



HSC Biology

Student Workbook

Student name: _____



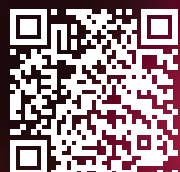


WESTERN SYDNEY
UNIVERSITY



STUDY AT
WESTERN

EXPLORE OUR *PROGRAMS*



DIFFERENT WAYS TO GET INTO UNI

Just because you don't fit the usual entry-mould for uni doesn't mean you can't get in. Maybe you didn't get the ATAR you wanted. Maybe you don't have an ATAR at all. Maybe there were things happening in your life that got in the way of your study.

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- Aboriginal and Torres Strait Islander Entry Program
- Schools Recommendation Scheme
- TAFE/Tertiary Education Pathways
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WESTERN'S EARLY OFFER PROGRAM FOR YEAR 12 STUDENTS

Our HSC True Reward program provides an early offer based on your Year 11 or Year 12 subject results relevant to your dream degree, rather than a scaled ATAR.

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See if you're eligible for adjustment factors or special consideration when you apply through UAC.

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westernsydney.edu.au/adjustmentfactors



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YOUR PATHWAY TO WESTERN.

Kick-start your uni journey with confidence, with smaller class sizes and personalised support.

Our Diploma courses provide a springboard to diverse career options or your pathway into the second year of a Bachelor degree at Western.

westernsydney.edu.au/thecollege



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FUTURE THINKING. UNLIMITED POSSIBILITIES.

The Academy is a co-curricular program for students who want to learn, grow and transform as leaders and changemakers. Join our community of leaders by applying for membership to The Academy or enrolling in the Bachelor of Creative Leadership.

westernsydney.edu.au/theacademy

LOVE THESE SUBJECTS? SEE WHERE THEY CAN TAKE YOU! FIND YOUR PATH FROM HSC TO UNIVERSITY.

YOU LOVE ENGLISH? *WHY NOT STUDY:*

- B Communication
- B Screen Media (Arts and Production)
- B Education (Primary)
- B Education (Secondary)
- B Arts
- B Arts (Interpreting and Translation)
- B Laws
- B Performing Arts (Acting)
- B Music
- B Design (Visual Communication)
- B Music
- B International Studies

YOU LOVE STUDIES OF RELIGION? *WHY NOT STUDY:*

- B Arts
- B Social Science
- B Education (Primary)
- B Education (Secondary)

YOU LOVE HISTORY? *WHY NOT STUDY:*

- B Arts
- B International Studies
- B Social Science
- B Education (Primary)
- B Education (Secondary)
- B Tourism and Event Management
- B Planning (Pathway to M Urban Management and Planning)

YOU LOVE VISUAL ARTS? *WHY NOT STUDY:*

- B Architectural Design
- B of Design
- B of Design and Technology
- B of Industrial Design (Honours)

YOU LOVE BUSINESS STUDIES? *WHY NOT STUDY:*

- B Business
- B Accounting
- B Education (Primary)
- B Education (Secondary)
- B Tourism and Event Management
- B Construction Management (Honours)

YOU LOVE LEGAL STUDIES? *WHY NOT STUDY:*

- B Criminology
- B Criminal and Community Justice
- B Cyber Security and Behaviour
- B Policing
- B Laws
- B Social Science
- B Humanitarian and Development Studies
- B Education (Primary)
- B Education (Secondary)
- B Construction Management (Honours)
- B Social Work
- B Youth Work

YOU LOVE COMMUNITY AND FAMILY STUDIES STUDIES? *WHY NOT STUDY:*

- B Arts
- B Criminology
- B Nursing
- B Midwifery
- B Psychology (Honours)
- B Psychological and Social Sciences
- B Social Science
- B Youth Work
- B Social Work
- B Humanitarian and Development Studies
- B Education (Early Childhood)
- B Education (Primary)
- B Education (Secondary)

YOU LOVE PHYSICS? *WHY NOT STUDY:*

- B Science
- B Education (Primary)
- B Education (Secondary)
- B Engineering
- B Architectural Design
- B Industrial Design (Honours)
- B Design and Technology

YOU LOVE CHEMISTRY? *WHY NOT STUDY:*

- B Science
- B Medical Science
- B Education (Primary)
- B Education (Secondary)

YOU LOVE HEALTH AND MOVEMENT SCIENCE? *WHY NOT STUDY:*

- B Health Science
- B Health, Physical Education and Sport
- B Exercise Physiology
- B Exercise Science
- B Sport and Performance Science
- B Occupational Therapy
- B Paramedicine
- B Physiotherapy
- B Podiatric Medicine
- B Speech Pathology
- B Traditional Chinese Medicine
- B Nursing
- B Midwifery
- B Education (Primary)

YOU LOVE MATHEMATICS? *WHY NOT STUDY:*

- B Computer Science
- B Data Science
- B Information and Communication Technology
- B Information Systems
- B Mathematics
- B Engineering
- B Education (Primary)
- B Education (Secondary)
- B Planning (Pathway to M Urban Management and Planning)
- B Accounting

YOU LOVE BIOLOGY? *WHY NOT STUDY:*

- B Health Science
- B Health, Physical Education and Sport
- B Occupational Therapy
- B Paramedicine
- B Physiotherapy
- B Podiatric Medicine
- B Speech Pathology
- B Sport and Performance Science
- B Traditional Chinese Medicine
- B Science
- B Medical Science
- B Nursing
- B Midwifery
- B Education (Primary)
- B Education (Secondary)
- B Clinical Science/Doctor of Medicine

At Western, we have a wealth of support services to help you navigate your university journey:

- Programs to help you settle into uni life as well as your studies
- Student Welfare Service
- Counselling and mental health and wellbeing services
- Disability services

- Members of the ADF – Student Veteran Program
 - Elite athletes and performers support
- westernsydney.edu.au/support

Overview

The course is covered over 4 terms in Year 11 to 12. Year 11 work is not directly assessed but is required to fully understand the Year 12 content. You may need to use Year 11 course content in your answers to get full marks in your HSC exam.

There are 4 modules (topics) that will be assessed in your exam:

1. Module 5 Heredity

Explain the structures of DNA and analyse the mechanisms of inheritance and how processes of reproduction ensure continuity of species.

2. Module 6 Genetic Change

Explain natural genetic change and the use of genetic technologies to induce genetic change

3. Module 7 Infectious Disease

Analyse infectious disease in terms of cause, transmission, management and the organism's response, including the human immune system

4. Module 8 Non-infectious disease and disorders

Explain non-infectious disease and disorders and a range of technologies and methods used to assist, control, prevent and treat non-infectious disease

To do well in Biology you must first be able to understand and memorise a large amount of content. **If you only do this then the highest mark you will probably get is a Band 4.**

Integral to the study of any of the Sciences is the ability to question and analyse the natural phenomena that surrounds us. If you aim higher than a Band 4 then you must be able to apply the Working Scientifically skills to the content you have memorised.

*Knowledge and understanding of content will contribute towards
40% of the marks in the exam.*

Working Scientifically Skills

The Stage 6 Science courses are designed to develop the skills needed to be a professional scientist.

As a result of generations of scientists applying these skills, a pool of knowledge and understanding has developed that scientists continue to contribute to and modify today.



Source: NESA (2017) Biology Stage 6 Syllabus, pg 22

1. Questioning and predicting

Develop and evaluate questions and hypotheses for scientific investigation.

2. Planning investigations

Design and evaluate investigations in order to obtain primary and secondary data and information.

3. Conducting investigations

Conduct investigations to collect valid and reliable primary and secondary data and information.

4. Processing data and information

Select and process appropriate qualitative and quantitative data and information using a range of appropriate media.

5. Analysing data and information

Analyse and evaluate primary and secondary data and information.

6. Problem solving

Solve scientific problems using primary and secondary data, critical thinking skills and scientific processes.

7. Communicating

Communicate scientific understanding using suitable language and terminology for a specific audience or purpose.

These skills will contribute towards 60% of the marks in the exam.

Structure of the exam

- The examination will consist of a written paper worth 100 marks.
- The time allowed is 3 hours plus 5 minutes reading time.
- NESA approved calculators can be used.
- There will be approximately equal weighting given to Modules 5 to 8.
- Only around 50-60% of the content you study will make it into the exam
- Questions relating to Working Scientifically Skills will be integrated throughout the examination.
- The paper will consist of two sections:
Section I (20 marks) - 20 multiple choice questions
Section II (80 marks) - Questions may contain parts. There will be 20 to 25 items.
At least two items will be worth 7 to 9 marks.

Exam strategy

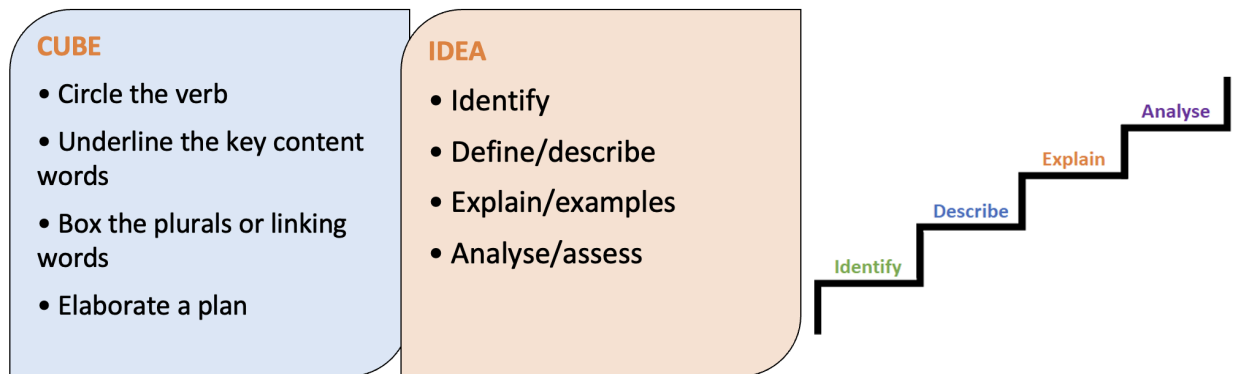
HSC Exam Formula

1. Write to the VERB.
2. Include lots of information from the STIMULUS.
3. Rewrite information from the SYLLABUS DOT POINT.
4. Write EXTRA information if you can.

Don't leave blank spaces!

If you come to a question that you don't know the answer to straight away, don't give up! Write down what you do know that may be related to the question. 1 or 2 marks in a 8 mark question is better than no mark at all.

CUBE / IDEA



HSC Verbs (brackets show how many times it appears in the syllabus)

- Investigate (23) – Carry out an examination or inquiry; may involve practical work, research, data collection, analysis and evaluation.
- Evaluate (12) – Make a judgement based on criteria; weigh evidence, strengths/limitations and reach a conclusion.
- Assess (9) – Make a judgement of value, quality, outcomes, results or extent.
- Analyse (8) – Identify components and the relationships between them; break information into parts and draw out implications.
- Model (7) – Use a representation (diagram, model, analogy, simulation or mathematical relationship) to describe, simplify or explain processes.
- Explain (5) – Relate cause and effect; make relationships clear; provide why and/or how.
- Interpret (5) – Draw meaning from information or data; explain significance, trends or patterns.
- Compare (4) – Show how things are similar and/or different.
- Construct (3) – Make, build or put together items, diagrams or arguments.
- Conduct (3) – Carry out or perform (an investigation, experiment or procedure).
- Represent (3) – Show data or relationships in a particular form (graph, table, model).
- Describe (2) – Provide characteristics, features or factual details.
- Collect (2) – Gather together data, samples or information.
- Present (2) – Display or show information in a particular form (tables, graphs, reports).
- Research (2) – Locate, gather and analyse information from secondary sources.
- Predict (2) – State or estimate a likely outcome based on evidence or models.
- Distinguish (1) – Recognise or indicate how things are different.
- Classify (1) – Arrange into categories or groups according to shared characteristics.
- Record (1) – Write down or capture observations or data.
- Design (1) – Plan or produce a method, model or investigation.

