Differentiation in Science Made Easy

Each book in this series:

• helps teachers to easily differentiate learning in science
• supplies absorbing worksheets on a diversity of science topics, presenting each topic at three different levels of ability
• is designed for independent work that both reinforces learning and challenges students further
• includes worksheet answers, which students can use to mark their own work, further supporting independent learning.

Wouldn’t it be wonderful if everyone in your science class could build on their learning about the same topic at a level that suits their individual needs and abilities? The good news is – there is a series that can help you make this ideal into a reality. The worksheets in Differentiation in Science Made Easy cover the same content at three levels: basic, proficient and advanced. Dealing with a great range of curriculum topics within each of four broad areas of science, the worksheets are carefully designed to achieve an appropriate balance between directly reinforcing learning and challenging higher-order thinking, based on each student’s current level of learning. Another emphasis is on lively questions that clearly make the connection between science topics and everyday life. The net result is a collection of engrossing worksheets that support and motivate students to work independently and productively.
Differentiation in Science Made Easy

BOOK 1: Worksheets at three levels for biology

Samantha York
## Contents

### Introduction

4

### Worksheets

- Artificial/selective breeding ................................................................. 5
- Cells ........................................................................................................... 8
- The effect of radiation on humans ............................................................... 11
- Genetic mutations ..................................................................................... 14
- Genetics punnet squares ........................................................................... 17
- Life processes ............................................................................................ 20
- Living or non-living .................................................................................... 23
- Pedigree charts ......................................................................................... 26
- Photosynthesis ............................................................................................ 29
- Respiratory diseases ................................................................................ 32
- Food chains and food webs ....................................................................... 35
- Sexual and asexual reproduction ................................................................. 38
- The human body’s systems ....................................................................... 41
- Using a key to classify organisms ............................................................... 44
- Factors that affect population size ............................................................. 47
- Adaptations for survival ............................................................................ 50
- Microorganisms ......................................................................................... 53

### Answers

56
Introduction

This *Differentiation in Science Made Easy* series is designed to help teachers easily differentiate learning in a range of science topics at Years 9–11 in New Zealand and Years 8–10 in Australia. For each topic, worksheets cover the same content at three levels:

- **Basic** worksheets the activities are geared to help the learner directly reinforce their learning from the lesson the teacher has taught. They lead the learner from the concrete to one or two higher-order questions so that the learner can experience success in science and is challenged to begin to improve their understanding in this area.

- **Surflqhw** worksheets also start by reinforcing the content of the lesson but move more quickly to challenge the learner to apply their knowledge to higher-order questions.

- **Advanced** worksheets are designed to be a challenge to engage and enthuse the able students in your class. For this reason, they focus strongly on higher-order, abstract questions designed to get learners to think about the content being taught in new ways.

This book covers biology topics ranging from genetics to photosynthesis to reproduction. Book 2 deals with physics, Book 3 with chemistry and Book 4 with earth and space science.

**How to use this resource**

For each area of content, there are three worksheets that can be photocopied for student use. The worksheets are not designed to be done consecutively by all students; rather each student completes one worksheet for each content area.

Teachers could allocate worksheets to groups of students according to level of ability. Alternatively it may be more appropriate for the learner to gauge their own level of understanding and then select the level of worksheet that would suit them. For this alternative approach to operate effectively, learners would need to be able to take risks in their learning and initially would require support and guidance to select the appropriate level for their ability.

The worksheets are designed to take approximately 20 minutes for students to finish. If the student is taking longer or finishing sooner, that is an indication that they are not working on a worksheet at the appropriate level.

Answers to the worksheets are available at the back of this book. If students use them to mark their own work, this would be another way to promote independent learning.
1. Match each of the following terms to its description. Then copy the terms and their matching descriptions into your science book.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloning</td>
<td>(a) Variable that all organisms have but they are all different sizes</td>
</tr>
<tr>
<td>Selective breeding</td>
<td>(b) Makes an identical copy</td>
</tr>
<tr>
<td>Continuous variation</td>
<td>(c) Variable where the organism has one of a set number of options</td>
</tr>
<tr>
<td>Discontinuous variation</td>
<td>(d) Allows more plants or animals to be produced with the desirable trait</td>
</tr>
</tbody>
</table>

2. Find a person who is doing the same level of worksheet as you. Discuss the following questions together. Then write down your responses independently.

Explain why each of the following is an example of artificial breeding and what the advantages of breeding in this way are.

(a) Taking a cutting from the best strawberry plant in the garden

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

(b) Inseminating dairy cows with straws of semen from bulls

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

(c) Buying semen to inseminate a champion show dog

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

3. Selective breeding has been around for as long as there has been farming. In Australia and New Zealand, dairy farmers are commonly paid per kilo of milk solid. List three features that these dairy farmers will look for in their dairy cows.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
Artificial/selective breeding

1. Find a person who is doing the same level of worksheet as you. Discuss the following questions together. Then write down your responses independently.

   Explain why each of the following is an example of artificial breeding and what the advantages are of breeding in this way.

   (a) Taking a cutting from the best strawberry plant in the garden

   (b) Inseminating dairy cows with straws of semen from bulls

   (c) Buying semen to inseminate a champion show dog

2. Selective breeding has been around for as long as there has been farming. Explain how this practice has helped to improve productivity in cattle farming.

3. Every spring and summer, garden centres are busy selling vegetable plants. Often these plants are genetically identical.

   (a) Explain the advantages of selling genetically identical plants.

   (b) Explain the disadvantages of selling genetically identical plants.

   (c) Is there any point in the home gardener trying to let these plants go to seed for next year’s crops? Explain your answer with reasons.
1. For each of the following questions, make a table in your book (see the example on the right), write the question above it and then list the advantages and disadvantages in the table.

(a) What are the advantages and disadvantages of taking a cutting from the best strawberry plant in the garden?

(b) What are the advantages and disadvantages of inseminating dairy cows with straws of semen from bulls?

(c) What are the advantages and disadvantages of buying semen to inseminate a dog?

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>

2. Explain how selective breeding using artificial insemination of dairy cows has helped to increase productivity in dairy herds.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

3. Explain the dangers of continuing to breed or mate close relatives in the animal world.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

4. Cloning animals is an expensive and risky process that involves using a fertilised egg of the animal to be cloned and a surrogate mother. Explain why this process could be worthwhile for a top mare such as Makybe Diva, which has won the Melbourne Cup three times.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

Artificial/selective breeding
1. Pair up with a neighbour doing the same level of worksheet as you. Read out the following statements to your partner and they circle true or false for each one and give a reason for their choice. Then swap over roles so you can record your answers.

(a) Plant cells look like bricks. True/False
   I chose this answer because
   _______________________________________________________________
   __________________________________________________________________

(b) Animal cells are square in shape and are stacked. True/False
   I chose this answer because
   _______________________________________________________________
   __________________________________________________________________

(c) Cell walls are found in both plant and animal cells. True/False
   I chose this answer because
   _______________________________________________________________
   __________________________________________________________________

(d) Chloroplasts are found in plant cells. True/False
   I chose this answer because
   _______________________________________________________________
   __________________________________________________________________

(e) All cells, except red blood cells, have a nucleus. True/False
   I chose this answer because
   _______________________________________________________________
   __________________________________________________________________

2. In the table below, list the features of plants and animal cells. One feature has been listed to start you off.

<table>
<thead>
<tr>
<th>Plant cell</th>
<th>Animal cell</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Has a cell membrane</td>
</tr>
</tbody>
</table>

3. Explain why a cell that is described as having only a nucleus, cytoplasm and organelles is definitely an animal cell.
Cells

1. Pair up with a neighbour doing the same level of worksheet as you. Read out the following statements to your partner and they circle true or false for each one and give a reason for their choice. Then swap over roles so you can record your answers.

