

Revision Notes for Higher Biology

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THE COURSE

- This book is designed to cover the Scottish Qualifications Authority (SQA) Higher Grade Syllabus in Biology.

USING THE BOOK

- You can indicate your knowledge and understanding of pieces of information with a ✓ next to the numbered box at the left hand side.
- Space has been left at the right hand side for you to make additional notes.
- You can also mark statements with a highlighter pen.
- Much of the information has been simplified by the extensive use of tables. These should be studied carefully in order that the facts are fully understood.

READING THE TABLES

- Always take note of the column heading.
- In tables drawn with single vertical lines the information should be read across the way.

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- In tables drawn with double vertical lines the information should be read across **and** down the way.

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YOUR REVISION

- It is worth planning your revision in advance.
- A **checklist** of **content areas** and **topics** has been provided below to allow you to keep track of your revision.
- The **appendices** provide further useful information on problem solving and the exam.
- Use the **revision planner** to make up your own timetable for study.

CHECKLIST OF CONTENT AREAS and TOPICS

UNIT 1 CELL BIOLOGY

Content Area	Topic	Page	Check
Cell structure in relation to function	1 Cell variety	5	
	2 Absorption and secretion	8	
Photosynthesis	3 Light and pigments	12	
	4 Photolysis and carbon fixation	16	
Energy release	5 Role and production of ATP	21	
	6 Respiration reactions	23	
Synthesis and release of proteins	7 Proteins	29	
	8 DNA	30	
	9 RNA and protein synthesis	34	
	10 Release of proteins	39	
Cellular response in defence in animals and plants	11 Viruses	41	
	12 Cellular defence mechanisms (animals)	43	
	13 Cellular defence mechanisms (plants)	45	

UNIT 2 GENETICS AND ADAPTATION

Content Area	Topic	Page	Check
Variation	14 Meiosis	46	
	15 Genetics	51	
	16 Mutation	62	
Selection and speciation	17 Natural selection	65	
	18 Speciation	67	
	19 Artificial selection	70	
	20 Genetic engineering	72	
Animal and plant adaptations	21 Maintaining a water balance (animals)	74	
	22 Maintaining a water balance (plants)	77	
	23 Adaptations in plants	80	
	24 Obtaining food (animals)	82	
	25 Obtaining food (plants)	88	
	26 Coping with dangers (animals)	90	
	27 Coping with dangers (plants)	92	

UNIT 3 CONTROL AND REGULATION

Content Area	Topic	Page	Check
Control of growth and development	28 Growth differences	93	
	29 Genetic control	99	
	30 Hormonal influences	103	
	31 Environmental influences	106	
Homeostasis	32 Homeostasis in mammals	109	
Population dynamics	33 Regulation in populations	113	
	34 Succession & climax in plant communities	116	

APPENDICES

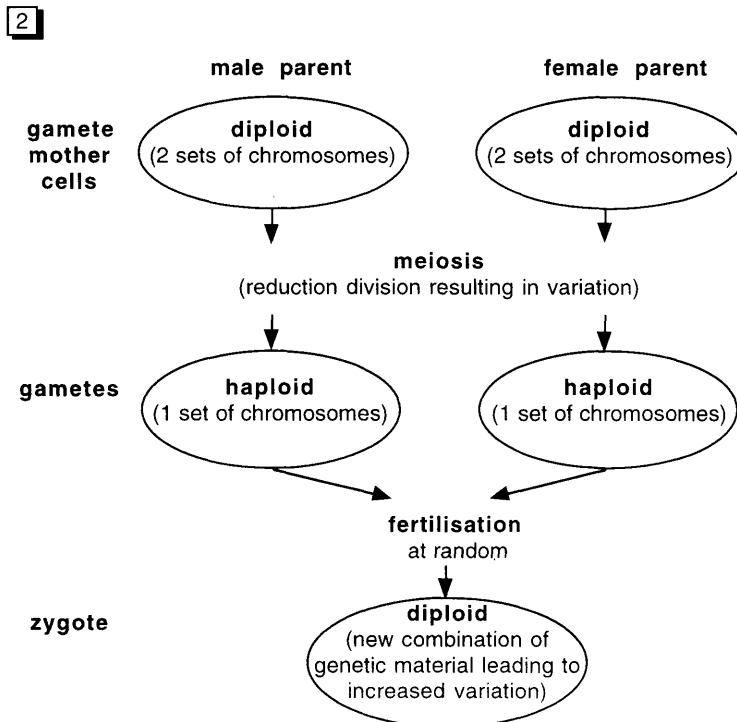
Appendix	Content	Page	Check
1	Problem Solving	117	
2	The Exam	125	

1 **Variation**

- helps a species survive and adapt to a changing environment
- is determined by genes, carried on chromosomes
- is maintained by sexual reproduction
- is important in long term evolutionary change