Verb Appearances (2019-2024)

- Explain – 43
- Outline – 22
- Describe – 15
- Justify – 11
- Compare – 9
- Evaluate – 7
- Analyse – 6
- Discuss – 3
- Assess – 3

Take note of plurals

If a word in question is plural then that is important. Take for example the phrase 'the effects on society and environment'. The response will likely require more than one effect for both society and environment.

You don't have to do things sequentially.

Don't know the answer to a question? Don't waste time and move on. You may find that later provides the inspiration to help you answer the missed question. But do make sure you go back and attempt it, don't leave it blank.

Take note of the amount of marks

It may sound obvious but be sure to take careful note of the number of marks allocated and let that be a guide to the depth of response required. Don't fall into the trap that an 8 mark question will necessarily need 8 points. Look at the amount of marks allocated.

Take note of the amount of space given

The amount of space provided for an answer will indicate the depth of response given. . Be careful not to go too far into the margins in case your writing gets cut off when your paper is scanned for marking. It's much better to ask for spare paper than it is to squish your answer up making it hard for the marker to read. If you do use spare paper remember to write clearly that your answer continues on spare paper. On the spare paper make sure you write what question it is you are answering.

Communicate in whatever way you can

This includes dot points, tables, diagrams, sketch graphs... Just because you are given lines to write on doesn't mean you have to write beautifully formed full sentences. We're doing an exam in Biology, not English!

Even annotations you jot down in the margin around the question will be read by the marker and can give you marks.

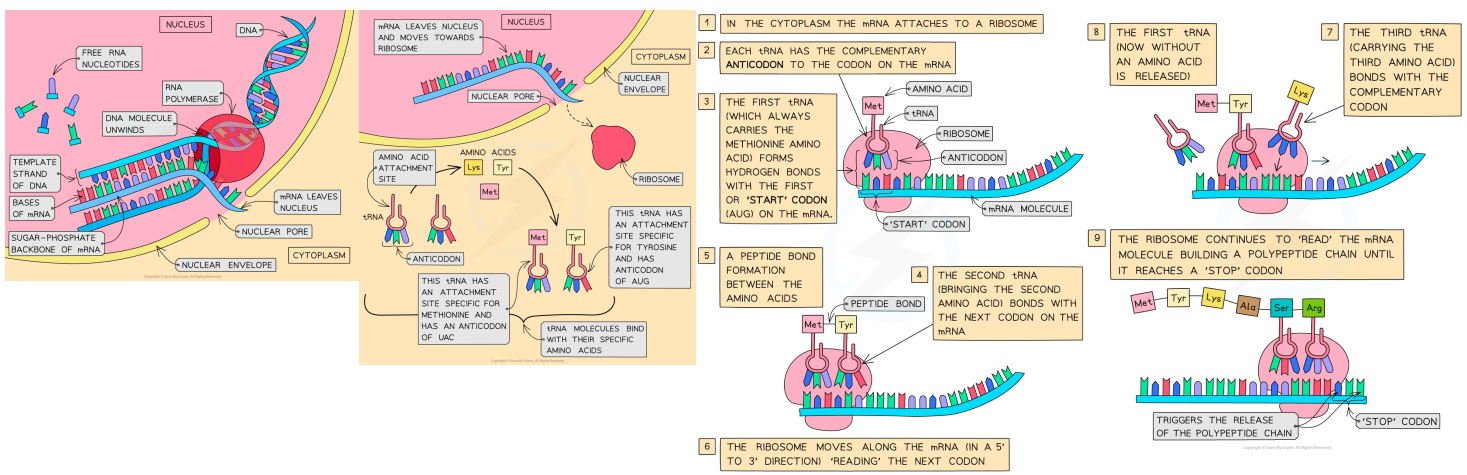
Applying the rules to the HSC syllabus

- Describe techniques and applications used in recombinant DNA technology, for example:
 - the development of transgenic organisms in agricultural and medical applications
- Analyse the features of fertilisation, implantation and hormonal control of pregnancy and birth in mammals
- Construct appropriate representations to model and compare the forms in which DNA exists in eukaryotes and prokaryotes
- distinguish between somatic mutations and germ-line mutations and their effect on an organism
- Interpret a range of secondary sources to assess the influence of social, economic and cultural contexts on a range of biotechnologies
- Evaluate the effectiveness of a technology that is used to manage and assist with the effects of a disorder
- Construct and interpret negative feedback loops that show homeostasis, using examples of temperature and glucose regulation
- interpret data relating to the incidence and prevalence of infectious disease in populations

Top concepts to study:

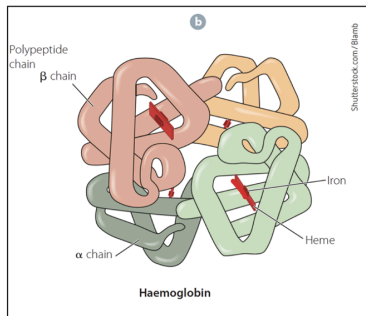
1. Polypeptide synthesis + mutations
2. DNA, genes and alleles
3. Immunity
4. Homeostasis and feedback Loops
5. Biotechnology and applications

1. Polypeptide Synthesis and Mutations

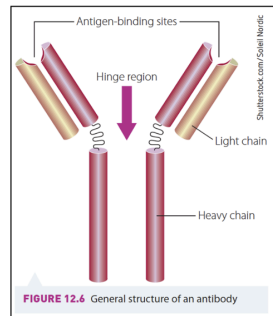


Proteins

Haemoglobin



Antibody



Mutations

Point:

- Substitution
- Insertion/ Deletion (frameshift)

Impact on polypeptide:

- Missense (result of substitution): New amino acid, sickle cell anemia still functions but is less effective.
- Nonsense (result of substitution/insertion/deletion): Stop codon
- Silent: Change to base no change to an amino acid so protein is still functional.
- Neutral: Change to base, different amino acids, no change to protein.

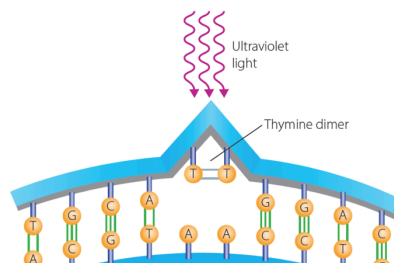
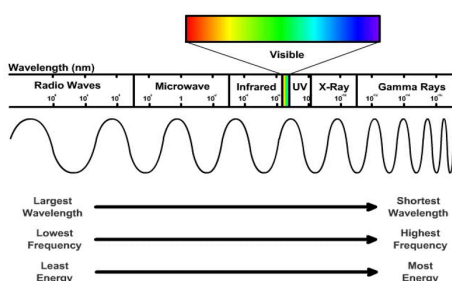
Chromosomal:

- Inversion - parts are flipped on chromosomes. Examples include haemophilia which is an inversion on the X chromosome
- Duplication - Sections are duplicated and example is huntingtons.
- Deletion - sections are deleted
- Translocation - Sections are moved from one chromosome to a different chromosome.

Types of Mutagens and effects:

EM

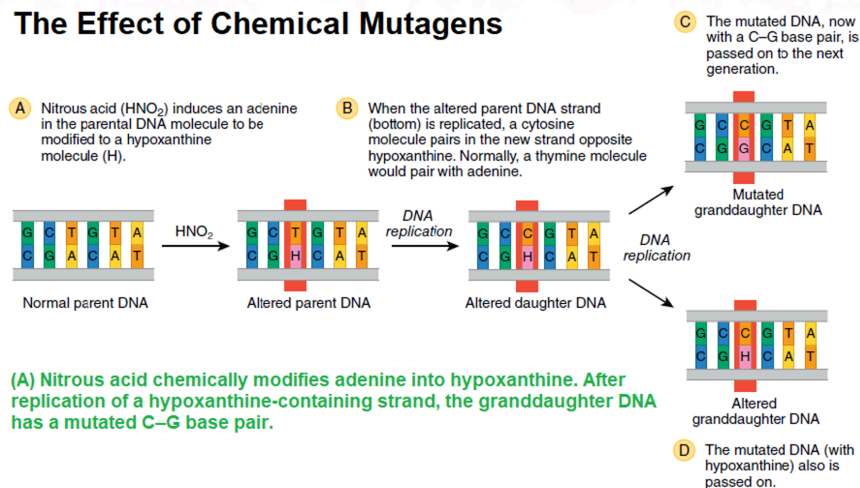
- UV Rays
 - X Rays
-
- Ionizing. Can knock electrons out. Cause bonding issues with atoms.
 - Pyrimidine (Thymine) dimers. Replication errors. Cancers.
 - Errors in protein production.



Chemical

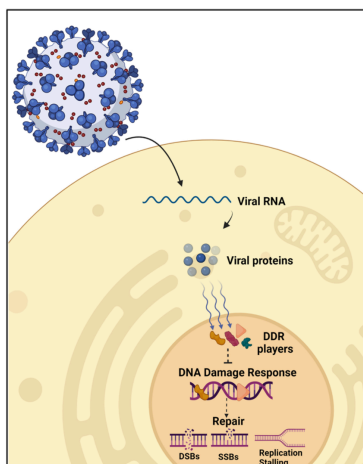
- Nitrites (Found in preservatives)
 - Alcohol
 - Tobacco
 - Lead
-
- Incorporated into the DNA leading to replication errors and mispairing
 - Impacts DNA replication processes as well as protein production.

The Effect of Chemical Mutagens



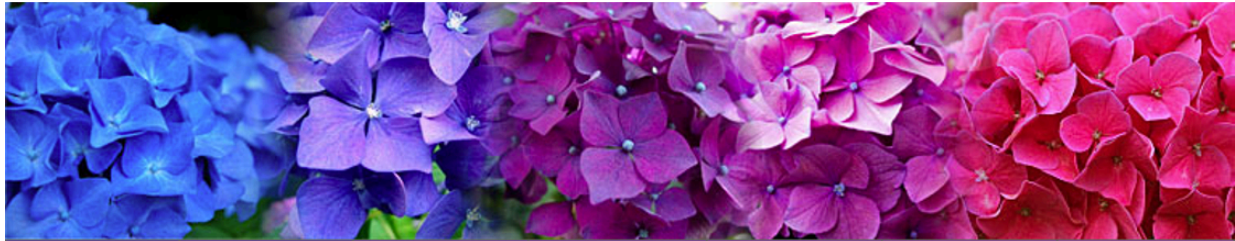
Naturally occurring

- Virus
 - Bacteria
 - Fungi
 - Metals (found in nature)
-
- Virus incorporated its DNA into the host DNA.
 - Impacts DNA replication processes as well as protein production.
 - Can change the function of genes and trigger cancers.



Genes and environment affect on phenotype

- Genes code for specific phenotypic traits.
- These traits can be altered by the environment.
- E.g. hydrangeas can be different colours depending on the PH of the soil. Blue and Pink.
- Nutrition in humans or lack of can cause changes in height/bone structure etc.