(a) Plant cells are shaped so they can stack. True/False
   I chose this answer because
   _________________________________________________________________
   _________________________________________________________________

(b) Organisms can be as small as a single cell. True/False
   I chose this answer because
   _________________________________________________________________
   _________________________________________________________________

(c) The cell division for growth and repair is called meiosis. True/False
   I chose this answer because
   _________________________________________________________________
   _________________________________________________________________

(d) We are made up of cells. True/False
   I chose this answer because
   _________________________________________________________________
   _________________________________________________________________

2. The cell organelle of a chloroplast is only found in plant cells. Explain why this statement is true.

   _________________________________________________________________
   _________________________________________________________________
   _________________________________________________________________

3. Explain why a cell described as having only a nucleus, a cytoplasm and organelles is definitely an animal cell.

   _________________________________________________________________
   _________________________________________________________________
   _________________________________________________________________
   _________________________________________________________________

4. Plant and animal cells have more things in common than not. Explain why this statement is true.

   _________________________________________________________________
   _________________________________________________________________
   _________________________________________________________________
   _________________________________________________________________
1. Pair up with a neighbour doing the same level of worksheet as you. Read out the following statements to your partner and they circle true or false for each one and give a reason why. Then swap over roles so you can record your answers.

(a) Plant cells are shaped so they can stack. True/False
I chose this answer because _______________________________________________
_________________________________________________________________________

(b) Organisms can be as small as a single cell. True/False
I chose this answer because _______________________________________________
_________________________________________________________________________

(c) The cell division for growth and repair is called meiosis. True/False
I chose this answer because _______________________________________________
_________________________________________________________________________

(d) We are made up of cells. True/False
I chose this answer because _______________________________________________
_________________________________________________________________________

2. Explain why a cell described as having only a nucleus, a cytoplasm and organelles is definitely an animal cell.
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

3. Plant and animal cells have more things in common than not. Explain why this statement is true.
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

4. Explain why a nerve cell is an example of a specialised cell.
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
The effect of radiation on humans

Could using your mobile phone excessively cause a brain tumour?

Mobile phones emit electromagnetic (EM) radiation that is non-ionising. Non-ionising radiation does not have enough energy to turn particles into ions but it does have enough energy to heat particles. Other types of non-ionising radiation include UV light, visible light, microwaves, infrared light and radio waves. To cause a tumour, a mobile phone would have to alter DNA and it appears this type of EM is not energetic enough to do so. There are no conclusive studies that link excessive mobile phone use to brain cancer. In fact, greater threats to today's teenagers are staying up too late because they are using their phones and having their rest interrupted due to answering messages in the middle of the night.

1. You can find information in the text above that directly confirms or rejects each of the following statements. For each one, circle whether it is true or false and give a reason for your choice.

(a) There are no conclusive studies that link excessive mobile phone use to brain cancer. True/False
Reason:
________________________________________________________________________________
________________________________________________________________________________________

(b) Mobile phones emit radiation like visible light. True/False
Reason:
________________________________________________________________________________
________________________________________________________________________________________

(c) Non-ionising radiation just heats up cells. True/False
Reason:
________________________________________________________________________________
________________________________________________________________________________________

(d) Radiation has to alter a cell's DNA in order to cause a tumour. True/False
Reason:
________________________________________________________________________________
________________________________________________________________________________________

(e) As a teenager you are more at risk from lack of sleep than cancer due to a mobile phone. True/False
Reason:
________________________________________________________________________________
________________________________________________________________________________________

2. The term non-ionising radiation means
________________________________________________________________________________
________________________________________________________________________________________

3. The radiation from a mobile phone is not harmful because
________________________________________________________________________________
________________________________________________________________________________________
Could using your mobile phone excessively cause a brain tumour?

Mobile phones emit electromagnetic (EM) radiation that is non-ionising. Non-ionising radiation does not have enough energy to turn particles into ions but it does have enough energy to heat particles. Other types of non-ionising radiation include UV light, visible light, microwaves, infrared light and radio waves. To cause a tumour, a mobile phone would have to alter DNA and it appears this type of EM is not energetic enough to do so. There are no conclusive studies that link excessive mobile phone use to brain cancer. In fact, greater threats to today’s teenagers are staying up too late because they are using their phones and having their rest interrupted due to answering messages in the middle of the night.

1. You can find information in the text above that directly confirms or rejects each of the following statements. For each one, circle whether it is true or false and give a reason for your choice.
   (a) Mobile phones emit the same type of radiation that visible light from the Sun does. True/False
       Reason:

   (b) Ionising radiation turns non-charged particles into ions. True/False
       Reason:

   (c) Mobile phone radiation does not have enough energy to alter DNA. True/False
       Reason:

2. These statements are not found in the text but you can infer from the information it provides whether each one is true or false. Circle your choice in each case and give a reason for it.
   (a) Teenagers generally need more sleep than they are getting due to excessive mobile phone use. True/False
       Reason:

   (b) My ear gets hot when I talk on my phone. That means I’m going to get cancer. True/False
       Reason:
The effect of radiation on humans

Could using your mobile phone excessively cause a brain tumour?

Mobile phones emit electromagnetic (EM) radiation that is non-ionising. Non-ionising radiation does not have enough energy to turn particles into ions but it does have enough energy to heat particles. Other types of non-ionising radiation include UV light, visible light, microwaves, infrared light and radio waves. UV light is the type of radiation that causes a skin response we know as a tan. In order to cause a tumour a mobile phone would have to alter DNA and it appears this type of EM is not energetic enough to do so. There are no conclusive studies that link excessive mobile phone use to brain cancer. In fact, greater threats to today’s teenagers are staying up too late because they are using their phones and having their rest interrupted due to answering messages in the middle of the night.

1. You can find information in the text above that directly confirms or rejects each of the following statements. For each one, circle whether it is true or false and give a reason for your choice.

(a) Mobile phones emit the same type of radiation that visible light from the Sun does. True/False

(b) Ionising radiation turns non-charged particles into ions. True/False

(c) Mobile phone radiation does not have enough energy to alter DNA. True/False

2. The text does not give the answers to these questions directly but you can infer the answers from the information it provides. Using your knowledge, answer each question and include your reasoning for it.

(a) My ear does get hot when I talk on my phone. Does that mean I’m going to get cancer?

(b) Is my risk of getting cancer from my phone the same as my risk of getting cancer from having a tan?
1. Fill in the gaps in this passage.

Genetic mutations are (a) __________________ in the sequence of genetic code in our (b) _______________. Some are lethal; some don’t matter at all. Common genetic disorders that humans have include: (c) __________________________, __________________________ and __________________________.

If the mutation happens in the (d) ______________________ (the sex cells), then the mutation can be passed onto offspring. If the mutation happens in the body cells then new body cells will have that change but the mutation (e) will/will not (cross one out) be passed on to offspring.

2. Cystic fibrosis is a genetic disorder in which the lungs produce thick mucus that blocks the airways and causes breathing difficulty. This disorder is caused by a recessive gene.

(a) Describe why a person who has cystic fibrosis disorder is lucky to live to their mid-thirties, given what the disorder does to their body.

________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

(b) Explain how the above information on cystic fibrosis means that two healthy parents can produce a child with cystic fibrosis. The following genotypes may help you with your answer:

cc = Cystic fibrosis; CC = Normal; Cc = Carrier of cystic fibrosis

________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

3. Sickle cell anaemia causes the usual round red blood cells to be shaped like a sickle. As a result, the person is less able to carry oxygen around the body as the shape of the cells can block veins and arteries. This disease is not common in Australasia. However, it is common in countries where you find malaria because, if you are a carrier of sickle cell anaemia, you are protected against malaria.

Normal red blood cell  Sickle cell

Explain what a person’s genotype would be if this person was immune to malaria and a carrier of sickle cell anaemia.

________________________________________________________________________________________
________________________________________________________________________________________
1. Cystic fibrosis is a genetic disorder in which the lungs produce thick mucus that blocks the airways and causes breathing difficulty. This disorder is caused by a recessive gene.

Explain how the above information means two healthy parents can produce a child with cystic fibrosis. The following genotypes may help you with your answer:

\[ cc = \text{Cystic fibrosis}; \ CC = \text{Normal}; \ Cc = \text{Carrier of cystic fibrosis} \]

2. Sickle cell anaemia causes the usual round red blood cells to be shaped like a sickle. As a result, you are less able to carry oxygen around the body as the shape of the cells can block veins and arteries. This disease is not common in Australasia but is common in countries where you find malaria because, if you are a carrier of sickle cell anaemia, you are protected against malaria.

![Normal red blood cell](image1) ![Sickle cell](image2)

(a) Describe why a person who has sickle cell anaemia has a reduced life expectancy compared with a person who has normal red blood cells.

___________________________________________________________________________________________

___________________________________________________________________________________________

(b) Explain what a person’s genotype would be if this person was immune to malaria and a carrier of sickle cell anaemia.