GAMETES AND FERTILISATION

1 **Gamete mother cells** are the only diploid cells which undergo meiosis to form **haploid** gametes



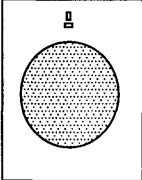
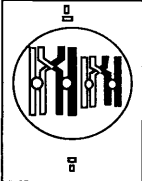
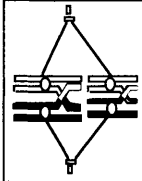
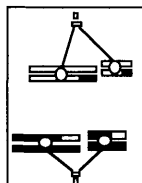
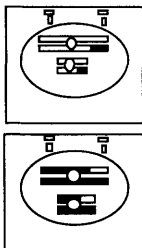
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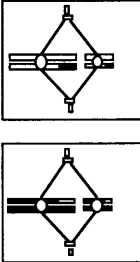
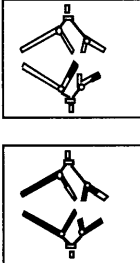
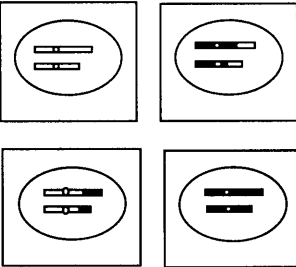
	Location of gamete mother cells	Gametes formed
Mammals	testes ovaries	sperm ova
Flowering plant	anther ovary	pollen ovules

MEIOSIS**1****Definition of terms**

Term	Definition
Homologous pair	pair of chromosomes similar in size, shape and position of centromere have the same gene at a particular locus
Centriole	cell organelle organises spindle formation in animal cells
Spindle	fibres providing a framework for the attachment of chromosomes
Chiasmata	sites at which chromatids of homologous pairs have broken and rejoined during the first meiotic division
Independent assortment	possible arrangements of homologous pairs on the equator the orientation of any one pair is unaffected by that of the others.

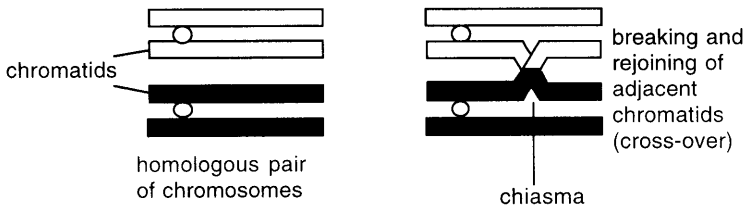
Process of meiosis in a cell with 2 pairs of homologous chromosomes

First meiotic division	Notes
 <p data-bbox="262 248 544 272">replication of chromosomes</p>	<p data-bbox="580 248 824 300">chromosomes long, thin and uncoiled</p>
 <p data-bbox="262 459 538 612">chromosomes visible homologous chromosomes pair crossing over occurs</p>	<p data-bbox="580 459 729 560">chromosomes have coiled to become short and thick</p> <p data-bbox="580 587 703 611">chiasmata</p>
 <p data-bbox="262 695 471 796">homologous pairs of chromosomes attach to spindle at equator of cell</p>	<p data-bbox="580 695 729 746">independent assortment</p>
 <p data-bbox="262 927 446 1002">homologous pairs move to opposite poles</p>	<p data-bbox="580 927 729 1002">chromatids are still joined at centromere</p>
 <p data-bbox="262 1161 446 1185">cytoplasm divides</p>	<p data-bbox="580 1161 754 1185">2 haploid cells</p> <p data-bbox="580 1241 770 1291">nuclear membrane reforms</p> <p data-bbox="320 1425 807 1449" style="text-align: center;">END OF THE FIRST MEIOTIC DIVISION</p>

Second meiotic division	Notes
 <p>chromosomes line up at equator</p>	<p>nuclear membranes disappear new spindles form</p>
 <p>chromatids move to opposite poles</p>	<p>centromeres split</p>
 <p>cytoplasm divides</p>	<p>nuclear membrane reforms</p> <p>4 haploid gametes formed</p>

3

Crossing over



4

Importance of meiosis

Feature	Importance	
Gametes are haploid	fusion restores diploid number	
Chiasmata	results in new combinations of genes	increases variation
Independent assortment	results in new combinations of genetic material	
Gametes are genetically different	fertilisation produces new combinations of chromosomes	

5

Comparison between meiosis and mitosis

Feature	Mitosis	Meiosis
Place where it occurs	body tissues	sex organs
Pairing of homologous chromosomes	no	yes
Chiasmata formation	no	yes
Number of divisions of nucleus	one	two
Number of daughter cells	2	4
Ploidy of daughter cells	diploid (or same as mother cell)	haploid
Effect on chromosome number	unaltered	halved
Processes providing variation	none	independent assortment and crossing over