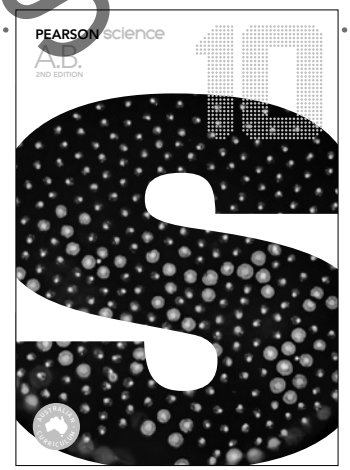
Contents

Access the worksheets for the Step up chapters in Biology, Chemistry and Physics on your eBook.

Answers are available in the teacher version of the eBook and on Productlink.



Pearson Science 2nd edition Activity Book

An intuitive, self-paced approach to science education, which ensures every student has opportunities to practise, apply and extend their learning through a range of supportive and challenging opportunities.

Pearson Science 2nd edition has been updated to fully address all strands of the new Australian Curriculum: Science which has been adopted throughout the nation. This edition also captures the coverage of Science curricula in states such as Victoria, which have tailored the Australian Curriculum slightly for their own particular students.

The *Pearson Science 2nd edition* features a more explicit coverage of the curriculum. The activities enable flexibility in the approach to teaching and learning. There are opportunities for extension as well as reinforcement of key concepts and knowledge. Students are also guided in self-reflection at the end of each topic.

More **explicit scaffolding** makes learning objectives clear and includes regular opportunities for reflection and self-evaluation.

In this edition, we provide a structured approach that integrates a seamless, intuitive and research-based approach hence **differentiating** the course for every student.

The Activity Book also provides richer application opportunities to take the Student Book content further with explicit coverage of Inquiry Skills, Science as a Human Endeavour and Science Understanding.

The diverse offering of worksheets allows students to be challenged at their level. Students have the flexibility to be self-paced and this new edition comes with the advantage of each worksheet being self-contained.

Be guided

A new handy **Toolkit** at the beginning of the Activity Book has been created to build skills in the key areas of practical investigations, research, thinking, organising, collecting and presenting. Each skill developed in the toolkit is directly relevant to applications in questions, investigations and research activities throughout the student and activity books. A toolkit spread provides guides and checklists alongside models and exemplars.

Be supported

Vocabulary boxes provide definitions for key terms, within the relevant context of the task. **Hints** help students get started on a worksheet and provide support in overcoming a barrier.

Be reflective

The **Thinking about my learning** feature provides the opportunity for self-reflection and self-assessment. It encourages students to look ahead to how they can continue to improve and assists in highlighting focus areas for skill and knowledge development.


5.9 Thinking about my learning

Be ready

A **knowledge preview** at the beginning of every chapter, activates prior knowledge relevant to the topic, providing an opportunity for students to show what they currently know. This handy tool supports teachers in assessing students' prior understanding.


CHAPTER 2 DNA and genetics
2.1 Knowledge preview
Science understanding

Be literate

Newly improved **literacy reviews**, in consultation with our Literacy Consultant Dr Trish Weekes, provide a deeper and broader range of language building tasks. Every chapter concludes with a literacy review which focuses on building a deeper understanding of key terms and supporting students to correctly apply key terms from the topic.


4.9 Literacy review
Science understanding

Be set

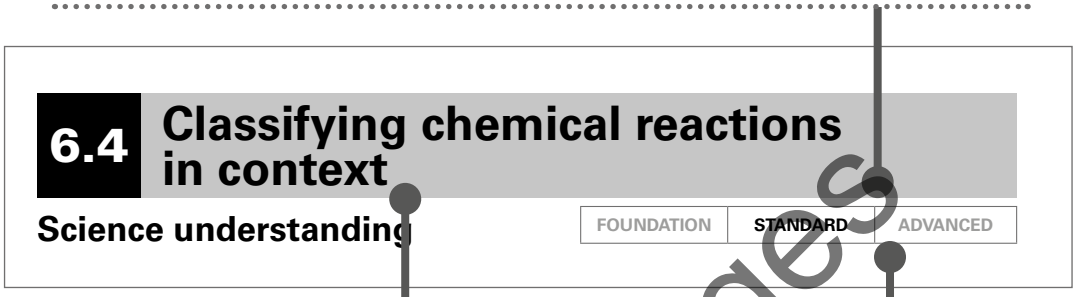
Visit www.pearsonplaces.com.au to enjoy the benefits of the following digital assets and interactive resources to support your learning and teaching:

- New interactive activities and lessons
- New Untamed Science videos
- Web destinations
- Student investigation templates and teacher support
- New STEP-UP student book and activity book chapters with answers at Years 9 & 10
- Full answers to all Student Book and Activity Book questions
- SPARKlabs
- Risk assessments
- Full teaching programs and curriculum mapping audits
- Chapter tests with answers

Each worksheet is classified according to the degree with which it deals with curriculum understandings.

- **Foundation** indicates the focus is on the basics like terminology.
- **Standard** indicates a focus on the core ideas, understandings and skills.
- **Advanced** indicates transfer and extension of core science understanding and skills to new or more sophisticated situations.

Teachers may use this tool to **differentiate** the worksheets allocated to students. They may select worksheets for students based on whether basic, core or extension exercises are required. The categories do not indicate the degree of difficulty of tasks on the worksheet. A worksheet labelled advanced may have tasks ranging from lower-level through to higher-level thinking.



The main science **strand** is identified for each worksheet: Science Inquiry Skills, Science Understanding, Science as a Human Endeavour

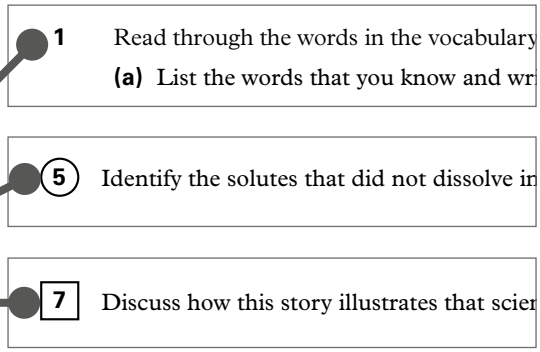
Science Inquiry Skills relevant to the worksheet are identified: Questioning and predicting, Planning and conducting, Processing and analysing, Evaluating, Communicating

Each question in a worksheet is identified according to the degree of difficulty. Bloom's taxonomy is used as the basis for question classification. The classification is intentionally subtle and unobtrusive. This tool may be used to differentiate between students, matching questions to their levels of ability.