___________________________________________________________________________________________

___________________________________________________________________________________________

3. As genetic testing is becoming more prevalent, an ethical debate about genetic disorders has arisen. Should an insurance company have all the information from any genetic testing you undertake before deciding to take you on as a client? Write your answer in your book.

In your answer you should include:
- why insurance companies have the right to know the amount of risk they are facing when taking you on as a client
- why you have the right to privacy about your own genes.
Find other people in your class working at this level and work in a small group on this worksheet.

Every child in Australasia has a blood sample taken to test for multiple disorders that can cause serious disability if not identified early. The samples are retained on cards called Guthrie cards.

1. Imagine a group of scientists wishes to analyse the DNA contained on Guthrie cards so that it can identify other genetic conditions and develop a cure for them.

If Guthrie cards were used in this manner, what would be the pros, cons and interesting questions for the different groups of people involved? Answer this question by completing the table below. If you need more room, make a larger table in your book and fill it in.

<table>
<thead>
<tr>
<th>Group affected</th>
<th>Pros (positives)</th>
<th>Cons (negatives)</th>
<th>Questions that this group might have</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Children and their parents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Scientists and doctors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Insurance companies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d) Employers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e) Police</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Now suppose the police see that a lot of people's DNA could be identified through the Guthrie cards database. They apply to the High Court to have those records released and the DNA mapped so that DNA evidence left behind in crimes can be compared and crimes solved faster with less cost to the taxpayer.

You are a government lawyer acting for the hospitals who have the Guthrie cards, as they are opposing this court action. In your group discuss your reasons for opposing the police and then use this discussion to write your own argument in your book, opposing the police use of Guthrie cards.

3. An insurance company decides to see if it can use the information contained on the Guthrie cards before taking on new clients. It gets around the government's opposition by getting prospective clients to sign a waiver giving the insurance company the right to use and analyse the DNA found on the client’s Guthrie card. Using the “pros, cons and questions” format above, develop your own opinion either for or against this practice. Write your answer in your book.
Genetics punnet squares

1. Sunflowers can be tall or short. The allele for tall sunflowers is dominant over the allele for short sunflowers.
   (a) Complete this punnet square to show the outcome when two heterozygous sunflowers are crossed.
   \[ \text{Note: } T = \text{Tall and } t = \text{short.} \]
   \[
   \begin{array}{cc}
   & T & t \\
   T & & \\
t & & \\
   \end{array}
   \]
   (b) Complete the following information.
   Height of offspring: \( \underline{\phantom{00}} \)% tall and \( \underline{\phantom{00}} \)% short
   Genotypes: \( \underline{\phantom{00}} \)% TT; \( \underline{\phantom{00}} \)% Tt; \( \underline{\phantom{00}} \)% tt

2. In mice, white fur (W) is dominant over grey fur (w). If a white mouse is crossed with a grey mouse, what percentage of their children will be white mice and what percentage will be grey? Express the answer in percentages and use the punnet square to show your reasoning.
   Percentages: \( \underline{\phantom{00}} \) \% white mice and \( \underline{\phantom{00}} \) \% grey mice

3. Short hair (H) in guinea pigs is dominant over long hair (h). Two heterozygous guinea pigs produce a long-haired offspring. What is the chance of doing this? Express the answer as a percentage and use the punnet square to show your reasoning.
   Percentage: \( \underline{\phantom{00}} \) \%

4. Lactose is a sugar found in milk. Most people can digest lactose; however, people who cannot are described as lactose intolerant and have the genotype of ee. If a heterozygous person for tolerating lactose mates with a lactose intolerant person, what is the chance of their offspring having lactose intolerance? Express your answer as a percentage and use the punnet square to show your reasoning.
   Percentage: \( \underline{\phantom{00}} \)%
1. In mice, white fur (W) is dominant over grey fur (w). If a white mouse is crossed with a grey mouse, what percentage of their children will be white mice and what percentage will be grey?

Percentages:

<table>
<thead>
<tr>
<th>W</th>
<th>w</th>
</tr>
</thead>
<tbody>
<tr>
<td>w</td>
<td></td>
</tr>
</tbody>
</table>

2. In poodles, coat colour is controlled by a single gene. Black coat colour (B) is dominant over brown coat colour (b). Complete the punnet square to show the cross between two heterozygous poodles. Give proportions of expected genotypes and phenotypes.

Genotypes:

<table>
<thead>
<tr>
<th>B</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td></td>
</tr>
</tbody>
</table>

Phenotypes:

<table>
<thead>
<tr>
<th>B</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td></td>
</tr>
</tbody>
</table>

3. A long-haired guinea pig has a recessive genotype for hair (hh). It is mated with a guinea pig with short hair (HH). What proportion of the offspring will be short-haired? Use a punnet square to show your reasoning.

Percentage:

<table>
<thead>
<tr>
<th>H</th>
<th>h</th>
</tr>
</thead>
<tbody>
<tr>
<td>h</td>
<td></td>
</tr>
</tbody>
</table>

4. Lactose is a sugar found in milk that most people can digest. Some people cannot digest lactose and are said to be lactose intolerant, which is a recessive trait. If a man who is said to be heterozygous for lactose intolerance has children with a woman who has lactose intolerance, what proportion of their offspring will be lactose intolerant? Use a punnet square to show your reasoning.

Percentage:

<table>
<thead>
<tr>
<th>L</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>l</td>
<td></td>
</tr>
</tbody>
</table>
1. In poodles, coat colour is controlled by a single gene. Black coat colour (B) is dominant over brown coat colour (b). Complete the punnet square to show the cross between two heterozygous poodles. Give proportions of expected genotypes and phenotypes.

   |   |   |   |
---|---|---|---|
   | B | b | B |
---|---|---|---|
   | b | B | b |
---|---|---|---|
   | B | b | B |
---|---|---|---|
   | b | B | b |
---|---|---|---|

Genotypes: ___________________________
Phenotypes: ________________________

2. A long-haired guinea pig has a recessive genotype for hair (hh). It is mated with a guinea pig with short hair (HH). What proportion of the offspring will be short-haired? Use a punnet square to show your reasoning.

   |   |   |   |
---|---|---|---|
   | H | h | H |
---|---|---|---|
   | h | H | h |
---|---|---|---|
   | H | h | H |
---|---|---|---|
   | h | H | h |
---|---|---|---|

Percentage: ________________________

3. When two short-haired guinea pigs were mated together, they only produced offspring with short hair. Explain why it is not certain that the genotype of the guinea pigs is heterozygous or homozygous dominant. Use a punnet square to show your reasoning.

   |   |   |   |
---|---|---|---|
   | H | h | H |
---|---|---|---|
   | h | H | h |
---|---|---|---|
   | H | h | H |
---|---|---|---|
   | h | H | h |
---|---|---|---|

Explanation: ____________________________________________________________
___________________________________________________________________

4. Cystic fibrosis is a genetic disease caused by two recessive genes. Among people of Caucasian ancestry, 1 in 25 is a genetic carrier for cystic fibrosis, usually without knowing it. What is the probability that one of your future children has cystic fibrosis? (Assume that both you and your future partner have that 1 in 25 chance of being a carrier.) Use a punnet square to show your reasoning.

   |   |   |   |
---|---|---|---|
   | H | h | H |
---|---|---|---|
   | h | H | h |
---|---|---|---|
   | H | h | H |
---|---|---|---|
   | h | H | h |
---|---|---|---|

Probability: ____________________________________________________________
___________________________________________________________________

5. In some cultures, male offspring are prized and female offspring are not. Use the punnet square to explain why the sperm from the father determines the sex of the offspring rather than the egg from the mother.

   |   |   |   |
---|---|---|---|
   | X | Y | X |
---|---|---|---|
   | Y | X | Y |
---|---|---|---|
   | X | Y | X |
---|---|---|---|
   | Y | X | Y |
---|---|---|---|

Explanation: ____________________________________________________________
___________________________________________________________________
1. Every living organism has seven life processes in common. They are:

M ___________________________
R ___________________________
S ___________________________
G ___________________________
R ___________________________
E ___________________________
N ___________________________

2. Using MRS GREN, state which of the seven life processes each of the following has and then decide whether it is living or non-living. Cross out the wrong answer.

(a) A rock has the following life processes: ___________________________
so it is living/non-living.

