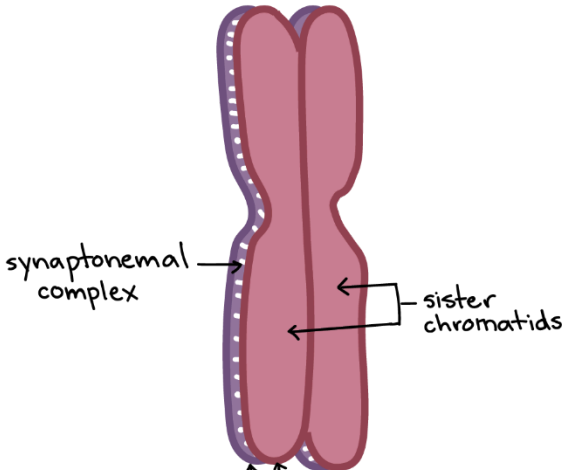
IB Biology Revision

Topic 3.3 & 10.1 - Meiosis



Name:

Teacher: Mr Trent

1. *[1 mark]*

What is produced by meiosis in a cell of a male animal?

A. Four gametes, each with the same number of chromosomes

B. Two gametes, each with the same number of chromosomes

C. Four gametes, each with different numbers of chromosomes

D. Two gametes, each with different numbers of chromosomes

2. *[1 mark]*

Which process occurs in meiosis but not in mitosis?

A. Attachment of spindle fibres to the centromeres of each chromosome

B. Movement of homologous chromosomes to opposite ends

C. Replication of DNA prior to the start of cell division

D. Separation of sister chromatids during anaphase

3. *[1 mark]*

When a cell divides by meiosis, chiasmata can be observed. Which are features of chiasmata?

I. They are points of attachment between chromatids of non-homologous chromosomes.

II. They occur during meiosis I.

III. They increase stability of bivalents.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

4. *[1 mark]*

Down syndrome can be detected before birth by chorionic villus sampling. From where are the cells for this test taken?

A. Amniotic fluid surrounding the fetus

B. Fetal digestive system

C. Tissue in the placenta

D. Lining of the uterus of the mother

5. *[1 mark]*

Which statement applies to meiosis and mitosis?

A. Meiosis occurs in a greater number of locations in the body compared to mitosis.

B. Separation of chromatids occurs in both meiosis and mitosis.

C. Recombination occurs in both meiosis and mitosis.

D. Reduction in chromosome number occurs in both meiosis and mitosis.

6. *[1 mark]*

Which statement is valid regarding chromatids?

A. Sister chromatids separate during meiosis I.

B. Chiasmata form between non-sister chromatids.

C. Crossing over is the exchange of DNA between sister chromatids only.

D. Non-sister chromatids have the same combination of alleles.

7. *[1 mark]*

Which event happens in meiosis II but not in meiosis I?

A. Spindle microtubules attach to centromeres.

B. Crossing over occurs.

C. Sister chromatids move to opposite poles.

D. Chromosomes become shorter and thicker by coiling.

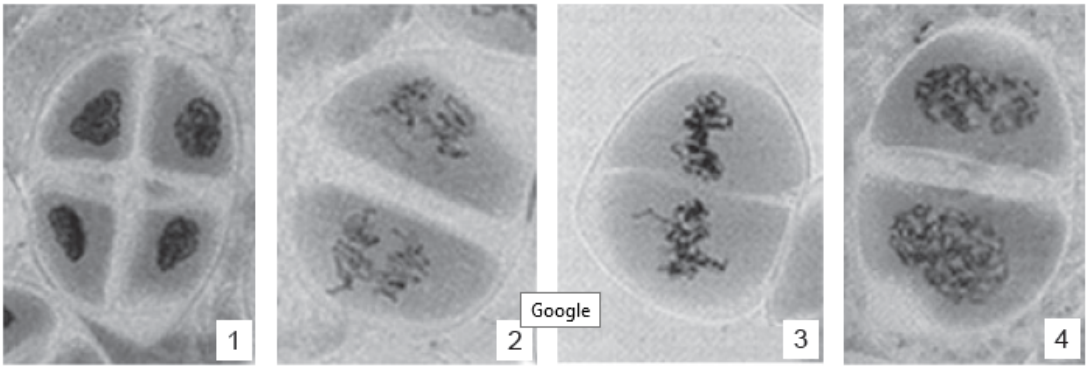
8. *[1 mark]*

During which phase of the first division of meiosis can non-disjunction take place and what structure is affected by the non-disjunction?

	Meiotic phase	Structure
A.	Anaphase	chromosomes
B.	Anaphase	chromatids
C.	Metaphase	chromosomes
D.	Metaphase	chromatids

9. *[1 mark]*

The micrographs show four different phases from meiosis II. What is the correct order?



[Source: http://biologyforhighschool.net]

A. 3-4-2-1

B. 2-3-4-1

C. 4-3-2-1

D. 4-2-3-1

10. *[1 mark]*

What happens during meiosis I and meiosis II?

	Meiosis I	Meiosis II
A.	chromosome number remains diploid	chromosome number reduced from diploid to haploid
B.	homologous chromosomes pair randomly in metaphase I	sister chromatids separate in metaphase II
C.	homologous chromosomes separate in anaphase I	sister chromatids separate in anaphase II
D.	homologous chromosomes separate in anaphase I	crossing over occurs in prophase II

11. *[1 mark]*

What is always passed to the next generation as a result of sexual reproduction?