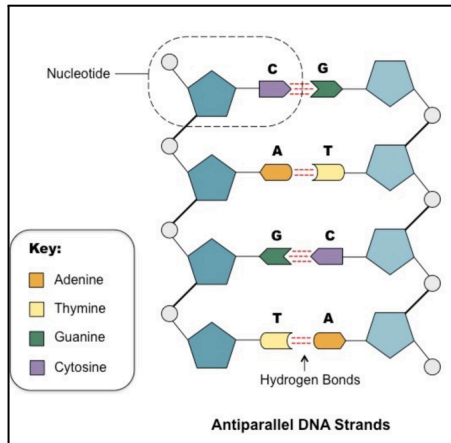


DEEP BLUE			PURPLE -PINK			DEEP PINK
4.5	5	5.5	6	6.5	6.8	7

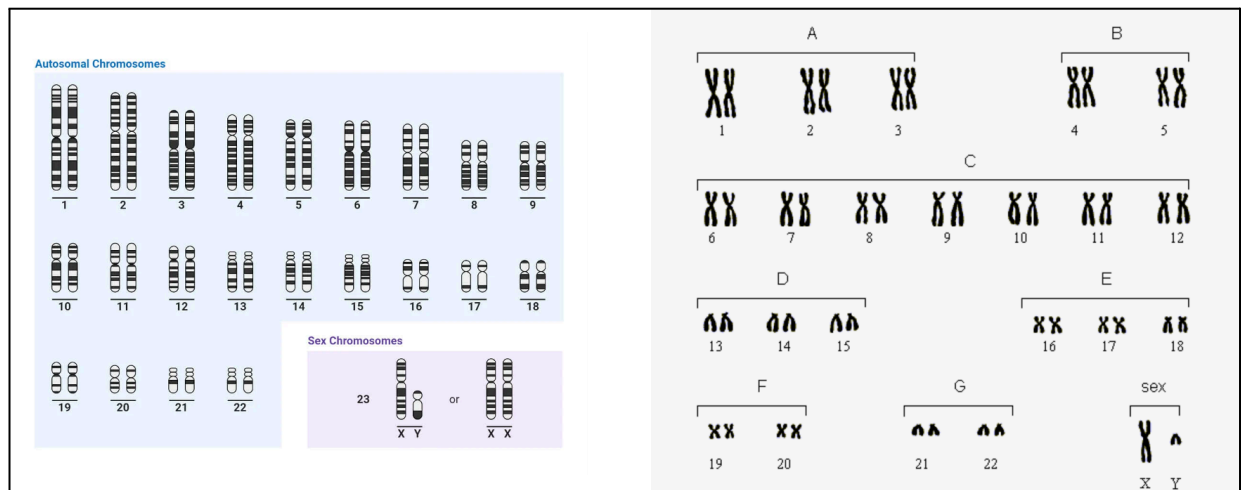
2. DNA, genes and alleles

- The structure and function of DNA
- The relationship between DNA, genes and chromosomes
- Alleles as alternative forms of a gene
- The use of symbols in the construction of simple genetic models
- Mendelian inheritance (including dominance, co-dominance and incomplete dominance)
- Punnett squares to predict outcomes of monohybrid crosses
- Sex-linkage
- Multiple Alleles
- Pedigrees
- Crossing over and recombination
- Independent assortment
- How variation arises
- New alleles arising from mutation
- Changes to protein function or gene expression

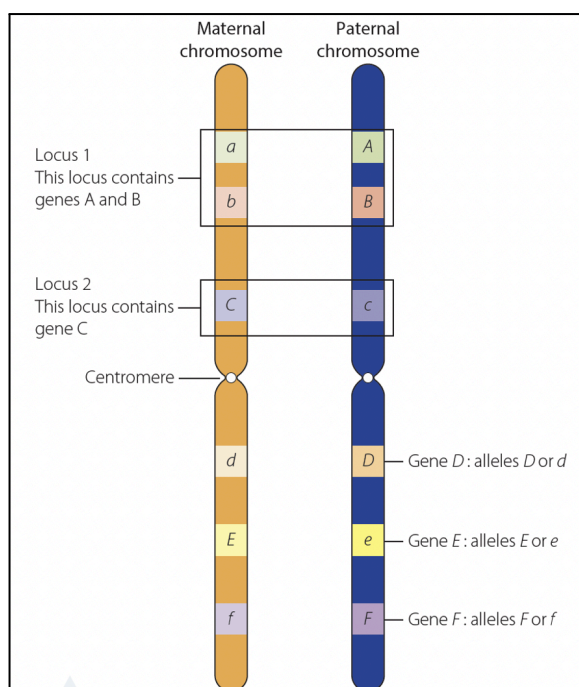
DNA



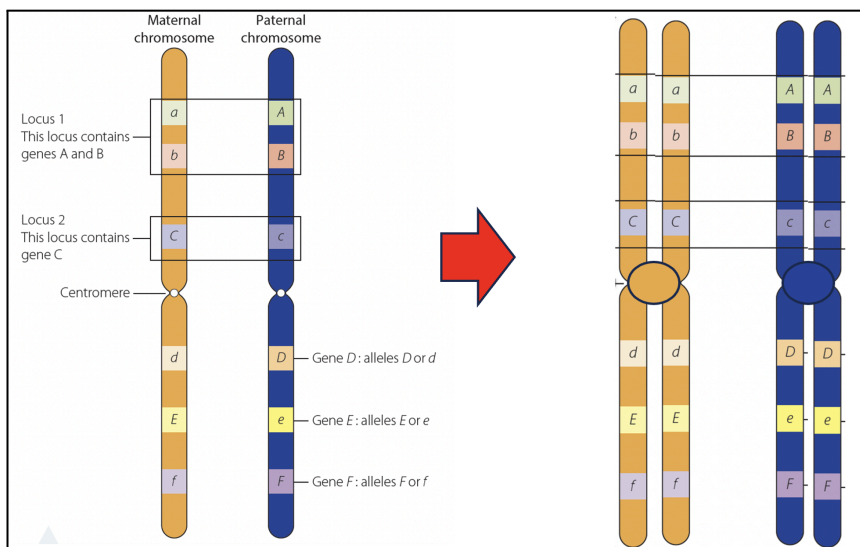
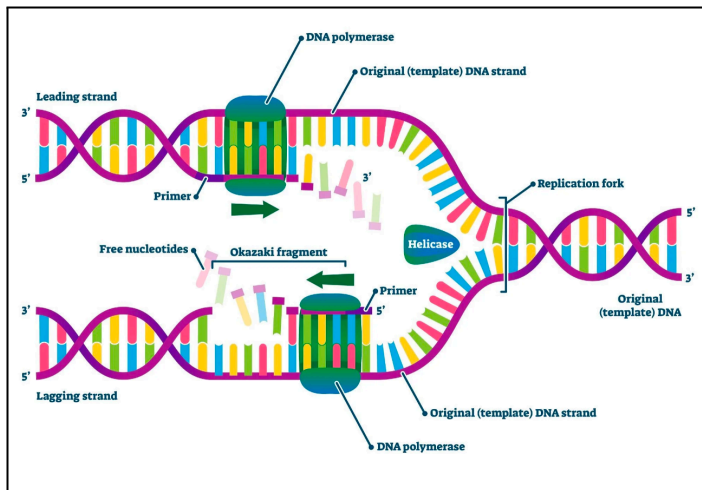
Karyotype