Question 1 is a straight number. This indicates a remembering or understanding lower-order question.

Question 5 has a circle around the question number. This indicates an analysing or applying middle-order question.

Question 7 has a square around the question number. This indicates a creating or evaluating high-order question.



An innovative tool for students to quickly and easily reflect on their understanding of each worksheet. The teacher may use the student responses as a formative assessment tool. At a glance teachers may assess which topics and which students need intervention for improvement.

CHAPTER 2

DNA and genetics

2.1 Knowledge preview

Science understanding

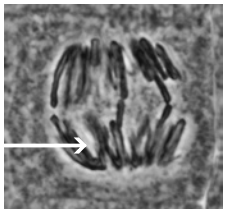
FOUNDATION | STANDARD | ADVANCED

1 **(a)** Identify the structure labelled 'M' in the adjacent image.

_____

(b) Structure M cannot be seen most of the time. What is the cell doing that has resulted in structure M being visible?

_____



2 For each of the following word pairs, write a sentence which shows how the two words are related:

(a) parents and offspring _____

_____

(b) gamete and egg _____

_____

(c) sperm and inheritance _____

_____

(d) DNA and genes _____

_____

(e) genes and chromosomes _____

_____

3 The box on the right includes the parts of the female and male reproductive systems. Circle the names which belong to the parts of the female system and underline the parts of the male reproductive system. Highlight any words you don't know.

cervix	Cowper's gland		epididymis
ovary	oviduct	penis	prostate gland
testes	uterus	vagina	vas deferens

4 Write down three questions that you would like answered while studying this topic.

_____

_____

_____

_____

_____

2.2 Structure of DNA

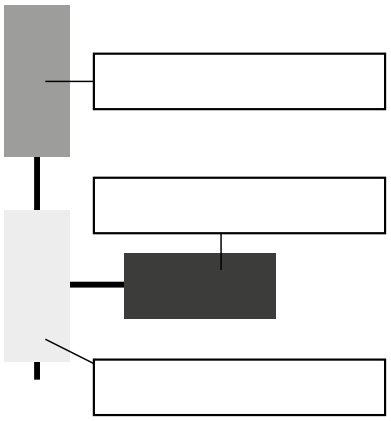
Science understanding

FOUNDATION | **STANDARD** | ADVANCED

DNA building blocks

The building blocks of a DNA molecule are called nucleotides. Each nucleotide has three parts:

- phosphate group
- sugar
- nitrogen-rich bases.



1 Use the three terms above to label the nucleotide diagram shown on the right.

DNA structure

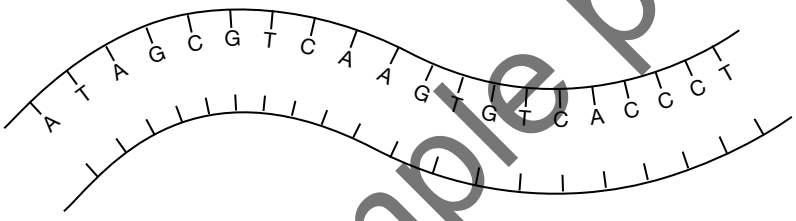
The nitrogen-rich bases can be one of four types:

- adenine (A)
- thymine (T)
- cytosine (C)
- guanine (G)

In a double-stranded DNA molecule, A and T always form a pair and C and G always form a pair. They are called complementary pairs.

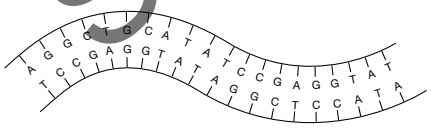
complementary (*adj*) matching, one of a pair
DNA (*n*) deoxyribonucleic acid—main part of chromosomes; transfers genetic characteristics
double-stranded (*adj*) with two strands
strand (*n*) rope or thread

2 The sequence of bases below represents a section of a single strand of DNA. Write the base sequence in the complementary strand of DNA.

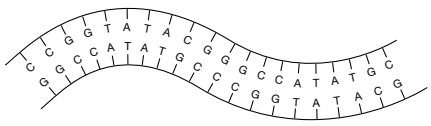


3 **(a)** Identify which of the following figures A, B, C, or D represents a possible correct base sequence in a molecule of DNA. _____

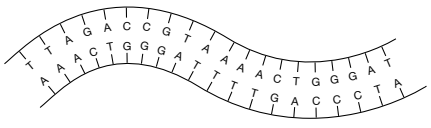
A



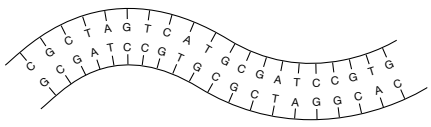
B



C



D



(b) Justify your decision for each molecule, explaining why it is correct or incorrect.

A _____

B _____

C _____

D _____

2.3 Complementary base pairing

Science understanding

FOUNDATION | **STANDARD** | ADVANCED

The chemical structure of the nitrogen-rich bases means that they can only form chemical bonds with one of the other bases.

- Adenine (A) only pairs with thymine (T).
- Cytosine (C) only pairs with guanine (G).

One side of the DNA 'ladder' could be like Figure 2.3.1 with the sugar–phosphate backbone and the attached bases.

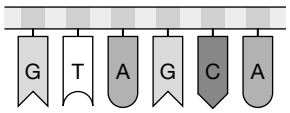


Figure 2.3.1 One side of the DNA strand

Using complementary base pairing, the other side of the molecule would look like Figure 2.3.2.

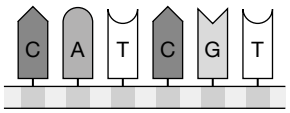


Figure 2.3.2 The other side of the DNA ladder

When the two sides are put together, the DNA molecule in Figure 2.3.3 would result.