A. Homologous chromosomes from the mother

B. A chromatid from every chromosome of the father

C. A haploid set of chromosomes from the mother

D. All alleles from each parent

12. *[1 mark]*

Which process could cause non-disjunction if it occurred during meiosis?

A. Sister chromatids do not align in metaphase I.

B. Homologous chromosomes do not separate in anaphase I.

C. Sister chromatids do not align in metaphase II.

D. Homologous chromosomes do not separate in anaphase II.

13. *[1 mark]*

What helps make the genome of each human unique?

	Orientation of pairs of homologous chromosomes during meiosis	Crossing over during meiosis	Fusion of gametes from two different parents
A.	✓		✓
B.		✓	✓
C.	✓	✓	
D.	✓	✓	✓

14. *[2 marks]*

Describe the process of crossing over.

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15. *[5 marks]*

Distinguish between the processes of meiosis and mitosis.

16. *[5 marks]*

According to the cell theory, living organisms are composed of cells.

Outline what occurs in cells in the first division of meiosis.

17. *[3 marks]*

Draw a labelled diagram of the formation of a chiasma by crossing over.

18. *[1 mark]*

What description is matched with the correct phase in meiosis I?

A.	Prophase I	recombination occurs only between sister chromatids
B.	Metaphase I	homologous chromosomes join together at each end of the cell
C.	Anaphase I	homologous chromosomes are pulled apart
D.	Telophase I	two diploid nuclei are produced

1. *[1 mark]*

A

2. *[1 mark]*

B

3. *[1 mark]*

C

4. *[1 mark]*

C

5. *[1 mark]*

B

6. *[1 mark]*

B

7. *[1 mark]*

C

8. *[1 mark]*

A

9. *[1 mark]*

C

10. *[1 mark]*

C

11. *[1 mark]*

C

12. *[1 mark]*

B

13. *[1 mark]*

D

14. *[2 marks]*

Markscheme

a. occurs during prophase I/during meiosis

b. homologous chromosomes form bivalents/pair up

c. breakage and rejoining of chromatids

d. exchange «of DNA/alleles» between non-sister chromatids/homologous chromosomes

[Max 2 Marks]

15. *[5 marks]*

Markscheme

	Mitosis	Meiosis
a.	occurs in/produces somatic cells	occurs in/produces sex cells;
b.	one cell division	two cell divisions;
c.	produces two (daughter) cells	produces four (daughter) cells;
d	daughter cells identical to parent cell / does not produce genetic variation	daughter cells differ from parent cell / produces genetic variation;
e	produces cells for growth/repair	produces gametes/for reproduction;
f	chromosome number stays the same/2n/diploid	chromosome number is halved/1n/haploid;
g	pairing of chromosomes does not occur	homologous chromosomes join together/pair;
h	no exchange of material between chromosomes/no crossing over;	exchange of material between chromosomes/crossing over;

16. *[5 marks]*

Markscheme

a. halves the chromosome number/produces haploid cells;

b. at start of meiosis each chromosome consists of two sister chromatids attached by a centromere;

c. prophase (I): pairing of homologous chromosomes;

d. crossing over occurs;

e. chromosomes condense by supercoiling;

f. metaphase (I): pairs of homologous chromosomes/bivalents move to equator of spindle
OR
metaphase (I): orientation of pairs of homologous chromosomes (prior to separation) is random;

g. anaphase (I): centromeres do not divide
OR
anaphase (I): spindle fibre pulls chromosome/whole centromere with two sister chromatids to opposite poles;

h. telophase (I): arrival of centromere with sister chromatids at opposite poles;

Some of these can be awarded for correctly annotated diagrams.

No credit for events in meiosis II.

17. *[3 marks]*

Markscheme

a. «crossing over/chiasmata shown between» homologous chromosomes

b. centromere drawn and labelled

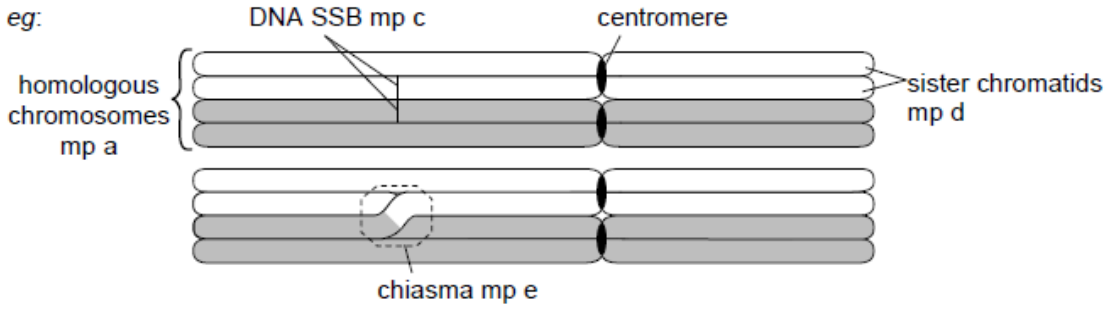
c. single strand break «SSB»/DNA cut between homologous chromosomes

d. non-sister chromatids labelled
OR
sister chromatids labelled

e. chiasma between homologous chromosomes labelled «shown forming after SSB»

Homologous chromosomes must be labelled and correctly drawn.

It is likely that more than one diagram will need to be included to demonstrate the stages.



18. *[1 mark]*

Markscheme

C

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