetically different, this ensure variability in the offspring produced by the two parents

6. Ovary

7. Both involves the division of cells

 DNA replication occurs in both

 Spindle fibres are formed in both

 The nucleus divides first then the cytoplasm

 New cells form at the end of the division