(b) A clock has the following life processes: ___________________________
so it is living/non-living.

(c) A blade of grass has the following life processes: ___________________________
so it is living/non-living.

3. Using MRS GREN, explain why a tree is living when it can’t move from the spot it is in.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4. Why is a car not a living organism even though it moves and needs nutrition (fuel)?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
1. Every living organism has seven life processes in common. They are:

M _______________________________
R _______________________________
S _______________________________
G _______________________________
R _______________________________
E _______________________________
N _______________________________

2. Using Life Processes MRS GREN, explain why a tree is living when it can’t move from the spot it is in.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

3. Why is a car not a living organism even though it moves and needs nutrition (fuel)?

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

4. Explain why a fire is not a living organism even though it can move, respire and reproduce. Use Life Processes MRS GREN in your answer.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
1. Using Life Processes MRS GREN, explain why a tree is living when it can’t move from the spot it is in.

___________________________________________________________________________________________
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2. Why is a car not a living organism even though it moves and needs nutrition (fuel)?

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3. Explain why a fire is not a living organism even though it can move, respire and reproduce. Use Life Processes MRS GREN in your answer.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

4. A science teacher states, “A seed is not a living thing.” Explain why she is wrong, using MRS GREN to form the basis of your answer.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
1. Living things all display seven different life processes. You can remember these by the mnemonic MRS GREN.

Finish the word for each letter of MRS GREN then draw a line between the label and its example. (You can use some examples for more than one life process.)

M ________________________________
R ________________________________
S ________________________________
G ________________________________
R ________________________________
E ________________________________
N ________________________________

(a) A pine cone contains hundreds of seeds for the tree.
(b) Plants grow towards the light because they can sense it.
(c) Plants make their own food using sunlight in a process called photosynthesis.
(d) Animals breathe in oxygen and expel carbon dioxide and other waste products.

2. For each of the following, circle if it is living or non-living.

(a) Pig Living/Non-living
(b) Cactus Living/Non-living
(c) Log of wood Living/Non-living
(d) Water Living/Non-living

3. For each of the following statements, use Life Processes MRS GREN to help you finish the second sentence to justify it.

(a) A rock is non-living. A rock cannot

(b) Water is non-living. Water cannot

(c) A fire is non-living. A fire cannot

4. Your friend is convinced that a car can be considered a living organism because it needs fuel for nutrition and it moves. Outline what life processes a car cannot do and why this means it is non-living.
1. Living things all display seven different life processes. You can remember these by the mnemonic MRS GREN.

Finish the word for each letter of MRS GREN then draw a line between the label and its example. (You can use some examples for more than one life process.)

<table>
<thead>
<tr>
<th>Letter</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>A pine cone contains hundreds of seeds for the tree.</td>
</tr>
<tr>
<td>R</td>
<td>Plants grow towards the light because they can sense it.</td>
</tr>
<tr>
<td>S</td>
<td>Plants make their own food using sunlight in a process called photosynthesis.</td>
</tr>
<tr>
<td>G</td>
<td>Animals breathe in oxygen and expel carbon dioxide and other waste products.</td>
</tr>
<tr>
<td>R</td>
<td>(b) Plants grow towards the light because they can sense it.</td>
</tr>
<tr>
<td>E</td>
<td>(c) Plants make their own food using sunlight in a process called photosynthesis.</td>
</tr>
<tr>
<td>N</td>
<td>(d) Animals breathe in oxygen and expel carbon dioxide and other waste products.</td>
</tr>
</tbody>
</table>

2. An item must do all of the life processes in order to be considered living. For each of the following, decide whether it is living or non-living and cross out the wrong answer. Then justify your answer. For example: A rock is non-living because it cannot respire, sense, reproduce, excrete or eat.

(a) A plant is living/non-living because

(b) Water is living/non-living because

(c) A car is living/non-living because

(d) A log of wood is living/non-living because

3. Your friend is convinced that a fire is a living organism because it needs fuel and can make new fires. You know that it is non-living. Use MRS GREN to help you write an explanation of why fire is non-living.
1. An item must do all of the life processes in order to be considered living. For each of the following, decide whether it is living or non-living and cross out the wrong answer. Then justify your answer. For example: A rock is non-living because it cannot respire, sense, reproduce, excrete or eat.

(a) A plant is living/non-living because __________________________________________________________
________________________________________________________________________________________

(b) Water is living/non-living because __________________________________________________________
________________________________________________________________________________________

(c) A car is living/non-living because __________________________________________________________
________________________________________________________________________________________

(d) A log of wood is living/non-living because __________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

2. Your friends Terry and Mel are arguing over whether fire is living or not. Terry is convinced that a fire is a living organism because it needs fuel and can make new fires. Mel is equally convinced it is non-living but is not using MRS GREN to back up her argument. Use MRS GREN to explain who is correct and why.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

3. Strawberry plants don’t need another plant in order to make new strawberry plants. Are they living or non-living? Use MRS GREN to justify your answer.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

4. Explain why the relieving science teacher was wrong when he said that a seed is not a living organism. Use MRS GREN to form the basis of your answer.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
Fur colour in mice is controlled by a single gene which is expressed as either white or grey.

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Based on the information in the pedigree chart above, is white or grey fur dominant? Cross out the wrong answer and give a reason for your chosen answer. Use a punnet square to help you explain your answer.

   White/Grey fur is dominant because
   
   ___________________________________
   ___________________________________
   ___________________________________

2. Explain how mouse 1 and mouse 2 on the pedigree chart, who are both white, could have one white mouse and one grey mouse as offspring. Use the punnet square to help you explain your answer.

   Explanation:
   
   ___________________________________
   ___________________________________
   ___________________________________

3. Explain why the genotype of mouse 7 on the pedigree chart is heterozygous. Use a punnet square to help you explain your answer.

   Explanation:
   
   ___________________________________
   ___________________________________
Fur colour in mice is controlled by a single gene which is expressed as either white or grey.

<table>
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1. Explain how mouse 1 and mouse 2 on the pedigree chart, who are both white, could have one white mouse and one grey mouse as offspring. Use the punnet square to help you explain your answer.

Explanation:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

2. Using the information in the pedigree chart, determine the genotype of mouse 7 and discuss the reasons for your answer. Use W for the dominant allele and w for the recessive allele.

Your answer should include an explanation for your conclusion that:
- the white fur phenotype is dominant or recessive
- the genotype of the mouse is homozygous or heterozygous.

Explanation:
Fur colour in mice is controlled by a single gene which is expressed as either white or grey.

1. Using the information from the pedigree chart, determine the genotype of mouse 7 and discuss the reasons for your answer. Use W for the dominant allele and w for the recessive allele. You may wish to use a punnet square to justify your answer.

Your answer should include an explanation for your conclusion that:
- the white fur phenotype is dominant or recessive
- the genotype of mouse is homozygous or heterozygous.

Explanation:

2. Outline a method that will conclusively tell you the genotype of mouse 12. You may wish to use one or more punnet squares to justify your answer.

Explanation:
1. Match each term on the left with its explanation on the right.

<table>
<thead>
<tr>
<th>Term</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photosynthesis</td>
<td>(a) The part of the cell in which photosynthesis occurs</td>
</tr>
<tr>
<td>Sun</td>
<td>(b) This is produced by photosynthesis</td>
</tr>
<tr>
<td>Energy</td>
<td>(c) Provides energy to the plant for the process</td>
</tr>
<tr>
<td>Chloroplast</td>
<td>(d) The process by which energy from the Sun is turned into carbohydrate</td>
</tr>
</tbody>
</table>

2. Photosynthesis occurs in plants and has the following word equation:

\[
\text{Carbon dioxide + water } \rightarrow \text{ Carbohydrate + oxygen}
\]

Where in the plant does photosynthesis occur?

___________________________________________________________________________________________

3. You can tell if a plant is undergoing photosynthesis as sugar will be made in the leaf. An indicator made of starch turns blue-black if sugar is made.

Suppose that a piece of cardboard is covering one leaf of a plant so sunlight cannot hit the surface. Explain what colour the indicator would go for this leaf and for the other leaves on the plant. Give reasons for your answer.