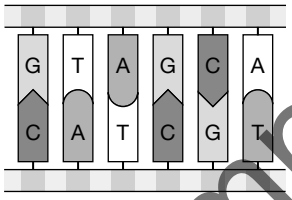


Figure 2.3.3 The resulting DNA molecule

1 Construct a diagram of the complementary DNA ladder for the following sequences.

(a) T C C C A G G C T A

(b) A G T T C A C G T G G

(c) A T A T G G T C A T G

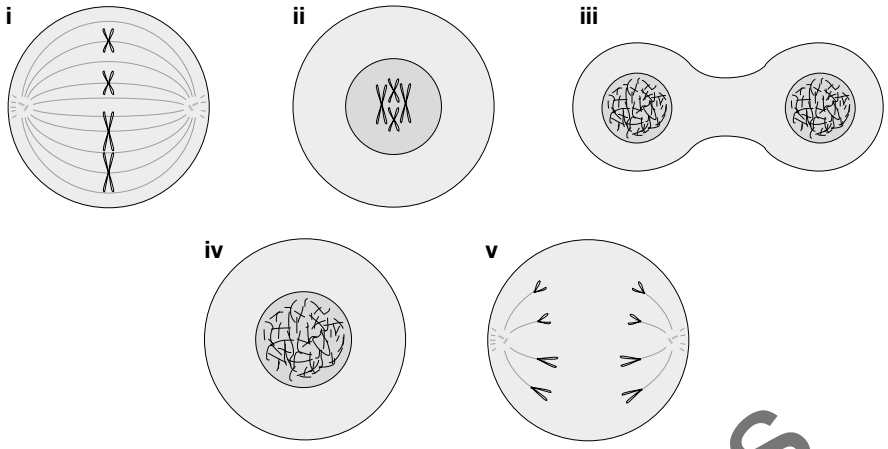
RATE MY UNDERSTANDING Shade the face that shows your rating ☺ 😐 ☹

2.4 Mitosis

Science understanding

FOUNDATION | **STANDARD** | ADVANCED

The diagram represents five stages of mitosis. However, they are not in the correct order.



The following captions (A to E) are descriptions of the five stages of mitosis shown above. The descriptions are not in the correct order.

A The chromatids separate. The spindle fibres contract, pulling the chromosomes to opposite poles of the cell.

B Separate chromosomes become visible. Each chromosome comprises two chromatids.

C In the period between cell divisions, the DNA replicates.

D The nuclear membrane re-forms, enclosing the chromosomes into a new nucleus at each pole. Division of the nucleus is now complete. The cytoplasm then divides, resulting in two identical daughter cells.

E The membrane surrounding the nucleus breaks down. The spindle appears, extending from the poles of the cell to each chromosome. The chromosomes line up across the equator of the cell.

comprise (*v*) made up of, to consist of
contract (*v*) to shorten
divide (*v*) to split in half
equator (*n*) middle, centre
identical (*adj*) exactly the same
replicate (*v*) to reproduce or copy itself

1 Use the table below to redraw each stage of mitosis in the correct order.

2 Identify the letter of the correct caption for each stage.

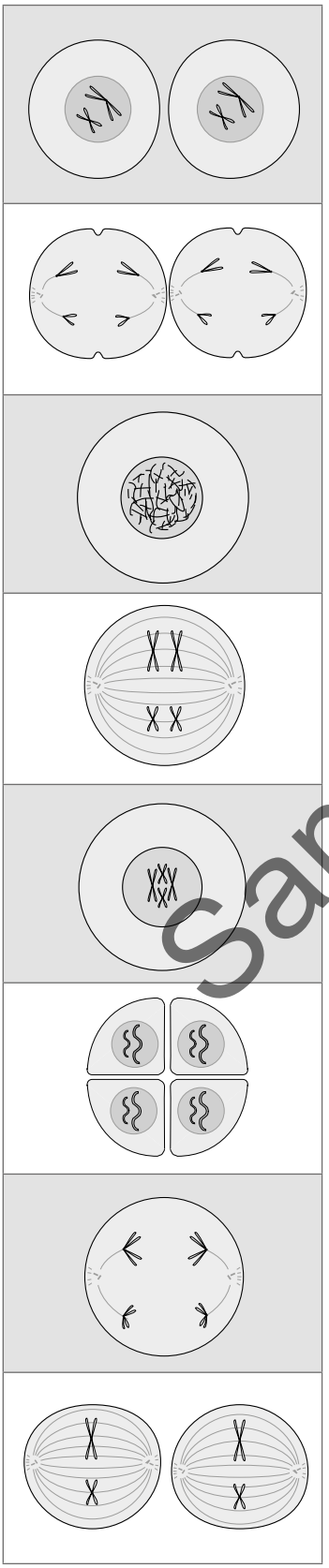
First stage	Second stage	Third stage	Fourth stage	Fifth stage
Caption:	Caption:	Caption:	Caption:	Caption:

2.5 Meiosis

Science understanding

FOUNDATION | **STANDARD** | ADVANCED

1 Meiosis takes place in 8 different stages. Draw lines to match each diagram of meiosis on the right with its correct description on the left.



The nuclear membrane breaks down and pairs of replicated chromosomes line up on the equator of the cell with spindle fibres attached.

The nuclear membranes form and the cytoplasm divides to produce four new cells. Each cell now contains the haploid number of chromosomes. These cells are the gametes.

In the period between cell divisions, the DNA replicates.

The spindle fibres contract, pulling the chromatids apart towards the poles of the cells.

At the end of the first part of the division, nuclear membranes may re-form. The chromosomes at each pole are enclosed into new nuclei.

The spindle fibres contract, drawing one chromosome from each pair to opposite poles of the cell. At this stage, each chromosome is still two chromatids.

The DNA becomes visible as separate chromosomes, each of which comprises two chromatids.

After the first part of the division, a new spindle forms at right angles to the first. The new spindle fibres attach to the chromosomes and line them up on the equator of the cell.