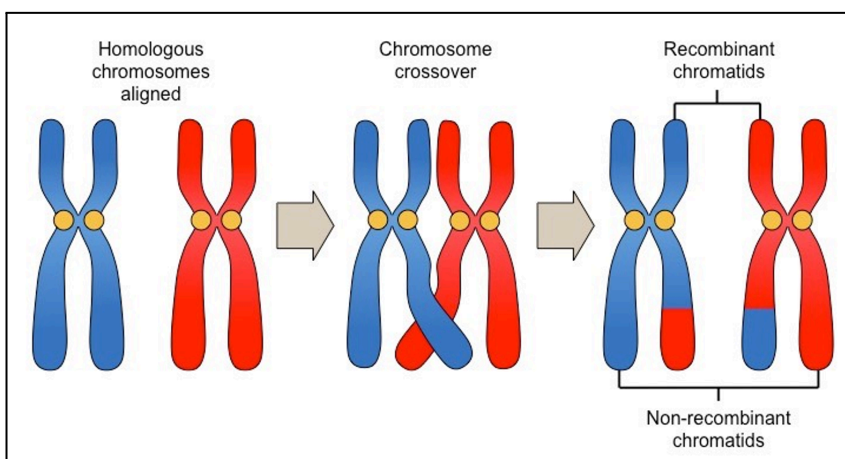
Genes and Alleles



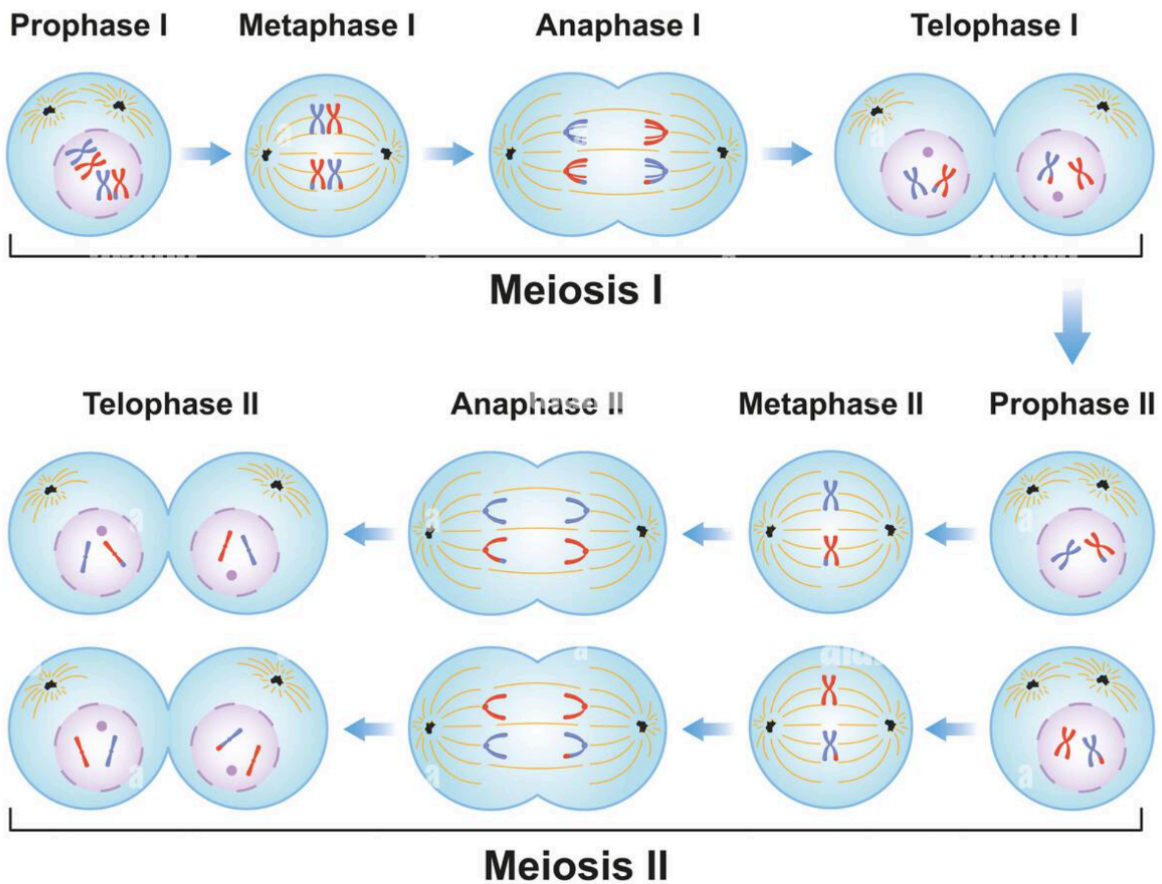
Duplication



Crossing Over

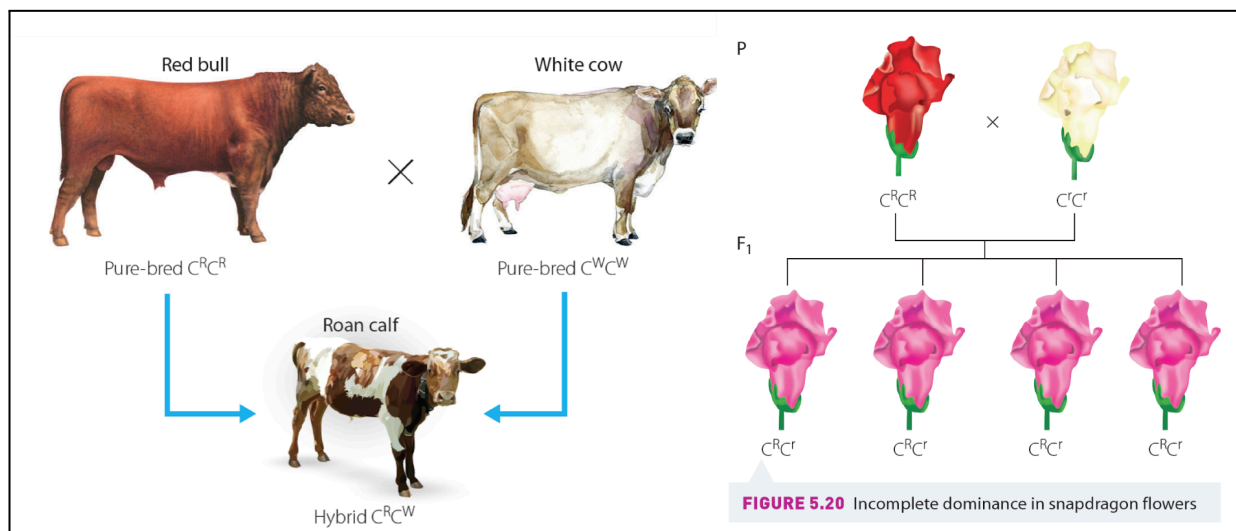


Meiosis Phases

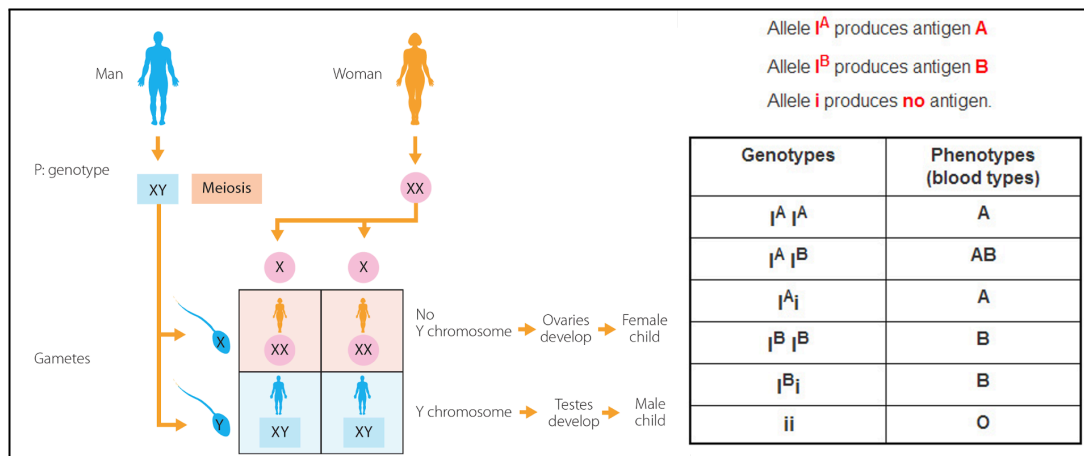


Pedigrees and Punnet Squares

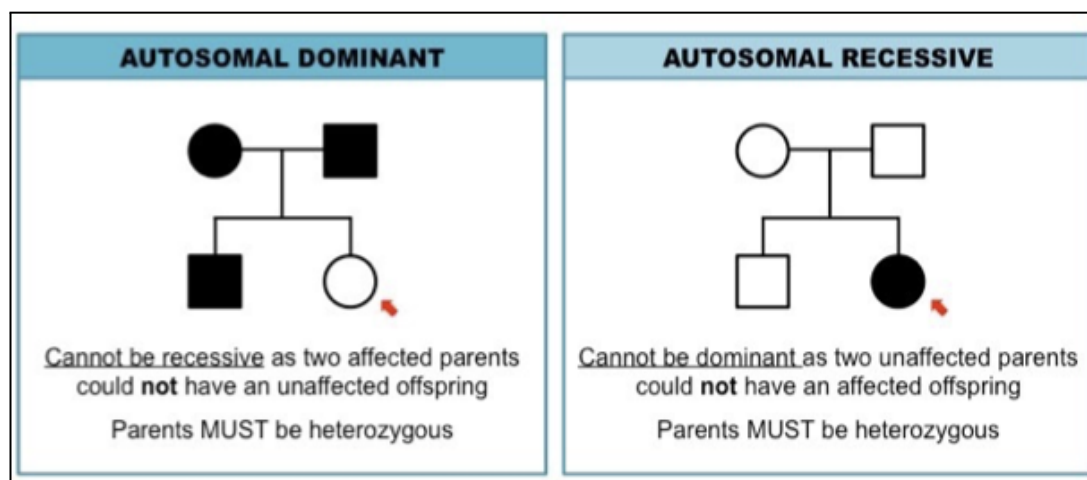
Codominant and Incomplete



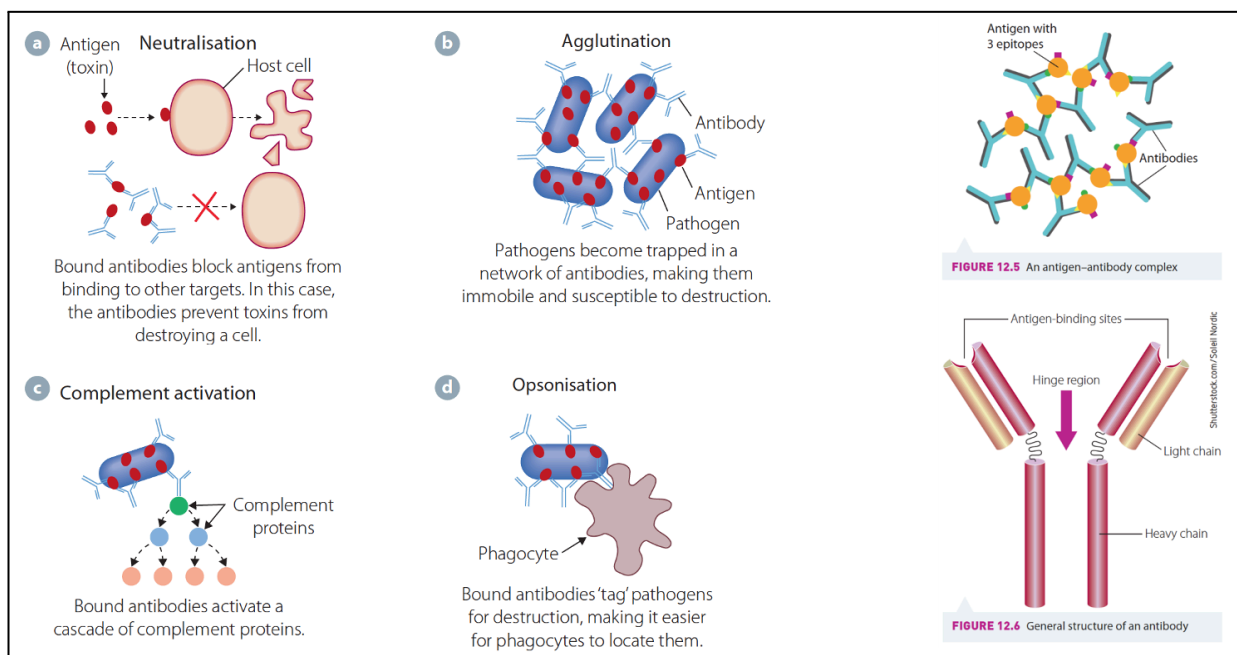
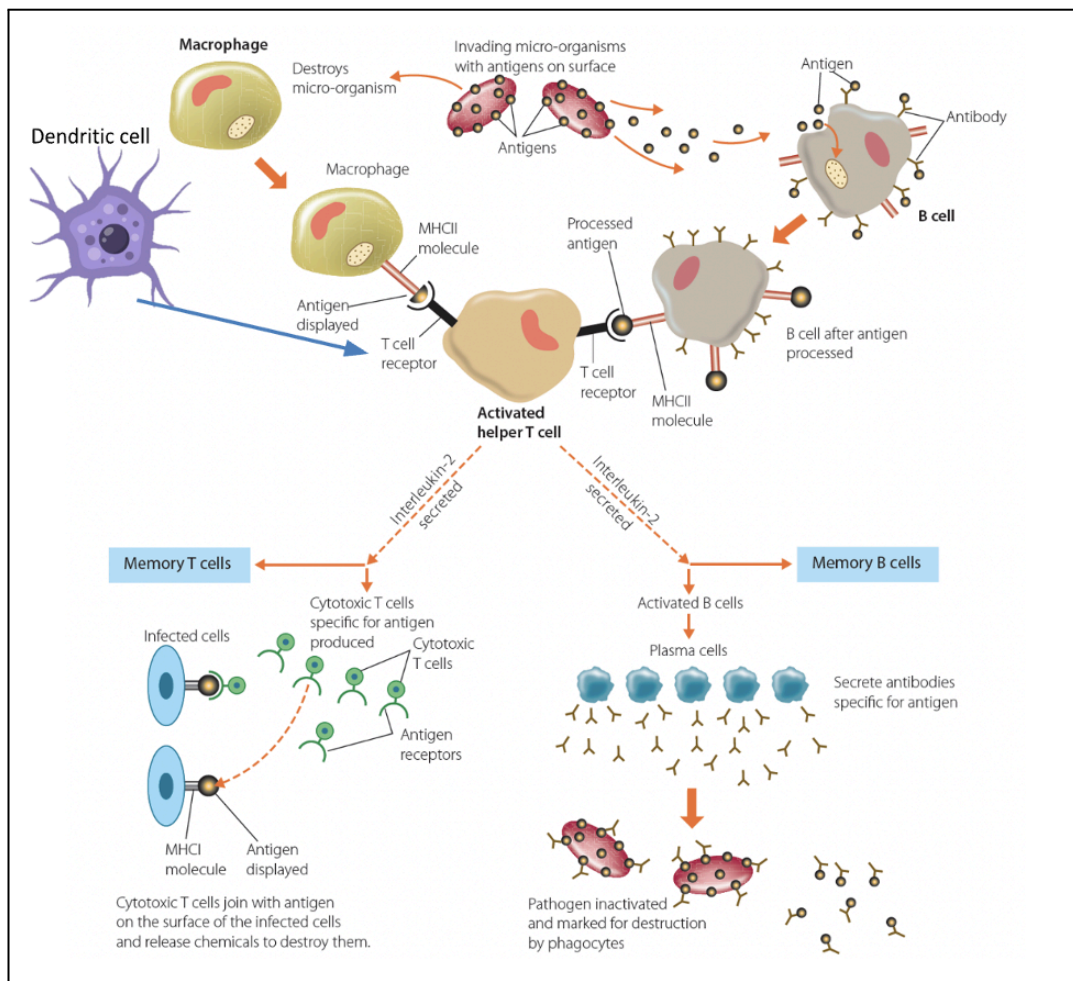
X-linked and Multiple Alleles