___________________________________________________________________________________________

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___________________________________________________________________________________________

___________________________________________________________________________________________

4. Explain why leaves on plants that grow in darker areas are larger than those on plants growing in brighter areas.

___________________________________________________________________________________________

___________________________________________________________________________________________

___________________________________________________________________________________________

___________________________________________________________________________________________

___________________________________________________________________________________________
Photosynthesis

1. Photosynthesis occurs in plants and has the following word equation:
   \[ \text{Carbon dioxide + water} \rightarrow \text{Carbohydrate + oxygen} \]
   Where in the plant does photosynthesis occur?

2. You can tell if a plant is undergoing photosynthesis as sugar will be made in the leaf. An indicator made of starch turns blue-black if sugar is made.
   Suppose that a piece of cardboard is covering one leaf of a plant so sunlight cannot hit the surface. Explain what colour the indicator would go for this leaf and for the other leaves on the plant. Give reasons for your answer.

3. Explain why leaves on plants that grow in darker areas are larger than those on plants growing in brighter areas.

4. Explain why leaves have a waxy, almost waterproof coating on them.
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___________________________________________________________________________________________
___________________________________________________________________________________________

3. Explain why leaves have a waxy, almost waterproof coating on them.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

4. Why is it common practice for commercial tomato growers to pump carbon dioxide gas into the tunnel house?

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
1. Write a definition for each of these words.
   (a) Inhaled:

   (b) Exhaled:

2. Air is drawn down the lungs where respiration occurs. The airways are lined with cilia, which are small hairs. Give a reason why the cilia line the airways.

3. Asthma is a chronic condition that causes the bronchial tubes (airways) to be inflamed and so they swell and narrow. It can be triggered by allergies to many things and affects around 1 in 10 Australians and 1 in 6 New Zealanders. It can be treated by using inhalers and avoiding triggers.
   Describe what **chronic** means in the paragraph above.

4. Imagine you are talking with a person who has been diagnosed with asthma for the first time. Explain why they should continue to use their inhaler even if they haven’t had an attack for a long time.

5. Explain the effect smoking has on the lungs and the rest of the body.
Respiratory diseases

1. Air is drawn down the lungs where respiration occurs. The airways are lined with cilia, which are small hairs. Give a reason why the cilia line the airways.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

2. Explain the effect smoking has on the lungs and the rest of the body.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

3. Asthma is a chronic condition that causes the bronchial tubes (airways) to be inflamed and so they swell and narrow. It can be triggered by allergies to many things and affects around 1 in 10 Australians and 1 in 6 New Zealanders. It can be treated by using inhalers and avoiding triggers.

Imagine you are talking with a person who has been diagnosed with asthma for the first time. Explain why they should continue to use their inhaler even if they haven’t had an attack for a long time.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

4. Pneumonia is a lung infection that can be caused by bacteria or viruses. Symptoms can include a “wet” cough (you cough up mucus) and fever, as well as chest pain when you breathe in. Treatment for pneumonia can be antibiotics or bed rest.

Explain why antibiotics can be helpful only when bacterial pneumonia is diagnosed.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
Respiratory diseases

1. Explain the effect smoking has on the lungs and the rest of the body.

___________________________________________________________________________________________
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Imagine you are talking with a person who has been diagnosed with asthma for the first time. Explain why they should continue to use their inhaler even if they haven’t had an attack for a long time.

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(a) Explain why antibiotics can be helpful only when bacterial pneumonia is diagnosed.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

(b) Explain why a person could be prescribed only bed rest for their pneumonia.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
1. Use the words from the box to complete the gaps in the information about food chains and food webs below.

<table>
<thead>
<tr>
<th>Producer</th>
<th>Flow of energy</th>
<th>Omnivore</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>→ Herbivore</td>
<td>→ (b)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>→ Carnivore</td>
</tr>
</tbody>
</table>

The arrows represent the (c) __________________________ from one organism to the next.

2. Arrange the following plants and animals into a food chain.

<table>
<thead>
<tr>
<th>Dingo</th>
<th>Grasses</th>
<th>Kangaroo</th>
</tr>
</thead>
</table>

3. Arrange the following plants and animals into at least three different food chains.

<table>
<thead>
<tr>
<th>Dingo</th>
<th>Grasses</th>
<th>Kangaroo</th>
<th>Fox</th>
<th>Emu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gumtree</td>
<td>Wattle tree</td>
<td>Possum</td>
<td>Cricket</td>
<td>Magpie</td>
</tr>
</tbody>
</table>

4. Use the food web of the Great Barrier Reef below to write three different food chains.

Food chains and food webs

Diagram of the Great Barrier Reef food web showing connections between different species.
1. Arrange the following plants and animals into a food chain.

<table>
<thead>
<tr>
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</tr>
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</table>

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<td>Possum</td>
<td>Cricket</td>
<td>Magpie</td>
</tr>
</tbody>
</table>

3. Use the food web of the Great Barrier Reef below to write three different food chains.

   Parrotfish → Tiger shark
   Sponge → Barramundi
   Kelp → Dugong
   Coral

4. Use the food chains you have created above to make another food web.

5. In your book, arrange the following Antarctic plants and animals into a food web. You may like to start by writing food chains and then link them with arrows.

<table>
<thead>
<tr>
<th>Bird</th>
<th>Sperm whale</th>
<th>Baleen whale</th>
<th>Smaller toothed whale</th>
<th>Krill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zooplankton</td>
<td>Elephant seal</td>
<td>Fish</td>
<td>Phytoplankton</td>
<td>Leopard seal</td>
</tr>
</tbody>
</table>
1. Arrange the following plants and animals into at least four different food chains.

<table>
<thead>
<tr>
<th>Dingo</th>
<th>Grasses</th>
<th>Kangaroo</th>
<th>Fox</th>
<th>Emu</th>
</tr>
</thead>
<tbody>
<tr>
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2. Use the food web of the Great Barrier Reef below to write four different food chains.

3. Arrange the following Antarctic plants and animals into a food web. You may like to start by writing food chains and then link them with arrows.

<table>
<thead>
<tr>
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</tr>
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<td>Krill</td>
<td>Zooplankton</td>
<td>Elephant seal</td>
<td>Fish</td>
</tr>
<tr>
<td>Phytoplankton</td>
<td>Leopard seal</td>
<td>Penguin</td>
<td></td>
</tr>
</tbody>
</table>

4. In your book, arrange the following plants and animals of Australia’s Simpson Desert into a food web.

<table>
<thead>
<tr>
<th>Woodpecker</th>
<th>Cactus</th>
<th>Elf owl</th>
<th>Cane grass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeds</td>
<td>Kangaroo</td>
<td>Roadrunner</td>
<td>Sturt’s desert pea</td>
</tr>
<tr>
<td>Thorny dragon</td>
<td>Gerbil</td>
<td>Honeypot ant</td>
<td>Skink</td>
</tr>
</tbody>
</table>
1. Use the words in the box to fill the gaps in the passage below. Then you will have created your own set of study notes about sexual and asexual reproduction.

<table>
<thead>
<tr>
<th>two plants</th>
<th>male</th>
<th>genetically different offspring</th>
</tr>
</thead>
<tbody>
<tr>
<td>parent</td>
<td>female</td>
<td>asexual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>genetically identical</td>
</tr>
</tbody>
</table>

(a) ____________________ reproduction only requires one (b) _______________ and gives lots of
(c) _______________ that are (d) _______________ to the parent. It is most common
in (e) _______________.

(f) ____________________ reproduction requires (g) _______________ parents – a (h) _______________ and
a (i) _______________ – and gives offspring that are (j) _______________ from each parent.

2. Complete the table below, which compares and contrasts sexual and asexual reproduction.

<table>
<thead>
<tr>
<th></th>
<th>Sexual reproduction</th>
<th>Asexual reproduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of parents</td>
<td>Two</td>
<td>(b)</td>
</tr>
<tr>
<td>Number of offspring</td>
<td>(a) Many</td>
<td></td>
</tr>
<tr>
<td>Variation</td>
<td>Yes, offspring genetically different to parents</td>
<td>(c)</td>
</tr>
</tbody>
</table>

3. For each of the statements below, circle sexual or asexual to show which kind of reproduction it is describing.

(a) A dog breeder needs a male dog and a female dog to get a litter of puppies. Sexual/Asexual
(b) A gardener uses his spade to chop off strawberry runners which he plants to create new strawberry plants. Sexual/Asexual
(c) A pine tree is grown from a seed that has fallen out of a pine cone. Sexual/Asexual
(d) A female hammerhead shark, which has reached sexual maturity while isolated in captivity, gives birth to a baby shark. Sexual/Asexual

4. Explain why taking a cutting off a rose bush is an example of asexual reproduction. Give reasons and use the following words in your answer.