RATE MY UNDERSTANDING
Shade the face that shows your rating

2.6 Punnett squares

Science understanding

FOUNDATION | **STANDARD** | ADVANCED

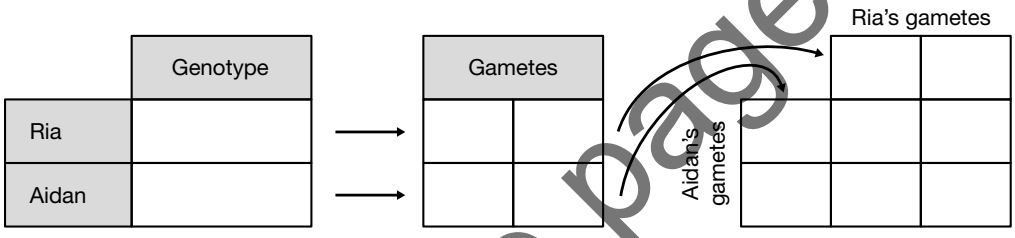
You may have noticed that some people have long eyelashes and others have short, straight eye lashes. Having long or short lashes is the phenotype of the person—the way they look. The length of your eyelashes is an inherited trait, with long lashes being dominant to short lashes. The alleles that you have inherited to determine the length of your eyelashes is your genotype.

cross (*n*) the mating of two organisms
inherited (*v*) received from another individual such as a parent
offspring (*n*) child
trait (*n*) quality, characteristic

1 Use a Punnett square to demonstrate the inheritance of long and short eyelashes respectively.

In this example, Ria, the mother, is homozygous for long lashes. Aidan, the father, is homozygous for short lashes.

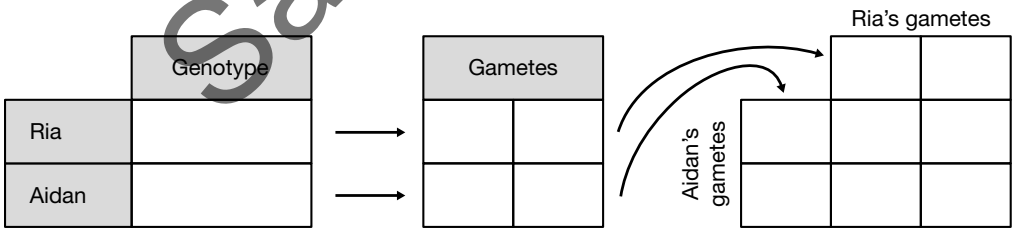
Use the letter E to represent the allele for long eyelashes and e to represent the allele for short eyelashes.



(a) Possible genotypes of children: _____

(b) Possible phenotypes of children: _____

2 Demonstrate how the characteristics of the offspring would change if both parents were heterozygous for eyelash length.



(a) Possible genotypes of children: _____

(b) Possible phenotypes of children: _____

3 In guinea pigs, black coat colour (B) is dominant to white coat colour (b).

(a) What is the ratio of phenotypes and genotypes of the offspring from a cross between a heterozygous black guinea pig and a homozygous white guinea pig?

_____

(b) How did you work out the answer? _____

2.7 Pedigree analysis

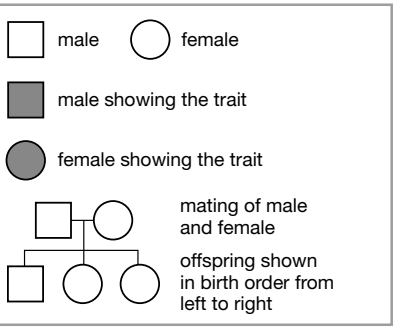
Science inquiry skills

FOUNDATION | **STANDARD** | ADVANCED

Processing & Analysing **Communicating**

Inheritance of a characteristic in a family can be demonstrated using a family tree or pedigree.

In a pedigree, such as the one shown, symbols are used to identify males and females, and those with or without a characteristic or trait.



1 The following diagram shows a pedigree for three generations of a family in which the ability to roll the tongue has been recorded. Tongue rolling is a dominant trait.

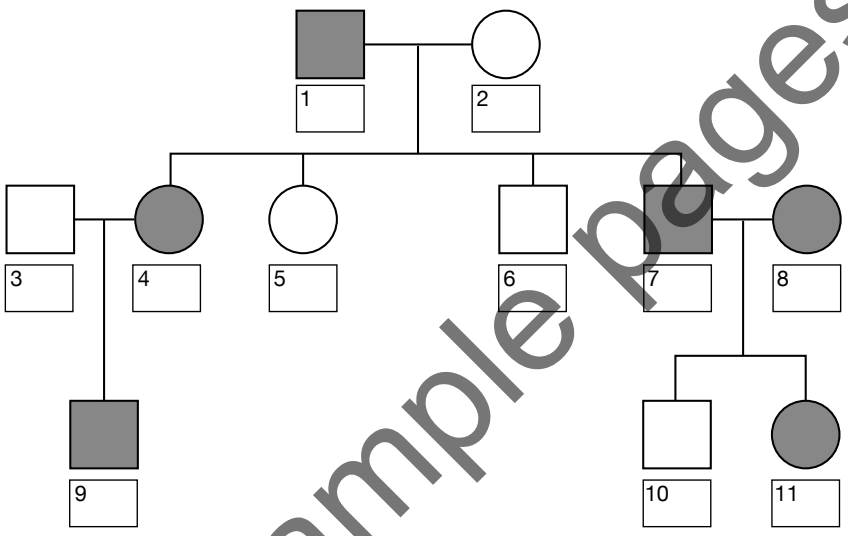
Determine the genotype of each individual in the pedigree and record it in the box provided. Use the letter R to represent the dominant trait. Use a '?' for an unknown allele (for example 'R?').

inheritance (*n*) a characteristic passed on from parent to offspring

generation (*n*) group of individuals born and living about the same time

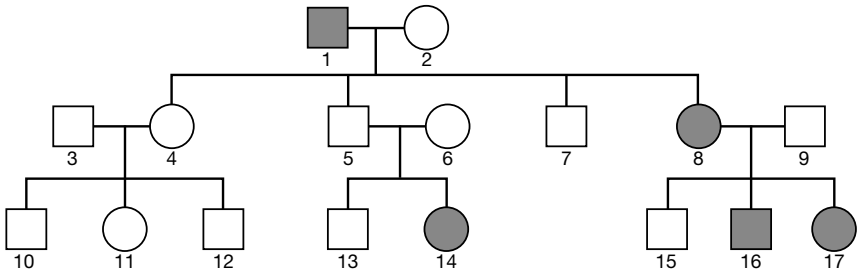
pedigree (*n*) a chart showing parents, offspring and their inherited traits

roll the tongue (*v*) to curl up the sides of the tongue



2 **(a)** The pedigree below shows inheritance of a different trait over three generations.