Patterns in Pedigrees



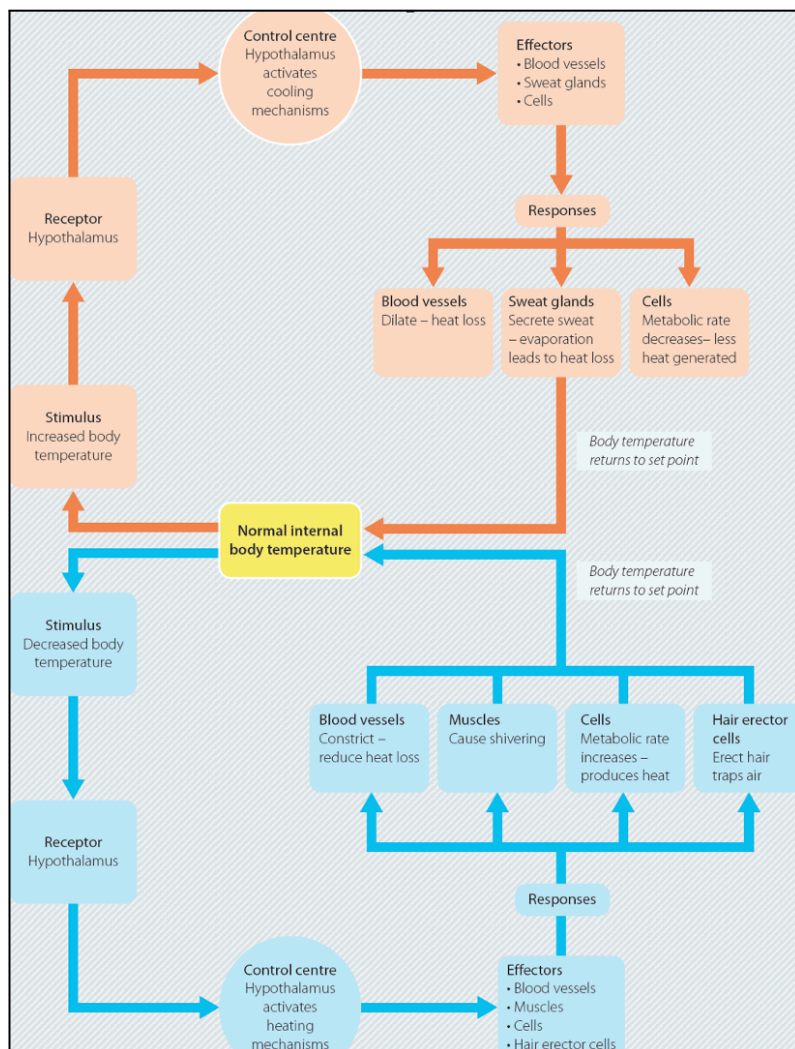
3. Immunity

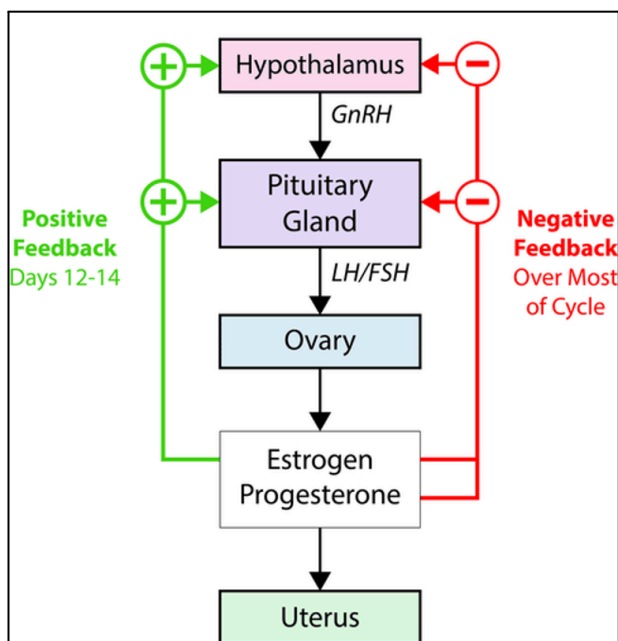
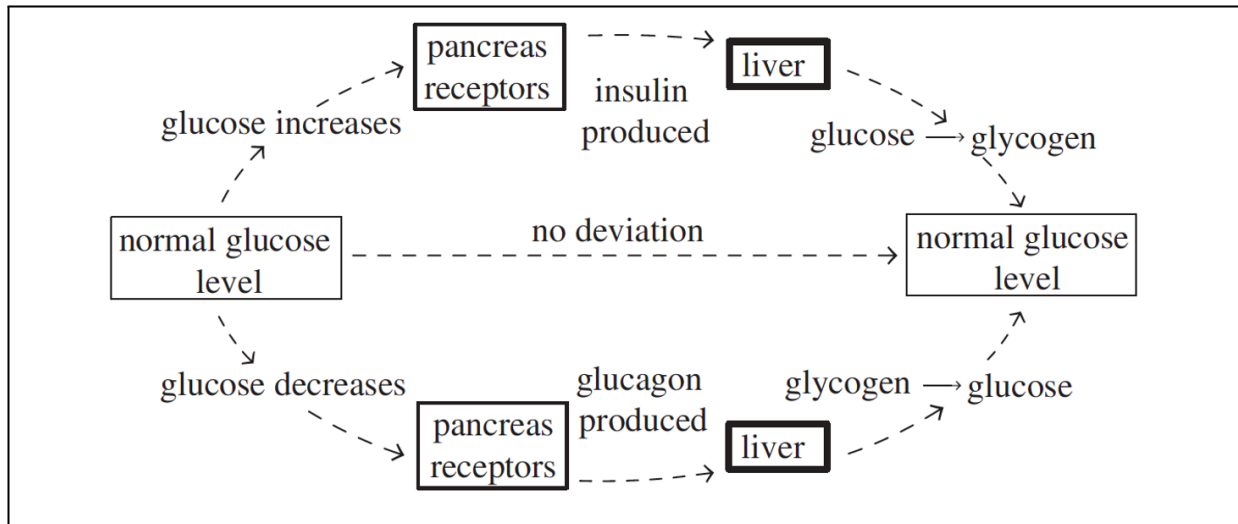


4. Homeostasis/Feedback Loops/Interpreting

- model the feedback mechanisms that maintain homeostasis
- stimulus response model
- negative feedback loop
- blood glucose
- Temperature
- Pregnancy hormones

Must know feedback loops

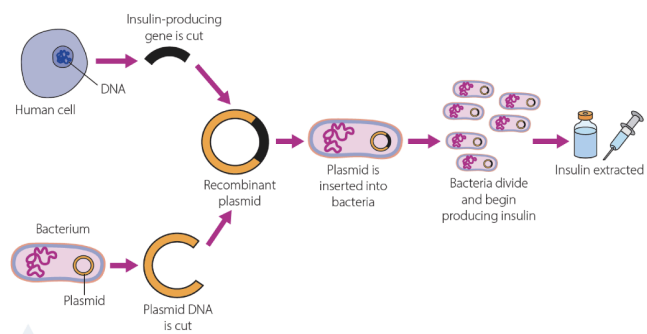




Best Biotechnology Examples

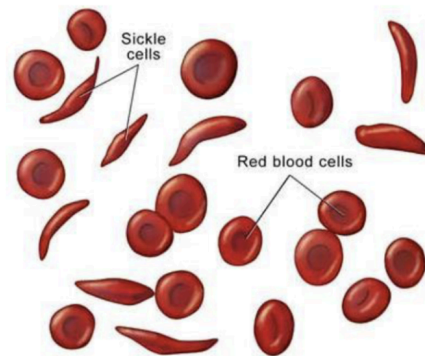
1. The Production of Insulin

- Transgenic
- Gene cloning
- Medical/industrial use of biotechnology
- Benefits humanity -
Minimizes pain and suffering
- Ethical use of biotechnology –
Not using organs of animals
- Protein structure/function
- Module 8 content (regulating blood glucose)



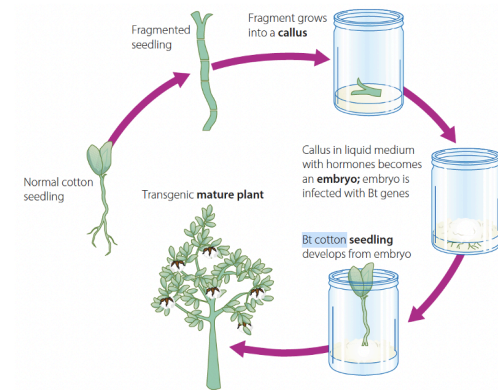
2. Sickle Cell Anaemia/CRISPR

- Example of genetic disorder (Cross into module 8)
- Example of point mutation (substitution)
- Leads to missense mutation (different amino acid)
- Example of protein malfunction
- Haemoglobin protein structure/function
- Impact on individual/quality of life
- Implications for genetic technologies like CRISPR/genetic engineering e.g. Switching on foetal haemoglobin
- Example of disease selected for in a population due to other factors (Malaria)



3. BT Cotton

- Transgenic plant use
- Agriculture use of technology
- Benefits humanity - Maximizes yield/minimizing pesticides.
- Ethical use of biotechnology – no harm to humans as used for clothing
- Changes to earth's biodiversity – minimal variation = high susceptibility.
- Very effective, used globally.
- Can discuss boll worm/moth as infectious pathogen/microparasite.



4. Panama disease (Cavendish banana)

- Agricultural farming practices
- Cloning (uses cuttings)
- Minimal variation – high susceptibility (already wiped-out Gros Michelle)
- Example of infectious plant disease (Panama disease Fungus)
- Adaptations of pathogens (can lie dormant in soil for years)
- Impact on biodiversity
- Economic impacts
- Modes of transmission
- Disease prevention methods (hygiene/quarantine/pesticides)



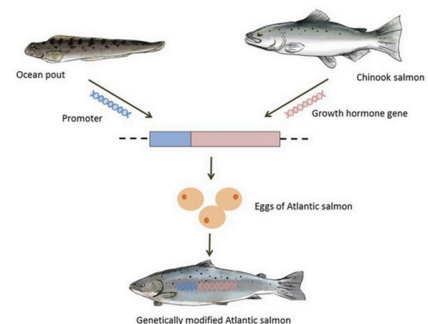
5. Golden Rice (Vitamin A deficiency/blindness)

- Impact of scientific knowledge on the manipulation of plant and animal reproduction in agriculture
- Transgenics / application of recombinant DNA technology in agriculture.
- Transcription and Translation (making beta carotene)
- Potential issues with gene flow/effect on genetic pool
- Minimal variation – high susceptibility
- Impact on biodiversity
- Using technology to minimize non-infectious diseases (Vitamin A deficiency)
- Social, economic and cultural impacts



6. Transgenic Salmon

- Transgenic salmon are made using recombinant DNA technology to insert a growth hormone gene.
- It is an example of gene expression and how it can be controlled.
- It relates to biotechnology in agriculture and aquaculture.
- It helps compare selective breeding with genetic engineering.
- It raises ethical issues about animal welfare and environmental risks.
- It supports discussions on the benefits and concerns of GM organisms.
- It shows how science can be used to solve real-world problems.
- Students can use it to research secondary sources and evaluate scientific impacts.
- It connects to how society uses and responds to new biotechnologies



Definitions of Considerations

Social considerations – How the biotechnology affects **people** and communities. This includes health, safety, employment, and public acceptance. Students should discuss benefits and risks to society.

Economic considerations – How the biotechnology affects **money**, markets, costs, profits, and access. Students can discuss affordability, financial benefits, and trade implications.

Cultural considerations – How the biotechnology affects **traditions**, beliefs, lifestyle, identity, and food practices. Students can discuss public perception, cultural acceptance, and impact on local practices.

Ethical considerations – The **moral** implications of using the biotechnology. This includes fairness, integrity, animal welfare, and responsibility. Students can discuss who benefits, potential harms, and societal responsibility.

Social: S.H.A.R.E.

- **S – Sustainability:** Does it support long-term wellbeing for people or communities?
- **H – Health:** Does it improve or harm human health?
- **A – Acceptance:** How accepted is it by the public or target community?
- **R – Resources:** Does it provide or use important resources?
- **E – Employment:** Does it create or reduce jobs?

How to elaborate: Discuss how the technology improves society or health, whether people support it, and its impact on community resources and jobs.

Economic: C.A.S.H.

- **C – Cost:** How much does it cost to develop or maintain?
- **A – Access:** Who can afford or access it?
- **S – Sales:** How much revenue or profit can it generate?
- **H – How:** How does it affect trade or market distribution?

How to elaborate: Discuss whether it is affordable, who benefits financially, potential profit, and trade or market implications.

C.U.L.T. (Cultural)

- **C – Customs:** Does it align or conflict with local traditions and practices?
- **U – Understanding:** Are people informed and educated about it?
- **L – Lifestyle:** Does it affect daily life or routines?
- **T – Traditions:** Does it impact cultural identity or food practices?

How to elaborate: Discuss whether the technology fits with cultural norms, affects traditional lifestyles, or requires education for acceptance.