<table>
<thead>
<tr>
<th>because</th>
<th>parent</th>
<th>genetically the same</th>
</tr>
</thead>
</table>

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
1. Complete the table below, which compares and contrasts sexual and asexual reproduction.

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<tr>
<td>Variation</td>
<td>Yes, offspring genetically different to parents</td>
<td>(c)</td>
</tr>
</tbody>
</table>

2. For each of the statements below, circle sexual or asexual to show which kind of reproduction it is describing.

(a) A dog breeder needs a male dog and a female dog to get a litter of puppies. Sexual/Asexual
(b) A gardener uses his spade to chop off strawberry runners which he plants to create new strawberry plants. Sexual/Asexual
(c) A pine tree is grown from a seed that has fallen out of a pine cone. Sexual/Asexual
(d) A female hammerhead shark, which has reached sexual maturity while isolated in captivity, gives birth to a baby shark. Sexual/Asexual

3. For each of your answers in question 2 above, give reasons for your choice of sexual or asexual.

(a) ________________________________________

(b) ________________________________________

(c) ________________________________________

(d) ________________________________________

4. Explain why taking a cutting off a rose bush is an example of asexual reproduction. Give reasons and use the following words in your answer.

<table>
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<th>Asexual reproduction</th>
</tr>
</thead>
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<td>Number of parents</td>
<td>(a)</td>
<td>(d)</td>
</tr>
<tr>
<td>Number of offspring</td>
<td>(b)</td>
<td>(e)</td>
</tr>
<tr>
<td>Variation</td>
<td>(c)</td>
<td>(f)</td>
</tr>
</tbody>
</table>

2. For each of the statements below, decide whether it is describing sexual or asexual reproduction and cross out the wrong answer. Then give a reason for your choice.

(a) A dog breeder needs a male dog and a female dog to get a litter of puppies.

This is an example of **sexual** reproduction because ____________________________________________
________________________________________________________________________________________

(b) A gardener uses his spade to chop off strawberry runners which he plants to create new strawberry plants.

This is an example of **sexual** reproduction because ____________________________________________
________________________________________________________________________________________

(c) A pine tree is grown from a seed that has fallen out of a pine cone.

This is an example of **sexual** reproduction because ____________________________________________
________________________________________________________________________________________

(d) A female hammerhead shark, which has reached sexual maturity while isolated in captivity, gives birth to a baby shark.

This is an example of **sexual** reproduction because ____________________________________________
________________________________________________________________________________________

3. Explain why taking a cutting off a rose bush is an example of asexual reproduction. Give reasons and use the following words in your answer.

<table>
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<th>parent</th>
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</thead>
<tbody>
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</tbody>
</table>

4. In your book, explain how sexual reproduction and its resulting variation can ensure a population survives for generations. Give reasons for your answer.
The human body’s systems

1. Match each of the following key terms with its meaning.

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breathing</td>
<td>(a) Exchange of CO₂ and O₂ occurring between alveoli and blood vessels in the body</td>
</tr>
<tr>
<td>Respiratory system</td>
<td>(b) The system – consisting of the heart, blood vessels, and blood that circulates blood throughout the body – delivers nutrients and other essential materials to cells, and removes waste products</td>
</tr>
<tr>
<td>Circulatory system</td>
<td>(c) The system of organs responsible for getting food in to and out of the body and for making use of food to keep the body healthy</td>
</tr>
<tr>
<td>Digestive system</td>
<td>(d) The organs that are involved in breathing, including the nose, throat, larynx, trachea, bronchi and lungs</td>
</tr>
<tr>
<td>Respiration</td>
<td>(e) The actual process of moving air in and out of the lungs; also called ventilation</td>
</tr>
</tbody>
</table>

2. Write these organs in the digestive system in the order in which they do their job.

<table>
<thead>
<tr>
<th>Small intestine</th>
<th>Mouth</th>
<th>Rectum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oesophagus</td>
<td>Large intestine</td>
<td>Stomach</td>
</tr>
</tbody>
</table>

3. On the simplified diagram of the heart on the right, trace the flow of blood as it travels from the heart to the lungs and then out to the body.

4. Explain how exercising can increase the metabolic rate of your body.

_________________________________________
_________________________________________
_________________________________________
_________________________________________
The human body’s systems

1. List the human body organs found in each of the following human body systems:
   (a) Respiratory system: ____________________________________________
   (b) Circulatory system: ____________________________________________

2. Write these organs in the digestive system in the order in which they do their job.

<table>
<thead>
<tr>
<th>Small intestine</th>
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<tbody>
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<td>Oesophagus</td>
<td>Large intestine</td>
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</tbody>
</table>

3. On the simplified diagram of the heart below, trace the flow of blood as it travels from the heart to the lungs and then out to the body.

4. The diagram above is slightly inaccurate because actually the left side of the heart is larger than the right. Explain why this happens.

5. Explain how exercising can increase the metabolic rate of your body.
1. Explain the difference between breathing and respiration.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

2. In the simplified diagram of the heart on the right, trace the flow of blood as it travels from the heart to the lungs and then out to the body.

3. The diagram on the right is slightly inaccurate because actually the left side of the heart is larger than the right. Explain why this happens.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

4. In the digestive system, digestion begins with the actions of the teeth and tongue in the mouth. Enzymes in saliva also aid the breakdown of the food particles before they go down the oesophagus. Explain how the actions of these three things in the mouth "kickstart" the digestive process before you even swallow your food.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

5. Explain how a human body maintains a usual metabolic rate despite competing catabolic and anabolic reactions.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
Using a key to classify organisms

Key to silly names for pencil case items

<table>
<thead>
<tr>
<th>Question</th>
<th>YES – Go to question B</th>
<th>NO – Go to question C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Does it write?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Can an eraser rub out the writing it makes?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Does it have numbers on it?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Use the key above to identify the silly name for each of these items commonly found in your pencil case. The names are given in bold in the key.

(a) Pen: ____________________________________  (c) Ruler: ______________________
(b) Pencil: ________________________________  (d) Eraser: _______________________

2. Complete this key to help others identify these types of cars.

A. Is the vehicle red? YES – Go to question C NO – Go to question B
B. Does the vehicle have a fabric top? YES – Model T Ford NO – Chevy Impala
C. Does the vehicle have a metal roof? ________________________________

D.

3. Create a key based on yes/no questions to identify the following types of plants.

<table>
<thead>
<tr>
<th>Grass</th>
<th>Tree</th>
<th>Bush</th>
<th>Rose</th>
<th>Sunflower</th>
</tr>
</thead>
</table>

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Using a key to classify organisms

Key to silly names for pencil case items

<table>
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<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Does it write?</td>
<td>YES – Go to question B</td>
</tr>
<tr>
<td>B. Can an eraser rub out the writing it makes?</td>
<td>YES – Do dakee</td>
</tr>
<tr>
<td>C. Does it have numbers on it?</td>
<td>YES – Wot’s it</td>
</tr>
</tbody>
</table>

1. Use the key above to identify the silly name for each of these items commonly found in your pencil case. The names are given in bold in the key.

   (a) Pen: ____________________________________
   (b) Pencil: __________________________________
   (c) Ruler: ___________________________________
   (d) Eraser: __________________________________

2. Create a key based on yes/no questions to help others identify these types of cars.

   Model T Ford  Chevy Impala  Red Holden Commodore  Red utility vehicle  Red convertible

3. Create a key based on yes/no questions to identify these types of plants.

   Grass  Tree  Bush  Rose  Sunflower

4. Create a key to identify these Australian animals.

   Kangaroo  Emu  Wallaby  Possum  Koala
1. Create a key based on yes/no questions to help others identify these types of cars.

| Model T Ford | Chevy Impala | Red Holden Commodore | Red utility vehicle | Red convertible |

2. Create a key based on yes/no questions to identify these types of plants.

| Grass | Tree | Bush | Rose | Sunflower | Cactus |

3. Create a key based on yes/no questions to identify these Australian animals.

| Kangaroo | Emu | Wallaby | Possum | Koala | Platypus | Crocodile |

4. Use the question starters to create two different keys about the following Australian cities. Write each key in your book.

| Darwin | Hobart | Brisbane | Canberra | Perth | Sydney | Melbourne |

(a) Question starter: Is it Australia’s southern-most city? YES NO
(b) Question starter: Is it close to the ocean? YES NO
Find others in the class who are working on a worksheet at the same level as you. In a small group, look carefully at the graph below and use it to discuss the following questions. Then write your answers to the questions on your own.