Determine whether it is a dominant or recessive trait. _____



(b) Justify your response.

_____

_____

_____

_____

2.10 Genetically modified food

Science understanding

FOUNDATION | **STANDARD** | ADVANCED

The Green Revolution of the 1950s increased food production by using new and improved chemicals to control weeds, insect pests and diseases. New varieties of crops and fertilisers also helped to increase food production.

The Gene Revolution of the 21st century uses genetic modification to grow crops that have the potential to produce more food with a higher nutritional value than traditional crops. The Gene Revolution also uses fewer chemicals. Scientists believe that by using gene technology they can improve a variety of crops including corn, wheat, rice, canola, chicory, squash, potato, soybean, alfalfa, cotton, banana and tomato.

(1) Compare the Green Revolution and the Gene Revolution.

Below are some of the arguments for and against the use of genetically modified (GM) food.

Arguments for the use of genetically modified crops

- GM crops are potentially more resistant to disease, can grow in less space, can provide greater yield and need less pesticide.
- Genetically modified, pest-resistant crops need less insecticide spray, which is better for the environment and saves the farmer money.
- Current agricultural methods will not be able to grow enough food to feed the 9 billion people predicted to populate the world by 2050.
- Genetic modification can improve crops more quickly than conventional selective breeding processes.
- Scientists can add genes that make plants tolerant to frost, drought and salinity (high salt levels). They can also add genes to make crops resistant to insect pests. These genes can be turned 'off' and 'on' in different parts of the plant. Genetic modification is one tool that farmers can use to maintain or increase crop yields as the climate changes.
- GM foods can improve a poor diet by providing nutritionally improved foods.
- Improved nutrition should have health benefits in both developed and developing countries. GM plants can also deliver medicines. For example, golden rice increases the intake of vitamin A, and bananas can carry a vaccine (cure) for the disease hepatitis D.
- Genetic modification may be able to remove allergens from nuts. Allergens are the chemicals that cause allergic reactions. Eleven different proteins in peanuts are known to cause allergic reactions. Scientists are developing genetically modified peanuts in which the two strongest allergens have been removed.
- There is no evidence to suggest that approved GM foods are more dangerous than normal foods.
- In Australia, GM foods are regulated, ensuring that only assessed and approved GM foods enter the food supply.

Arguments against the use of genetically modified crops

- Some people say that GM crops are not safe to eat. They feel that there has not been enough evaluation of the potential risks and side effects of consuming GM foods, especially those that are nutritionally boosted. There is a chance that new allergens may be created.
- Herbicides are chemicals that are used to control weeds. The genes for herbicide resistance may be transferred from the GM crop to weeds in the environment, making it more difficult to control weed species.

- Some people think that antibiotic resistance may develop in humans and farm animals fed on genetically modified foods. This could make antibiotics less effective in treating disease.
- Creating pest- or herbicide-resistant GM crops could lead to the evolution of more-resistant bugs and weeds.

(2) Discuss the idea that genetic modification is just an extension of the strategies, such as selective breeding, that farmers have used to modify food crops for centuries.

3 Identify what you think is the strongest argument for GM foods and highlight it in green.

4 Identify what you think is the strongest argument against GM foods and highlight it in red.

Social and ethical concerns

- Large companies that own the patent (exclusive rights) for the GM plants may be able to monopolise (dominate) the world's food market by controlling the distribution of the genetically modified seeds.
- Using genes from animals in food plants may create ethical or religious concerns. For example, eating traces of genetic materials from pork in a vegetable or fruit could be a problem for some religious groups or vegetarians.
- Some people believe that genetically modifying plants and animals is 'playing God' or is unnatural. They say that genes from unrelated species should not be mixed.

(5) A gene from arctic fish has been inserted into tomato plants to help them survive frost damage. Discuss whether a vegetarian should feel concerned about eating such a tomato containing fish genes.

Labelling genetically modified food

In Australia, GM foods and ingredients must be identified on labels with the words 'genetically modified'. GM foods with altered characteristics such as increased nutrient levels, or that need to be cooked or prepared in a different way, also have to be labelled.

Below are two examples of labels for food products:

1

Ingredients: meat (60%), reconstituted textured soy protein*, water, wheat flour, soy protein*, dehydrated potato, salt, beetroot powder, onion powder, mineral salts (450), black pepper, soy lecithin*.
*Genetically modified

2

Ingredients: wheat flour, water added, yeast, soy flour (genetically modified), vegetable oil, sugar, emulsifiers (471, 472E), preservative (282), enzyme amylase.

If the food is unpackaged (for example, loose vegetables), then the information must be displayed with them.

Antibiotic or herbicide resistance

When food crops are genetically modified, scientists introduce a marker gene along with the desired gene. Marker genes are often genes for antibiotic or herbicide resistance.

If the antibiotic resistance genes in the GM food were taken up by bacteria in the human gut, this could reduce the effectiveness of antibiotics given to patients to treat infections. For this to happen the marker gene would have to remain intact after digestion and a long chain of events would have to occur before the antibiotic resistance gene became part of the genetic material of the gut bacteria (see Figure 2.10.1). Each step along the pathway may or may not occur, therefore it is very unlikely that antibiotic resistance becomes part of the bacterial genome.

Many bacteria have naturally occurring antibiotic resistance and these bacteria are in the foods we eat.