Ethical: F.A.I.R.

- **F – Fairness:** Does everyone benefit equally, or are some disadvantaged?
- **A – Animal welfare:** Are animals treated ethically or harmed?
- **I – Integrity:** Is it safe, reliable, and morally sound?
- **R – Responsibility:** Who is responsible for potential consequences?

How to elaborate: Discuss moral implications, fairness of access, treatment of animals, safety, and who is responsible for outcomes.

Syllabus Content Points

Module 5 Heredity

Section 1: Reproduction

Inquiry question: How does reproduction ensure the continuity of a species? *Students:*

- explain the mechanisms of reproduction that ensure the continuity of a species, by analysing sexual and asexual methods of reproduction in a variety of organisms, including but not limited to:
 - animals: advantages of external and internal fertilisation
 - plants: asexual and sexual reproduction
 - fungi: budding, spores
 - bacteria: binary fission (ACSBLO75)
 - protists: binary fission, budding
- analyse the features of fertilisation, implantation and hormonal control of pregnancy and birth in mammals (ACSBLO75)  
- evaluate the impact of scientific knowledge on the manipulation of plant and animal reproduction in agriculture (ACSBLO74)  

Section 2: Cell Replication

Inquiry question: How important is it for genetic material to be replicated exactly? *Students:*

- model the processes involved in cell replication, including but not limited to:
 - mitosis and meiosis (ACSBLO75)  
 - DNA replication using the Watson and Crick DNA model, including nucleotide composition, pairing and bonding (ACSBLO76, ACSBLO77)
- assess the effect of the cell replication processes on the continuity of species (ACSBLO84) 

Section 3: DNA and Polypeptide Synthesis

Inquiry question: Why is polypeptide synthesis important?

Students:

- construct appropriate representations to model and compare the forms in which DNA exists in eukaryotes and prokaryotes (ACSBLO76) 
- model the process of polypeptide synthesis, including: (ACSBLO79)
 - transcription and translation
 - assessing the importance of mRNA and tRNA in transcription and translation (ACSBLO79)
 - analysing the function and importance of polypeptide synthesis (ACSBLO80) – assessing how genes and environment affect phenotypic expression (ACSBLO81) 



- investigate the structure and function of proteins in living things 

Section 4: Genetic Variation

Inquiry question: How can the genetic similarities and differences within and between species be compared?

Students:

- conduct practical investigations to predict variations in the genotype of offspring by modelling meiosis, including the crossing over of homologous chromosomes, fertilisation and mutations (ACSBLO84)
- model the formation of new combinations of genotypes produced during meiosis, including but not limited to:
 - interpreting examples of autosomal, sex-linkage, co-dominance, incomplete dominance and multiple alleles (ACSBLO85) ☐
 - constructing and interpreting information and data from pedigrees and Punnett squares
- collect, record and present data to represent frequencies of characteristics in a population, in order to identify trends, patterns, relationships and limitations in data, for example: ☐ ☐
 - examining frequency data
 - analysing single nucleotide polymorphism (SNP)

Section 5: Inheritance Patterns in a Population

Inquiry question: Can population genetic patterns be predicted with any accuracy? *Students:*

- investigate the use of technologies to determine inheritance patterns in a population using, for example: (ACSBLO64, ACSBLO85) ☐
 - DNA sequencing and profiling (ACSBLO86) ☐
- investigate the use of data analysis from a large-scale collaborative project to identify trends, patterns and relationships, for example: (ACSBLO64, ACSBLO73) ☐ ☐ ☐ ☐ – the use of population genetics data in conservation management ☐ – population genetics studies used to determine the inheritance of a disease or disorder ☐ ☐ ☐ – population genetics relating to human evolution ☐

Write down any questions about Module 5 that you want answered today:

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Module 6 Genetic Change

Section 1: Mutation

Inquiry question: How does mutation introduce new alleles into a population?

Students:

- explain how a range of mutagens operate, including but not limited to: ☐
 - electromagnetic radiation sources
 - chemicals
 - naturally occurring mutagens
- compare the causes, processes and effects of different types of mutation, including but not limited to: ☐ ☐
 - point mutation
 - chromosomal mutation
- distinguish between somatic mutations and germ-line mutations and their effect on an organism (ACSBLO82, ACSBLO83) ☐
- assess the significance of 'coding' and 'non-coding' DNA segments in the process of mutation (ACSBLO78) ☐ ☐
- investigate the causes of genetic variation relating to the processes of fertilisation, meiosis and mutation (ACSBLO78) ☐
- evaluate the effect of mutation, gene flow and genetic drift on the gene pool of populations (ACSBLO91, ACSBLO92) ☐

Section 2: Biotechnology

Inquiry question: How do genetic techniques affect Earth's biodiversity?

Students:

- investigate the uses and applications of biotechnology (past, present and future), including: (ACSBLO87)
 - analysing the social implications and ethical uses of biotechnology, including plant and animal examples ☐ ☐ ☐ ☐
 - researching future directions of the use of biotechnology ☐ ☐
 - evaluating the potential benefits for society of research using genetic technologies ☐ ☐ ☐
 - evaluating the changes to the Earth's biodiversity due to genetic techniques ☐ ☐ ☐

Section 3: Genetic Technologies

Inquiry question: Does artificial manipulation of DNA have the potential to change populations forever?

Students:

- investigate the uses and advantages of current genetic technologies that induce genetic change

- compare the processes and outcomes of reproductive technologies, including but not limited to: ☐
 - artificial insemination
 - artificial pollination
- investigate and assess the effectiveness of cloning, including but not limited to: ☐☐
 - whole organism cloning
 - gene cloning
- describe techniques and applications used in recombinant DNA technology, for example: ☐☐
 - the development of transgenic organisms in agricultural and medical applications (ACSBLO87)
- evaluate the benefits of using genetic technologies in agricultural, medical and industrial applications (ACSBLO86) ☐☐
- evaluate the effect on biodiversity of using biotechnology in agriculture ☐
- interpret a range of secondary sources to assess the influence of social, economic and cultural contexts on a range of biotechnologies ☐☐☐☐

[illegible]

Module 7 Infectious Disease

Section 1: Causes of Infectious Disease

Inquiry question: How are diseases transmitted?

Students:

- describe a variety of infectious diseases caused by pathogens, including microorganisms, macroorganisms and non-cellular pathogens, and collect primary and secondary-sourced data and information relating to disease transmission, including:
 - classifying different pathogens that cause disease in plants and animals (ACSBL117)
 - investigating the transmission of a disease during an epidemic
 - design and conduct a practical investigation relating to the microbial testing of water or food samples ☐
 - investigate modes of transmission of infectious diseases, including direct contact, indirect contact and vector transmission
- investigate the work of Robert Koch and Louis Pasteur, to explain the causes and transmission of infectious diseases, including: ☐ ☐
 - Koch's postulates
 - Pasteur's experiments on microbial contamination
- assess the causes and effects of diseases on agricultural production, including but not limited to: ☐ ☐
 - plant diseases
 - animal diseases
- compare the adaptations of different pathogens that facilitate their entry into and transmission between hosts (ACSBL118)

Section 2: Responses to Pathogens

Inquiry question: How does a plant or animal respond to infection?

Students:

- investigate the response of a named Australian plant to a named pathogen through practical and/or secondary-sourced investigation, for example:
 - fungal pathogens
 - viral pathogens
- analyse responses to the presence of pathogens by assessing the physical and chemical changes that occur in the host animal's cells and tissues ☐ ☐

Section 3: Immunity

Inquiry question: How does the human immune system respond to exposure to a pathogen?

Students:

- investigate and model the innate and adaptive immune systems in the human body
- explain how the immune system responds after primary exposure to a pathogen, including innate and acquired immunity

Section 4: Prevention, Treatment and Control

Inquiry question: How can the spread of infectious diseases be controlled? *Students:*

- investigate and analyse the wide range of interrelated factors involved in limiting local, regional and global spread of a named infectious disease ☐ ☐
- investigate procedures that can be employed to prevent the spread of disease, including but not limited to: (ACSBL124) ☐ ☐ ☐ ☐
 - hygiene practices
 - quarantine
 - vaccination, including passive and active immunity (ACSBL100, ACSBL123) ☐ ☐ - public health campaigns
 - use of pesticides
 - genetic engineering
- investigate and assess the effectiveness of pharmaceuticals as treatment strategies for the control of infectious disease, for example: ☐ ☐ ☐ ☐
 - antivirals
 - antibiotics
- investigate and evaluate environmental management and quarantine methods used to control an epidemic or pandemic ☐ ☐
- interpret data relating to the incidence and prevalence of infectious disease in populations, for example: ☐ ☐
 - mobility of individuals and the portion that are immune or immunised (ACSBL124, ACSBL125)
 - Malaria or Dengue Fever in South East Asia ☐
- evaluate historical, culturally diverse and current strategies to predict and control the spread of disease (ACSBL125) ☐ ☐ ☐ ☐ ☐
- investigate the contemporary application of Aboriginal protocols in the development of particular medicines and biological materials in Australia and how recognition and protection of Indigenous cultural and intellectual property is important, for example: ☐
 - bush medicine
 - smoke bush in Western Australia

Write down any questions about Module 7 that you want answered today:

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Module 8 Non-infectious Disease

Section 1: Homeostasis

Inquiry question: How is an organism's internal environment maintained in response to a changing external environment?

Students:

- construct and interpret negative feedback loops that show homeostasis by using a range of sources, including but not limited to: (ACSBL101, ACSBL110, ACSBL111) ☐
 - ☐ – temperature (ACSBL098)
 - glucose
- investigate the various mechanisms used by organisms to maintain their internal environment within tolerance limits, including:
 - trends and patterns in behavioural, structural and physiological adaptations in endotherms that assist in maintaining homeostasis (ACSBL099, ACSBL114) ☐
 - internal coordination systems that allow homeostasis to be maintained, including hormones and neural pathways (ACSBL112, ACSBL113, ACSBL114)
 - mechanisms in plants that allow water balance to be maintained (ACSBL115) ☐

Section 2: Causes and Effects

Inquiry question: Do non-infectious diseases cause more deaths than infectious diseases?

Students:

- investigate the causes and effects of non-infectious diseases in humans, including but not limited to: ☐
 - genetic diseases
 - diseases caused by environmental exposure
 - nutritional diseases
 - cancer
- collect and represent data to show the incidence, prevalence and mortality rates of non-infectious disease, for example: ☐☐☐☐
 - nutritional diseases
 - diseases caused by environmental exposure

Section 3: Epidemiology

Inquiry question: Why are epidemiological studies used?

Students:

- analyse patterns of non-infectious diseases in populations, including their incidence and prevalence, including but not limited to: ☐☐☐☐
 - nutritional diseases
 - diseases caused by environmental exposure
- investigate the treatment/management, and possible future directions for further research, of a non-infectious disease using an example from one of the non infectious diseases categories listed above ☐☐☐

- evaluate the method used in an example of an epidemiological study
- evaluate, using examples, the benefits of engaging in an epidemiological study

Section 4: Prevention

Inquiry question: How can non-infectious diseases be prevented?

Students:

- use secondary sources to evaluate the effectiveness of current disease-prevention methods and develop strategies for the prevention of a non-infectious disease, including but not limited to: ☐
 - educational programs and campaigns ☐
 - genetic engineering ☐

Section 5: Technologies and Disorders

Inquiry question: How can technologies be used to assist people who experience disorders?