**Approximate model of changes in number of forest birds and number of cats on a New Zealand offshore island**

1. In each of the following years, which species had the highest population on the island?
   (a) 1850 ________________________________
   (b) 1900 ________________________________
   (c) 1950 ________________________________
   (d) 2000 ________________________________

2. Outline the approximate years when forest bird and the kiwi populations were the highest.

___________________________________________________________________________________________

3. As the number of rats and cats grew, what happened to the number of birds?

___________________________________________________________________________________________
___________________________________________________________________________________________

4. Explain why the size of the forest bird and kiwi populations was affected by the number of rats and cats on the island.

___________________________________________________________________________________________
___________________________________________________________________________________________

5. Kiwi are flightless birds. Why were they at such risk from cats?

___________________________________________________________________________________________

6. Outline the trend shown in the graph above by completing the following sentence. Use the words from the box in your sentence.

<table>
<thead>
<tr>
<th>predators</th>
<th>decreased</th>
<th>increased</th>
<th>rats</th>
<th>cats</th>
<th>kiwi</th>
<th>forest birds</th>
</tr>
</thead>
</table>

As the number of ____________________________
Factors that affect population size

Approximate model of changes in number of forest birds and number of cats on a New Zealand offshore island

Use the information from the graph above to answer the following questions.

1. Outline the approximate years when forest bird and the kiwi populations were the highest.

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___________________________________________________________________________________________

2. As the number of rats and cats grew, what happened to the number of birds?

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3. Explain why the size of the forest bird and kiwi populations was affected by the number of rats and cats on the island.

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4. Explain why kiwi were at such risk from cats.

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As the number of

___________________________________________________________________________________________

6. In 1990 the New Zealand Department of Conservation started a trapping programme on this island. Using evidence from the graph, state whether you feel this programme was successful or not and give reasons for your answer.

___________________________________________________________________________________________
___________________________________________________________________________________________
Approximate model of changes in number of forest birds and number of cats on a New Zealand offshore island

Use the information from the graph above to answer the following questions.

1. Describe a general trend in the populations of the birds and animals on the island over the last 150 years.

2. Explain the events that led to the island suddenly having populations of cats and rats.

3. Outline the trend shown in the graph above by completing the following sentence. Use the words from the box in your sentence.

   As the number of predators decreased and increased, rats and cats increased, kiwi and forest birds decreased.

4. Explain why the population of kiwi was more drastically reduced than the population of forest birds.

5. Explain the trend in the graph from around 1995 onwards, which shows a reversal from the previous 90 years when the populations of kiwi and forest birds were declining.
1. In the following table, decide whether each plant feature helps the plant survive drought or whether the feature helps it survive a bush fire. Record your decisions in the table.

<table>
<thead>
<tr>
<th>Plant feature</th>
<th>Helps the plant in times of: drought or fire (choose one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Waxy coating on leaves</td>
<td></td>
</tr>
<tr>
<td>(b) Small leaves</td>
<td></td>
</tr>
<tr>
<td>(c) Heat-resistant seeds</td>
<td></td>
</tr>
<tr>
<td>(d) Extensive deep-root systems</td>
<td></td>
</tr>
<tr>
<td>(e) Store energy in their roots</td>
<td></td>
</tr>
<tr>
<td>(f) Hard leaves</td>
<td></td>
</tr>
</tbody>
</table>

2. Match each term for a type of adaptation with its definition.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural</td>
<td>(a) Relates to how an organism acts</td>
</tr>
<tr>
<td>Behavioural</td>
<td>(b) Caused by chemical structures in the organism</td>
</tr>
<tr>
<td>Functional</td>
<td>(c) Relates to an organism’s size, shape or structure</td>
</tr>
</tbody>
</table>

3. A large part of the Australian coastline has mangrove swamps. Mangroves are plants that can survive in water that has a high salt (salinity) content. Read the information about each kind of mangrove below and decide in each case whether the adaptation is an example of structural, behavioural or functional adaptation.

(a) Red mangroves: The roots of red mangroves contain a waxy substance that helps keep salt out. The salt that does get through this barrier is sent to old leaves that the trees then shed.

Adaptation type: _______________________

(b) White mangroves: White mangrove trees have glands in their leaves that let salt pass from the inside of the tree to the outside.

Adaptation type: _______________________

4. Many desert animals are nocturnal (active at night). Using your knowledge of the desert climate, suggest reasons for this behavioural adaptation.

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___________________________________________________________________________________________
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___________________________________________________________________________________________

4. There are many varieties of eucalyptus trees across Australia. Explain how the eucalyptus tree has adapted to cope with drought. In your answer, you should state what the adaptation is and explain how the adaptation helps the tree prevent water loss.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
1. In the following table, decide whether each plant feature helps the plant survive drought or whether the feature helps it survive a bush fire. Record your decision in the table, along with an explanation of how this adaptation helps the plant survive drought or a bush fire.

<table>
<thead>
<tr>
<th>Plant feature</th>
<th>Helps the plant in drought or fire?</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Waxy coating on leaves</td>
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3. There are many varieties of eucalyptus trees across Australia. Explain how the eucalyptus tree has adapted to cope with fire. In your answer, you should state what the adaptation is and explain how the adaptation helps the tree survive a bush fire.

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
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___________________________________________________________________________________________

Adaptations for survival
1. Match each of the following terms with its definition.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria</td>
<td>(a) Often said to be “on the edge of life”, requiring a living host to work; they are always pathogenic (disease causing)</td>
</tr>
<tr>
<td>Fungi</td>
<td>(b) Single-celled organisms that can come in different shapes, including rods and spirals</td>
</tr>
<tr>
<td>Viruses</td>
<td>(c) Neither a plant nor an animal; they have their own kingdom for classification</td>
</tr>
</tbody>
</table>

2. Microorganisms can be helpful or harmful. List three examples of everyday foods that are made by microbes.

3. Food poisoning such as *Salmonella* is a serious problem that can strike sufferers and cause a major illness or even death. It can be prevented with some simple food handling practices. For each of the following practices, state why it helps with handling food safely.

(a) Washing hands every time after going to the toilet

(b) Putting raw meat at the bottom of the refrigerator

(c) Cooking barbecued meat right through

4. In the early 1800s it was common for women to catch “childbed fever” and die after giving birth in a hospital. The cause of this disease was tracked to doctors who did not wash their hands between patients. Outline how the doctors’ failure to wash their hands would have led to the spread of this disease.
Microorganisms

1. Microorganisms can be helpful or harmful. List three examples of everyday foods that are made by microbes.

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4. It is not just humans who can catch a fungal disease; Facial eczema is a problem in sheep across much of Australia. Explain why this problem is much more prevalent during summer and after rain.

5. Explain why it is common for backpackers to wear footwear such as thongs (jandals or flipflops) in the shower in communal bathrooms.
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________________________________________________________________________________________
________________________________________________________________________________________

4. Explain why it is common for backpackers to wear footwear such as thongs (jandals or flipflops) in the shower in communal bathrooms.
________________________________________________________________________________________
________________________________________________________________________________________

5. Explain why viruses are always pathogenic and need a host cell in order to survive.
________________________________________________________________________________________
________________________________________________________________________________________
Artificial/selective breeding (pp 5–7)

**Basic**
1. Cloning (b); Selective breeding (d); Continuous variation (a); Discontinuous variation (c)
2. (a) It is taking an exact copy of the best plant in the garden so you get more of the nicest strawberries growing.
   (b) Insemination happens without the bull present and the farmer can pick the traits that they want in the calf by selecting them in the bull.
   (c) There is no actual mating of the dogs and you can get the traits from the male dog that the breeder specifically wants in order to get champion puppies.
3. Lots of milk; udders that are well formed; healthy cows.