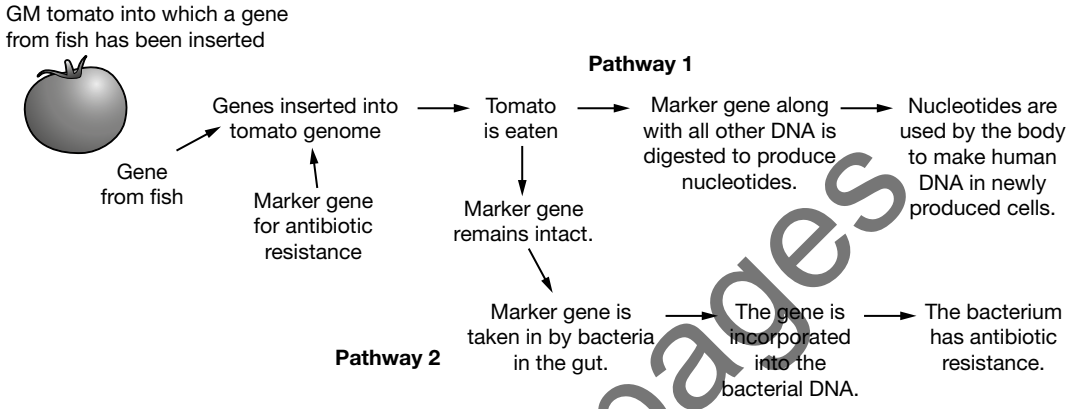


Figure 2.10.1 Pathway 1 is the most likely series of events after a genetically modified tomato (or any other genetically modified food) has been consumed. All the steps in Pathway 2 must occur for antibiotic resistance to become part of the bacterial genome.

6 Decide whether you support the continued use of GM foods in Australia. Justify your opinion.

RATE MY UNDERSTANDING
Shade the face that shows your rating

2.11 Bioinformatics

Science understanding

FOUNDATION | STANDARD | **ADVANCED**

Bioinformatics is a field of science in which biology, information technology and computer science all work together. Analysis of the human genome would be impossible without very powerful computers.

Analysis of the human genome produced long lines of the letters A, T, C and G such as those shown in Figure 2.11.1.

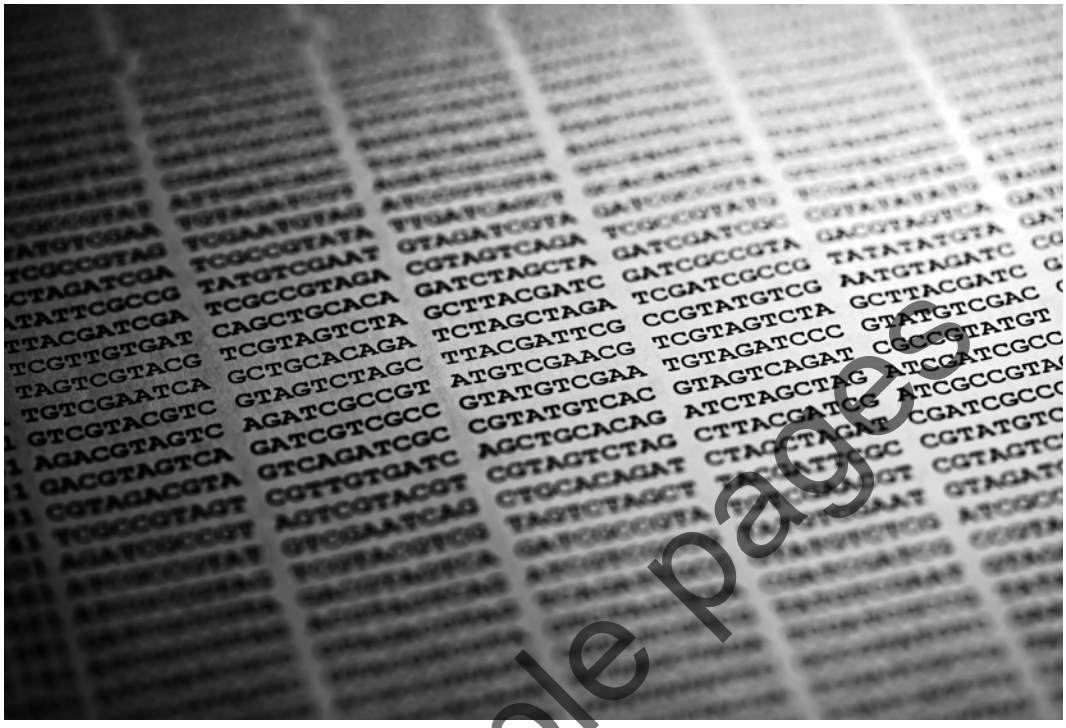


Figure 2.11.1 One way of presenting the data collected in the human genome project is as a list in order of the bases found in the genes.

Scientists discovered that there is one base different between a person with normal haemoglobin in their red blood cells and a person with sickle cell anaemia—a disease that can be fatal.

As part of the gene, a person with normal haemoglobin has the base sequence:

CTG ACT CCT GAG GAG AAG TCT

A person with sickle cell anaemia has the base sequence:

CTG ACT CCT GTG GAG AAG TCT

1 Below is a section of the haemoglobin gene:

TAT ATT CCA AAT AGT AAT GTA GTA CTA GGC AGA CTG TGT AAA

GTT TTT TTT TAG TTA CTT AAT CTG ACT CCT GTG GAG AAG TCT

GTA TCT CAG AGA TAT TTC AAT GTA GTA CTA GGC AGA CTG TGT

AAA GTT TTT TTT TAG TTA CTT AAT CTG ATT CCT

Decide whether the person with this gene suffers from sickle cell anaemia or has normal haemoglobin. Justify your response.

2 One way of deciding how similar organisms are, is to compare the frequency with which the different bases appear in the same gene such as the gene for haemoglobin.

(a) Identify the number of times each of the four bases appears in the section of the haemoglobin gene shown in question 1.

(b) Compare your answer with the totals reached by others in your class.

3 Consider the amount of time it took you to work out the answers to questions 1 and 2.

Consider the benefits of using computers for these tasks in terms of:

(a) accuracy

(b) time taken.

4 Assess whether analysis of the human genome would be possible without computing power given that you analysed bases equivalent of less than 0.00012% of the haemoglobin gene and the haemoglobin gene is one five-thousandth of the human genome.