Students:

- explain a range of causes of disorders by investigating the structures and functions of the relevant organs, for example:
 - hearing loss
 - visual disorders
 - loss of kidney function
- investigate technologies that are used to assist with the effects of a disorder, including but not limited to: (ACSB100) ☐ ☐
 - hearing loss: cochlear implants, bone conduction implants, hearing aids ☐ ☐
 - visual disorders: spectacles, laser surgery ☐ ☐
 - loss of kidney function: dialysis ☐
- evaluate the effectiveness of a technology that is used to manage and assist with the effects of a disorder (ACSB100) ☐ ☐

Write down any questions about Module 8 that you want answered today:

[illegible]



Skills

Remember 60% of the paper will assess your skills in Biology. These skills

- include:
1. Questioning and predicting
 2. Planning investigations
 3. Conducting investigations
 4. Processing data and information
 5. Analysing data and information
 6. Problem solving
 7. Communicating

What would questions assessing these skills look like in the exam? •

Drawing graphs

- Analysing graphs
- Analysing data in tables
- Designing experiments
- Assess the validity, reliability, relevance and/or accuracy of:
 - A method given in question
 - A set of results
 - Secondary information shared with you (i.e. references)
- Assessing the use of models in science. What are the advantages and disadvantages of models in science?

Processes: Flow-charts

Could you summarise these processes using a flow-chart?

Heredity

- mitosis
- meiosis
- DNA replication
- Protein synthesis
- DNA sequencing

Genetic Change

- Point mutation and chromosomal mutation
 - Reproductive technologies: artificial insemination and artificial pollination •
- Cloning
- Recombinant DNA technology
 - Transgenic species

Non-infectious Diseases

- Negative feedback loops
 - Temperature control
 - Glucose regulation

Experiments and models

Potential HSC question could be worded as:

- “How did you model in class, as part of your HSC Biology course, the process of...” • “Describe the practical investigation you conducted to predict...” • “Describe how you collected, recorded and presented data to...”

Heredity

1. Model the processes involved in cell replication, including but not limited to: mitosis and meiosis
2. DNA replication using the Watson and Crick DNA model, including nucleotide composition, pairing and bonding
3. Conduct practical investigations to predict variations in the genotype of offspring by modelling meiosis, including the crossing over of homologous chromosomes, fertilisation and mutations
4. Model the formation of new combinations of genotypes produced during meiosis, including but not limited to:
 - Interpreting examples of autosomal, sex-linkage, co-dominance, incomplete dominance and multiple alleles
5. Constructing and interpreting information and data from pedigrees and Punnett squares
6. Collect, record and present data to represent frequencies of characteristics in a population, in order to identify trends, patterns, relationships and limitations in data, for example:
 - examining frequency data
 - analysing single nucleotide polymorphism (SNP)

Infectious Diseases

1. Design and conduct a practical investigation relating to the microbial testing of water or food samples
2. Pasteur's experiments on microbial contamination
3. Investigate the response of a named Australian plant to a named pathogen through practical and/or secondary-sourced investigation, for example:
 - fungal pathogens
 - viral pathogens
4. model the innate and adaptive immune systems in the human body

Non-infectious Diseases

1. Collect and represent data to show the incidence, prevalence and mortality rates of non-infectious diseases, for example:
 - nutritional diseases
 - diseases caused by environmental exposure

Diagrams / Structures

Could you draw and/or recognise a diagram showing the following?

Heredity

1. Features of fertilisation, implantation
2. DNA replication using the Watson and Crick DNA model, including -
nucleotide composition,
- pairing and bonding
3. Compare DNA in eukaryotes AND prokaryotes
4. Structure of proteins

Non-Infectious Diseases

1. Structures in plants linked to osmoregulation (water balance)
2. Structures of relevant organs for:
 - Hearing loss
 - Visual disorders
 - Loss of kidney function

Long response questions

Potential, long response questions 6-8 marks

Evaluate verbs found in syllabus = 11

Assess verbs = 6

Analyse verbs = 4

21/55 = 38% of the exam paper

Heredity

- assess the effect of the cell replication processes on the continuity of species

Genetic Change

- (Predict/assess/discuss) future directions of the use of biotechnology
- evaluate the changes to the Earth's biodiversity due to genetic techniques
- assess the influence of social, economic and cultural contexts on a range of biotechnologies

Infectious Diseases

- analyse responses to the presence of pathogens by assessing the physical and chemical changes that occur in the host animals cells and tissues

Non-infectious Diseases

- investigate the treatment/management, and possible future directions for further research, of a non-infectious disease using an example from one of the non infectious diseases categories listed

- Nutritional diseases
- Diseases caused by environmental exposure
- evaluate, using examples, the benefits of engaging in an epidemiological study •
evaluate the effectiveness of a technology that is used to manage and assist with the effects of a disorder
 - Hearing loss
 - Visual disorders
 - Loss of kidney function

Scientists

You need to be able to:

1. Describe the work done by these scientists (e.g. what experiments did they do? What were the strengths / weaknesses of their experimental methods? What were their results?)
2. What technologies did they use to make their discoveries?
3. How did their work lead to further discoveries by other scientists?
4. How has the knowledge developed by these scientists affected society? What are the ethical / moral implications of their work?
5. How does society / ethics affect the development of scientific knowledge?

Heredity

- Watson and Crick
- Mendel

Infectious Diseases

- Robert Koch
- Louis Pasteur

Technologies

You need to be able to link technologies to specific developments / advances in biological knowledge. General technologies such as microscopes (light and electron), computers etc as well as ones specifically named in the syllabus:

Heredity

DNA sequencing and profiling

Genetic Change

Reproductive technologies

- Artificial insemination
- Artificial pollination
- Cloning: whole organism + gene cloning

Recombinant DNA technology

- Transgenic species: agricultural, medical & industrial applications

Infectious Diseases

Pharmaceuticals as treatments

- Antivirals
- antibiotics

Non-infectious Diseases

- hearing loss: cochlear implants, bone conduction implants, hearing aids •
- visual disorders: spectacles, laser surgery
- loss of kidney function: dialysis

Module 5

- ☐ Define sexual and asexual reproduction.
- ☐ Explain the advantages and disadvantages of asexual and sexual reproduction including examples of organisms that use each method relating each point to the continuity of a species.
- ☐ Explain the advantages and disadvantages of external and internal reproduction including examples of organisms that use each method relating each point to the continuity of a species.
- ☐ Identify a range of plants that use sexual and asexual reproduction.
- ☐ Describe at least 2 different methods of asexual reproduction in plants.
- ☐ Describe the process plants use for sexual reproduction including examples.
- ☐ Explain how plants can use sexual and asexual reproduction to ensure the continuity of the species
- ☐ Describe the process of budding in fungi.
- ☐ Describe the process of spore production in fungi.
- ☐ Describe the process of binary fission in bacteria.
- ☐ Describe the process of binary fission in protists and how this differs from bacteria.
- ☐ Describe the process of budding in protists.
- ☐ Relate the above 5 points to the continuity of the species
- ☐ Identify the main components of the reproductive system
- ☐ Describe the processes of fertilisation and implantation.
- ☐ Describe the process of egg production in women
- ☐ Outline how at least 2 different hormones function in the following stages
 - ☐ Fertilisation (LH, FSH, Progesterone, Oestrogen)
 - ☐ Implantation/pregnancy (hCg, progesterone, relaxin)
 - ☐ Birth (oxytocin, prolactin)
- ☐ Identify different methods of animal reproduction in agriculture.
- ☐ Describe these methods.
- ☐ Identify which scientific principles allow us to successfully manipulate plants and animals in agriculture.
- ☐ Explain how these methods allow us to produce better results.
- ☐ Evaluate (Make a judgement) about the impact of the scientific knowledge in agriculture.
- ☐ Describe how you modelled cell replication.
- ☐ Describe the process of mitosis and meiosis.
- ☐ Be able to draw and interpret diagrams of mitosis and meiosis
- ☐ Describe how you modelled DNA replication.
- ☐ Identify key components of the DNA model.
- ☐ Describe how DNA replication works including nucleotide composition, pairing, and bonding rules
- ☐ Make a judgement about the effect that cell replication processes have on the continuity of a species.
- ☐ Describe how you modelled DNA in prokaryotes and eukaryotes.
- ☐ Create a table to show the similarities and differences between the forms in which DNA exists in eukaryotes and prokaryotes
- ☐ Describe how you modelled polypeptide synthesis.
- ☐ Describe the process of transcription and translation

- ☐ Make a judgement about the importance of mRNA and tRNA in transcription and translation
- ☐ Explain the importance of polypeptide synthesis including examples of at least 2 proteins that are made in the body. (Haemoglobin/antibodies)
- ☐ Define phenotype.
- ☐ Make a judgement about how environment can affect phenotype including examples.
- ☐ Identify the structural components of proteins.
- ☐ Describe the function of at least 2 proteins in the body.
- ☐ Describe a homologous chromosome.
- ☐ Describe the practical investigation/model you used to predict variation in genotypes. (crossing over during meiosis model)
- ☐ Describe the process of meiosis including crossing over
- ☐ Describe independent assortment
- ☐ Describe random segregation
- ☐ Explain the importance of this process in contributing to variation.
- ☐ Describe how fertilisation can affect genotype.
- ☐ Describe how mutations can affect genotype.
- ☐ Describe how you modelled new combinations of genotypes through punnet squares and pedigrees
- ☐ Be able to draw and interpret punnet squares and pedigrees with the following:
 - ☐ Autosomal
 - ☐ Sex-linked
 - ☐ Codominant
 - ☐ Incomplete dominant
 - ☐ Multiple alleles
- ☐ Describe what is meant by frequency data
- ☐ Calculate frequency data from genotypes
- ☐ Describe an SNP
- ☐ Describe where frequency data and/or SNP's can be used to determine inheritance patterns or diseases.
- ☐ Describe at least 2 techniques used for DNA sequencing (Sanger and Oxford Nanopore)
- ☐ Explain how they can be used to determine inheritance patterns in a population
- ☐ Describe the process of DNA profiling including an STR
- ☐ Explain how profiling can be used to determine inheritance patterns, disease, population and crime data.
- ☐ Identify a large-scale collaborative project. (e.g. Human Genome Project)
- ☐ Describe the large-scale collaborative project that allows us to identify trends, patterns and relationships

Module 6

- ☐ Define mutation.
- ☐ Define mutagen.
- ☐ Identify at least 2 different electromagnetic radiation sources.
- ☐ Describe how they are made/where they are emitted.
- ☐ Explain how they cause mutations.
- ☐ Identify at least 2 different chemicals that can cause mutation.
- ☐ Describe how they are made/where they are emitted.
- ☐ Explain how they cause mutations

- ☐ Identify at least 2 different naturally occurring mutagens.
- ☐ Describe how they are made/where they are emitted.
- ☐ Explain how they cause mutations
- ☐ Identify at least 3 different types of point mutations.
- ☐ Describe how they occur and what impact they have on DNA
- ☐ Identify at least 3 different types of chromosomal mutations.
- ☐ Describe how they occur and what impact they have on DNA.
- ☐ Create a table to show the similarities and differences between point mutations and chromosomal mutations
- ☐ Describe the differences between somatic mutations and germline mutations. Include at least 1 example of each type of mutation.
- ☐ Describe the difference between coding and non-coding DNA.
- ☐ Explain how mutations in these areas can affect an organism.
- ☐ Make a judgement about the significance of mutations in coding and non-coding regions.
- ☐ Define gene flow and genetic drift.
- ☐ Describe the gene pool.
- ☐ Explain how mutation can affect the gene pool.
- ☐ Explain how gene flow can affect the gene pool.
- ☐ Explain how genetic drift can affect the gene pool.
- ☐ Make a judgement about how significant the effects are from each of the previous factors with examples.
- ☐ Define biotechnology
- ☐ Identify at least 1 example of a past, present and future biotechnology.
- ☐ Explain the social and ethical implication of each biotechnology with examples
- ☐ Describe at least 1 form of biotechnology that has potential to be used in the future. (e.g. CRISPR)
- ☐ Describe at least two biotechnologies and their benefits to society.
- ☐ Discuss the positive and negative aspects of the technologies
- ☐ Make a judgement about the overall impact the biotechnologies could have on society
- ☐ Describe at least two genetic biotechnologies
- ☐ Explain using examples how genetic techniques can impact biodiversity. (e.g. BT Cotton/Transgenic Salmon/Golden Rice).
- ☐ Make a judgement about the impact on biodiversity from using genetic techniques.
- ☐ Describe artificial insemination and artificial pollination.
- ☐ Create a table to show the similarities and differences between artificial insemination and artificial pollination
- ☐ Explain the process of whole organism cloning with examples. (e.g. Dolly the sheep)
- ☐ Make a judgement about the effectiveness of whole organism cloning
- ☐ Explain the process of gene cloning with examples. (e.g. Insulin)
- ☐ Make a judgement about the effectiveness of gene cloning.
- ☐ Define a transgenic species.
- ☐ Describe a recombinant DNA technique (e.g. gene cloning for insulin)
- ☐ Identify at least 2 transgenic species in agriculture and 2 in medical application. (e.g. BT cotton/transgenic salmon and Insulin production/knockout mice)
- ☐ Describe at least 1 genetic technique used in agriculture, medical and industrial applications. (may be same as above)
- ☐ Make a judgement about the benefit of using the genetic technology in each of the areas listed above.