RATE MY UNDERSTANDING
Shade the face that shows your rating

2.12 Personalised medicine

Science understanding

FOUNDATION | STANDARD | **ADVANCED**

Traditionally, doctors have used an individual patient's symptoms along with their medical and family history to diagnose and treat disease. With advances in genetics, the medical professionals now have a more detailed understanding of the role of genetics in disease. There is greater opportunity to tailor treatments to individual needs. In 2012 the Ian Potter Centre for Genomics and Personalised Medicine was established in Melbourne. It is the first personalised medicine division in Australia.

Not all patients with the same disease respond to particular medication in the same way as shown in Figure 2.12.1. Some patients respond well and get better quickly. Others have little or no response, and patients in a third group have a negative response and are harmed by the medicine that was supposed to cure them. Research is ongoing into the genetic reasons for these different responses. It is hoped that in the future, genetic testing of individuals will identify which patients could have a negative reaction to certain medicines. A different treatment would then be given to those patients.

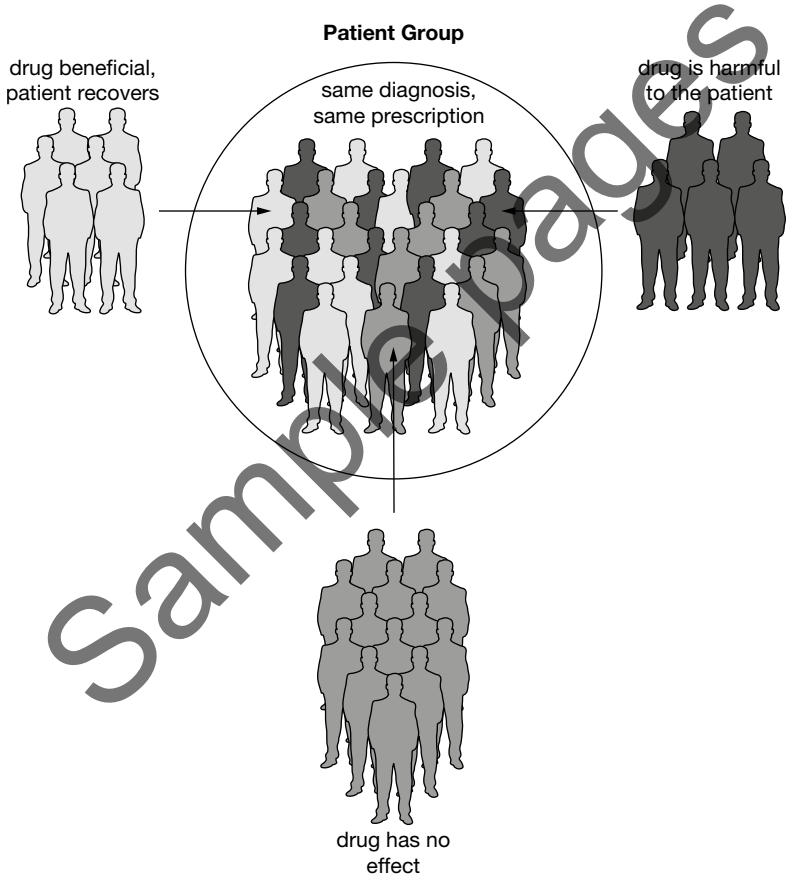


Figure 2.12.1 How you respond to some medicinal drugs depends on your genotype.

Cancers are diseases that have a strong genetic component. The genome of the cancerous tumour is different from the genome of the patient with the disease. By identifying the differences, doctors can make better decisions on the best treatment for a particular cancer. Technology today makes it possible to determine the genome of both the patient and the tumour, but this process takes time and money. However, a small change in the amount of information available allows patients to be put into groups according to their likely response to a particular treatment. This makes the treatment quicker and more likely to be effective. Cancer treatments are expensive, so money is saved getting the treatment right the first time.

2.12 Personalised medicine

Researchers are not sure how much environmental factors such as diet and exercise influence the development of many types of cancers. One way of studying this is to use genetic information to identify people who have alleles predisposing them to a disease and screening these people regularly for the disease. Where possible, prevention programs can be developed that may prevent or delay the onset of disease in individuals at highest risk. If the disease does develop then it can be diagnosed early, when hopefully it will be more treatable.

Some people do not want to know the details of their genetic information such as whether they may have the allele of a gene that is linked to heart disease or to breast or prostate cancer. However, research shows that having the allele may not change the chance of developing the disease by very much. For example, there is a gene linked with breast cancer that increases the chance that tumours will develop. Some individuals with that gene also have a gene that acts to stop tumours forming. In this case the disease is less likely to develop. Research has shown that the majority of breast cancer cases are not linked to identified genes.

1 Explain how knowing a person's genome could reduce the chances of that person having an adverse reaction to a prescribed medicine.

2 **(a)** Describe the information doctors collect before deciding how to treat a cancer patient.

(b) Explain how this benefits the patient.

3 Explain how knowing that you are 'at risk of developing a particular disease' could help you stay healthy.

RATE MY UNDERSTANDING
Shade the face that shows your rating ☺ 😐 ☹

2.13 Assisted reproduction

Science understanding

FOUNDATION | STANDARD | **ADVANCED**

Use the information provided on the noteboard in Figure 2.13.1 and your knowledge of genetics to answer the questions that follow.

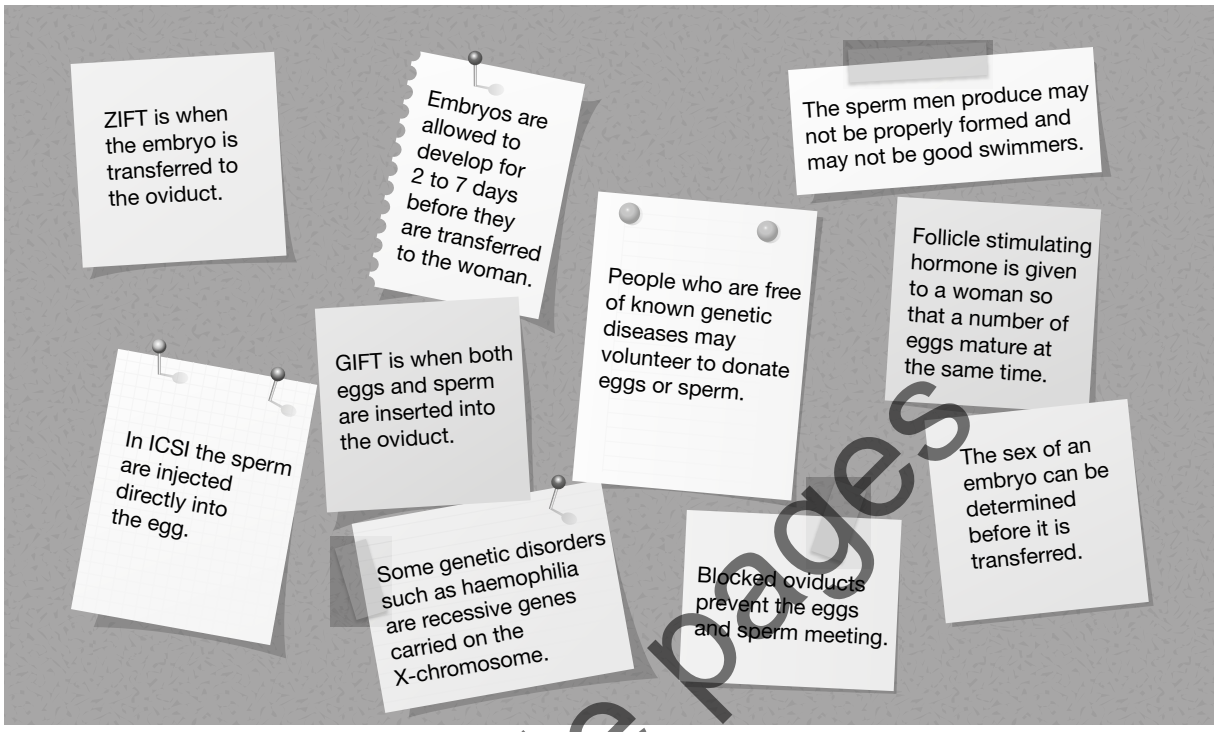


Figure 2.13.1

1. Name the hormone that causes eggs to mature. _____

2. State two causes of infertility.

_____

_____

3. Identify the assisted reproduction technique that would be used if:

(a) the sperm were not strong enough to enter the egg to fertilise it

_____

_____

(b) the sperm were not good swimmers.

_____

_____

4 **(a)** Explain why zygote intrafallopian transfer (ZIFT) would not work when the woman has blocked oviducts.

(b) Explain how assisted reproduction could be used to ensure that the child of a carrier of haemophilia was not a haemophiliac.

(c) Deduce whether a child born using this technique could pass haemophilia on to the next generation. Justify your answer.

2.14 Literacy review

Science understanding

FOUNDATION | STANDARD | ADVANCED

1 Use your knowledge of genetics and DNA by using the words from the box to complete the sentences below. Words may be used more than once.

adult stem cells	alleles	complementary base pairs	cytosine	deoxyribonucleic acid	differentiate
gene splicing	genetically modified	genotype	homologous	meiosis	mitosis
phenotype	pluripotent	recombinant DNA	replication	thymine	

(a) _____ _____ (DNA) is the complex molecule that carries the genetic code.

(b) The four nitrogen-rich bases pair up as c _____

b _____ p _____ . Adenine pairs with _____ and guanine pairs with _____ .

(c) DNA is able to make copies of itself in a process known as _____ .

(d) DNA replication takes place before both types of cell division, which are called:

_____ and _____ .

(e) _____ produces two daughter cells that are identical to the parent cell.

(f) _____ produces gametes (eggs and sperm) that have half the number of chromosomes of the original cell.

(g) _____ chromosomes have the same genes for particular characteristics at the same location on the chromosome.

(h) Variations of genes are known as _____ .

(i) The _____ is the actual genetic information carried by an individual.

The _____ is the observable characteristics of the individual.

(j) During the process of growth and maturation, cells _____ , meaning they become different from each other in structure and function.

(k) When the genetic information contained within the nucleus is changed by inserting new genes, the cell has been _____ _____ .

(l) Scientists use _____ _____ to remove unwanted genes and add new genes into the DNA of the bacterium. The product is _____ _____ , which is DNA that has been recombined with other genes.

(m) _____ _____ _____ are the cells that allow you to regenerate and repair your tissues.

(n) Embryonic stem cells are _____ . They are capable of becoming any one of the 220 different cell types found in the human body.

2.15 Thinking about my learning

1 Imagine that you are going to be presenting a talk to a Year 8 class about genetics and inheritance. There will be time for questions at the end. Some questions that you could be asked are given in the table below. Consider how confidently you could answer them. Tick the appropriate box in the table.

Question	I could answer this question with confidence	I think I could answer this question	I don't think I could answer this question
1 What is a double helix?			
2 What did Watson and Crick do that was special?			
3 What is DNA made of?			
4 What are genes?			
5 Where do you find genes?			
6 What is the process of making new body cells called?			
7 What sorts of cells are made during meiosis?			
8 How many chromosomes does a human have?			
9 What is meant by a dominant trait?			
10 My mum has black hair and my dad has blonde hair—so why is my hair red?			
11 What is a Punnett square?			
12 What is an allele?			
13 What is a mutation?			
14 Are all mutations the same?			
15 Are mutations all bad?			
16 What is genetic engineering?			
17 What is a plasmid?			
18 How are plasmids used for genetic engineering?			
19 What is the Human Genome Project?			
20 What advantages have been gained from the Human Genome Project?			
21 What is a disadvantage of genetic testing?			
22 How is a DNA profile made?			
23 Why can a DNA profile distinguish between different people?			

2 Write down the numbers of the questions which you can answer now but which you didn't know the answer to before you started this unit.

_____

3 What do you think was the most important thing that you learned in this topic?

_____

4 What was the most interesting thing that you learned in this topic?

_____