- ☐ Define biodiversity.
- ☐ Explain how biotechnologies are used in agriculture with examples. (may be same as above)
- ☐ Make a judgement about the effect of these technologies on biodiversity.
- ☐ Describe how you interpreted a range of secondary sources. (CRAAP methodology).
- ☐ Explain the social, economic and cultural impacts of at least 2 biotechnologies. (Golden Rice/BT cotton)
- ☐ Make a judgement about how social, economic and cultural factors influence the use of these technologies.

Module 7

- ☐ Identify and be able to draw or label 6 different types of pathogens.
- ☐ Describe the features of the 6 pathogens.
- ☐ Describe diseases caused by the 6 pathogens including at least 2 pathogen that affect plants.
- ☐ Classify each of the pathogens using a table to compare the similarities and differences
- ☐ Define epidemic.
- ☐ Define endemic.
- ☐ Define pandemic.
- ☐ Describe the transmission of a disease during an epidemic.
- ☐ Explain the way you collected and analysed reliable data on the epidemic.
- ☐ Define direct, indirect, and vector transmission with examples.
- ☐ Describe how different diseases use different methods of transmission.
- ☐ Identify Koch's postulates.
- ☐ Describe Kochs postulates.
- ☐ Describe at least 2 other contributions made by Koch
- ☐ Evaluate the impact that Koch had on our understanding of disease
- ☐ Describe Pasteur's experiment.
- ☐ Describe at least 2 other contributions made by Pasteur.
- ☐ Evaluate the impact that Pasteur had on our understanding of disease.
- ☐ Identify 2 plant diseases in agriculture.
- ☐ Describe the diseases.
- ☐ Assess the impact of the diseases on agricultural production
- ☐ Identify 2 animal diseases in agriculture.
- ☐ Describe the diseases.
- ☐ Assess the impact of the diseases on agricultural production
- ☐ Identify adaptations of at least 2 different pathogens that facilitate entry into and transmission between hosts.
- ☐ Describe how the adaptations allow the organisms to enter into the host.
- ☐ Describe how the adaptations allow the organisms to transfer between hosts.
- ☐ Create a table to compare these adaptations.
- ☐ Identify either a named fungal or viral pathogen that impacts a named Australian plant. (e.g. myrtle rust)
- ☐ Describe the response of the Australian plant including the innate and active response.
- ☐ Describe the role of the first line of defence in humans including the physical and chemical barriers.

- ☐ Describe the role of the second line of defence including the inflammation response and phagocytosis.
- ☐ Describe the role of the third line of defence.
- ☐ Be able to draw or label diagrams of the third line of defence.
- ☐ Describe 4 types of t-cells
- ☐ Describe the process of a B cell becoming a plasma cell.
- ☐ Describe the role of the dendritic cell and macrophage in the immune response.
- ☐ Describe the role of antigens and antibodies.
- ☐ Explain how primary exposure to a pathogen alters the innate and acquired immune system.
- ☐ Identify a named disease that was an epidemic or pandemic.
- ☐ Describe the way the disease functions including naming the pathogen.
- ☐ Explain/Discuss how the spread of the disease can be limited at the local, regional and global levels.
- ☐ Describe at least 3 hygiene practices.
- ☐ Explain how they limit the spread of disease.
- ☐ Define quarantine.
- ☐ Explain how quarantine is used to prevent the spread of disease.
- ☐ Define isolation.
- ☐ Define vaccination and immunisation
- ☐ Explain how vaccination can be used in passive and active immunity.
- ☐ Identify at least 2 public health campaigns for infectious diseases.
- ☐ Describe the key methods used in the campaigns
- ☐ Explain how these campaigns limit the spread of disease.
- ☐ Identify at least 2 pesticides. (e.g. Glyphosate and Captan)
- ☐ Describe how they work.
- ☐ Explain how they prevent the spread of disease.
- ☐ Identify a method of genetic engineering. (e.g. Car T-cell therapy)
- ☐ Describe how it works.
- ☐ Explain how it is used to prevent the spread of disease.
- ☐ Define antivirals or antibiotics. (antibiotics are easier)
- ☐ Identify some examples of either.
- ☐ Describe how they work.
- ☐ Assess the effectiveness of the pharmaceutical in treating diseases including a named disease example.
- ☐ Define incidence.
- ☐ Define prevalence.
- ☐ Define mortality
- ☐ Interpret data from graphs/tables on mobility of immune/immunised and/or malaria and dengue fever in South East Asia
- ☐ Describe historical methods of predicting and controlling the spread of disease.
- ☐ Evaluate how effective they were at preventing and controlling disease.
- ☐ Describe culturally diverse methods of predicting and controlling the spread of disease.
- ☐ Evaluate how effective they are at preventing and controlling disease.
- ☐ Describe current methods of predicting and controlling the spread of disease. (SIR modelling/epidemiology).
- ☐ Evaluate how effective they are at preventing and controlling disease.
- ☐ Describe a protocol that ensures the recognition and protection of Aboriginal Intellectual property.

- ☐ Describe the function of either bush medicine or smoke bush in preventing/treating disease.
- ☐ Explain the importance of recognition and protection of indigenous cultural intellectual property in relation to these medicines.

Module 8

- ☐ Define homeostasis
- ☐ Be able to draw and interpret negative feedback loops for temperature.
- ☐ Explain each section of the feedback loop including the stimulus response pathway.
- ☐ Be able to draw and interpret negative feedback loops for glucose.
- ☐ Describe the difference between glucose, glycogen and glucagon.
- ☐ Explain each section of the feedback loop including the stimulus response pathway.
- ☐ Describe structural, behavioural and physiological adaptations.
- ☐ Describe behavioural adaptations of at least 3 endotherms that assist in maintaining homeostasis.
- ☐ Describe structural adaptations of at least 3 endotherms that assist in maintaining homeostasis.
- ☐ Describe physiological adaptations of at least 3 endotherms that assist in maintaining homeostasis.
- ☐ Describe hormone pathways that allow homeostasis to be maintained (insulin and glucagon/pregnancy hormones)
- ☐ Describe the structure and function of neurons.
- ☐ Explain the stages of the action potential.
- ☐ Explain how the action potential relates to regulating temperature.
- ☐ Identify an Australian plant that regulates water.
- ☐ Describe the methods it uses to regulate water balance.
- ☐ Explain how this method allows for water balance to be maintained.
- ☐ Identify at least 2 genetic diseases.
- ☐ Describe the causes of the diseases.
- ☐ Describe the effects of the diseases.
- ☐ Identify at least 2 diseases caused by the environment.
- ☐ Describe the causes of the diseases.
- ☐ Describe the effects of the diseases.
- ☐ Identify at least 2 nutritional diseases.
- ☐ Describe the causes of the diseases.
- ☐ Describe the effects of the diseases.
- ☐ Identify at least 2 types of cancer.
- ☐ Describe the causes of the cancers.
- ☐ Describe the effects of the cancers.
- ☐ Explain how you used data to show the incidence prevalence and mortality rates of nutritional diseases and diseases caused by environmental exposure. (note: These points will most likely involve interpreting and representing data through graphs/diagrams etc)
- ☐ Identify a non-infectious disease (nutritional or environmental)
- ☐ Describe the way it is treated.
- ☐ Describe the way it is managed.
- ☐ Describe the future direction of the treatment/management of the disease.

- ☐ Define epidemiology.
- ☐ Describe the different types of epidemiological studies.
- ☐ Describe the features of a valid epidemiological study.
- ☐ Identify a named epidemiological study. (e.g. UK doctors smoking study/Pima population)
- ☐ Describe the method that was used to collect data.
- ☐ Make a judgement about the effectiveness of the method
- ☐ Identify 2 examples of epidemiological studies. (Same as above.)
- ☐ Describe the studies.
- ☐ Make a judgement about the benefits of these studies.
- ☐ Identify 2 education programs/campaigns that are used to prevent non-infectious diseases. (e.g. Quit and Slip, Slop, Slap)
- ☐ Describe the programs.
- ☐ Make a judgement about the effectiveness of the program.
- ☐ Describe a range of strategies that could be used in an educational campaign/program to prevent a non-infectious disease.
- ☐ Describe the strategies.
- ☐ Describe 2 genetic engineering methods that prevents a non-infectious disease. (e.g. Golden Rice and PGT)
- ☐ Make a judgement about the effectiveness of the methods.
- ☐ Identify the structures of the ear.
- ☐ Describe the function of the ear.
- ☐ Identify 2 disorders that affect the ear.
- ☐ Describe at least 2 causes of hearing loss
- ☐ Identify the structures of the eye.
- ☐ Describe the function of the eye including the process of accommodation.
- ☐ Identify 2 disorders that affect the eye.
- ☐ Describe at least 2 causes of vision loss
- ☐ Identify the structures of the kidney.
- ☐ Describe the function of the kidney.
- ☐ Identify a disorder that affects the kidney.
- ☐ Describe at least 2 causes for the loss of kidney function.
- ☐ Identify a disorder that requires a hearing aid.
- ☐ Describe how the hearing aid functions.
- ☐ Identify a disorder that requires the bone conduction implant.
- ☐ Describe how the bone conduction implant functions.
- ☐ Identify a disorder that requires the cochlear ear implant.
- ☐ Describe how the cochlear ear implant functions
- ☐ Identify a disorder that requires spectacles.
- ☐ Describe how spectacles functions, focussing on convex and concave lenses.
- ☐ Identify a disorder that requires laser eye surgery.
- ☐ Describe the process of laser eye surgery.
- ☐ Identify a disorder that requires dialysis.
- ☐ Describe the process of dialysis
- ☐ Identify a technology that is used to manage the disorder.
- ☐ Make a judgement about the effectiveness of a technology to treat a disorder.

Skills

- ☐ Define and write a hypothesis
- ☐ Define Independent and Dependent Variables
- ☐ Define Controlled variables with examples.
- ☐ Define a control and give an example.
- ☐ Give examples of how each of the above can be used to improve an experiment
- ☐ Draw and label a line graph
- ☐ Draw and label a column graph
- ☐ Draw and label a histogram
- ☐ Understand when to choose the right type of graph.
- ☐ Write a method
- ☐ Write a risk assessment
- ☐ Define reliability
- ☐ Define accuracy
- ☐ Define validity
- ☐ Write a conclusion
- ☐ Determine how to ensure you used valid secondary sources (CRAAP methodology).

Specific Models studied in Biology.

- ☐ Cell replication
- ☐ Mitosis
- ☐ Meiosis
- ☐ Watson and Cricks Model including nucleotide composition, pairing and bonding rules.
- ☐ DNA in prokaryotes and Eukaryotes
- ☐ Transcription and Translation
- ☐ Crossing Over
- ☐ Punnet Squares and Pedigrees
- ☐ The innate and Adaptive Immune System

- ☐ **Practical Investigations you have to know**

- ☐ Food and Water testing Investigation

Other useful investigations to know

- ☐ Pasteur's swan neck flask experiment
- ☐ Barry Marshalls investigation on Helicobacter Pylori supporting Koch's postulates
- ☐ Bush medicine investigation using agar plates (Depth study)



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