**Proficient**
1. (a) It is taking an exact copy of the best plant in the garden so you get more of the nicest strawberries growing.
   (b) Insemination happens without the bull present and the farmer can pick the traits that they want in the calf by selecting them in the bull.
   (c) There is no actual mating of the dogs and you can get the traits from the male dog that the breeder specifically wants in order to get champion puppies.
2. You can get cows that: produce more milk and eat less; have healthy feed so don’t require vet care; etc.
3. (a) The plants are proven performers and are examples of superior plants, eg, they produce lots of crop.
   (b) If you have a disease in your garden, all of your plants could be wiped out.
   (c) Yes, but they may not get the same amount of produce the next season because the new season plants will not be an exact copy of the commercial plants.

**Advanced**
1. (a) Advantages: Get the best strawberries;
   Disadvantages: If a disease wipes out original plant, it will wipe out new plant.
   (b) Advantages: Can introduce traits into herd that are desirable; Disadvantages: Can be expensive.
   (c) Advantages: Can select a dog with strong desirable traits; Disadvantages: Can be expensive.
2. Dairy herds are more productive because the semen has been selected for traits that make the herd more productive, eg, high milk volume or high milk fat content.
3. If close relatives are bred, inbreeding can lead to genetic problems that are common in the breed such as weak hips in lots of dog breeds.
4. Cloning gives an exact genetic copy of the mare; in this case it would mean that the owner could continue to breed her and produce very valuable foals from her DNA long after Makybe Diva is dead.

Cells (pp 8–10)

**Basic**
1. (a) True; because they have a rigid cell wall that the plant relies on for staying upright.
   (b) False; because animal cells don’t have a rigid cell wall so are not regular in shape or stacked.
   (c) False; because only plant cells have cell walls.
   (d) True; because chloroplasts are used for photosynthesis, which is something that only plants can do.
   (e) True; because the nucleus tells the cell what to do.
2. Plant cell: has a cell membrane; has a nucleus; has a cytoplasm.
   Animal cell: has a cell membrane; has a cell wall; has a nucleus; has a cytoplasm; has a large vacuole; has chloroplasts.
3. It does not have any of the features of a plant cell such as a cell wall or chloroplasts.

**Proficient**
1. (a) True; because they have a rigid cell wall that the plant relies on for staying upright.
   (b) True; because there are organisms with a single cell which are called unicellular organisms.
   (c) False; because meiosis does not give an exact copy of the cell so it is not suitable for use in growth and repair.
   (d) True; because inside everyone is cells.
2. It is true because chloroplasts are where photosynthesis takes place and only plants can go through the process of photosynthesis.
3. It does not have any of the features of a plant cell such as a cell wall or chloroplasts.
4. This statement is true because the common structure of the plant and animal cells is very similar, eg, both have a cytoplasm, organelles and a nucleus.

**Advanced**
1. (a) True; because they have a rigid cell wall that the plant relies on for staying upright.
   (b) True; because there are organisms with a single cell which are called unicellular organisms.
   (c) False; because meiosis does not give an exact copy of the cell so it is not suitable for use in growth and repair.
   (d) True; because inside everyone is cells.
2. It does not have any of the features of a plant cell such as a cell wall or chloroplasts.
3. This statement is true because the common structure of the plant and animal cells is very similar, eg, both have a cytoplasm, organelles and a nucleus.
4. It is a specialised cell because it has a specific task or role to do – that is, to pass electrical impulses along it as fast as possible.

The effect of radiation on humans (pp 11–13)

**Basic**
1. (a) True; the statement is the same as a sentence in the text.

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(b) True; the text identifies other types of non-ionising radiation such as UV light and visible light.
(c) True; non-ionising radiation does not have enough energy to turn particles into ions but it does have enough energy to heat particles.
(d) True; to cause a tumour a mobile phone would have to alter DNA.
(e) True; teenagers are more likely to miss out on sleep because they stay up too late using their phones or are interrupted in their rest due to answering messages in the middle of the night.

2. It means that the radiation can heat up objects/cells but cannot turn cells into ions (charged particles).
3. The energy is not strong enough to turn cells into ions.

Profi cient
1. (a) True; radiation from the Sun is also electromagnetic radiation.
(b) True; this is what ionising radiation does.
(c) True; it is non-ionising radiation so can only heat cells – it cannot alter DNA of cells.
2. (a) True; the text implies that teenagers stay up too late and don’t sleep right through the night due to interruptions from their mobile phone.
(b) False; the radiation from the mobile phone doesn’t have enough energy to alter the DNA in your ear cells – it can only heat the cells up.

Advanced
1. (a) True; radiation from the Sun is also electromagnetic radiation.
(b) True; this is what ionising radiation does.
(c) True; it is non-ionising radiation so can only heat cells – it cannot alter DNA of cells.
2. (a) No, it doesn’t mean you are getting cancer. It means your mobile phone is emitting ER radiation that has enough energy to heat up your ear cells but it doesn’t have enough energy to alter your ear cell’s DNA.
(b) Your level of risk depends on how long you spend in the Sun but generally you are more at risk of getting cancer from tanning in the Sun than you are of getting cancer from using a mobile phone.

Genetic mutations (pp 14–16)

Basic
1. (a) changes
(b) DNA
(c) A range of answers is possible, including any three of the following: Huntington’s disease, cystic fibrosis, sickle cell anaemia, Down syndrome.
(d) gametes
(e) will not
2. (a) This person would be lucky to live into their thirties as the thick mucus that the lungs produce blocks the airways and fills up the lungs which stop working so the person cannot breathe effectively.
(b) Two healthy parents could be carriers of the disorder with genotypes (Cc). When they mate, they have a 1/4 chance of producing a cystic fibrosis sufferer with a cc genotype.
3. This person would be a carrier of the disorder and be heterozygous, eg, Ss.

Profi cient
1. Two healthy parents could be carriers of the disorder with genotypes (Cc). When they mate, they have a 1/4 chance of producing a cystic fibrosis sufferer with a cc genotype.
2. (a) The person with sickle cell anaemia has sickle-shaped red blood cells that cannot carry oxygen effectively and so the person has a reduced life expectancy.
(b) This person would be a carrier of the disorder and be heterozygous, eg, Ss.
3. Answer could include the following points: The insurance company should know if you are going to develop a genetic disorder that is expensive to treat because you will be a higher-risk client. However, people’s genes are their business and they don’t know the future whereas a genetic screen could predict a future that is filled with hospitals and a genetic disorder.

Advanced
Answers could include the following points:
1. (a) Pros: The genetic disorder may have a cure if the gene is still dormant; Cons: They will know their fate; Questions: How did I get this disorder?
(b) Pros: Can know the prevalence of a disorder in the population, can put health money where it is most needed; Cons: Knowing prevalence may not lead to a change in funding and a cure; Questions: Does this affect how we plan our health spending as a nation?
(c) Pros: Can identify high-risk people who are likely to develop a genetic disorder that will be expensive to treat; Cons: May be an unpopular policy among consumers if insurance company raises premiums for some people or refuses to insure them; Questions: Is it ethical for an insurance company to find out about people’s genes?
(d) Pros: Can see who is likely to need time off work; Cons: May not employ good people because further down the track they are likely to develop a genetic disorder; Questions: Is it an employer’s business to know about their employees’ genes?
(e) Pros: Know everyone’s DNA so if they commit a crime they can be identified without lots of money spent on solving the case; Cons: Too much information could mean that the police don’t do any detective work any more; Questions: How would the data be secured?
2. Some reasons for opposing the police are: the database contains data collected from people for a purpose they did not authorise; the Guthrie card was not collected for this purpose; who would look after these data?
3. Pros: Insurance company is looking to reduce costs and risks with insuring clients; Cons: Many people would not understand what they are signing; many people won’t know that they have a genetic disorder while the insurance company would hold information about how their life is going to turn out; Questions: Does the presence of a gene that may lead to a disorder actually mean the insurance company will refuse to insure the client?
Genetics punnet squares (pp 17–19)

Basic
1. (a) 
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(b) Height of offspring: 75% tall and 25% short; Genotypes: 25% TT; 50% Tt and 25% tt
2. 
   | W  | w |
   | w  | Ww | ww |
   | w  | Ww | ww |
50% are white and 50% are grey.
3. 
   | H  | h |
   | H  | HH | Hh |
   | h  | Hh | hh |
The chance of two short-haired guinea pigs producing a long-haired guinea pig is 25%.
4. 
   | E  | e |
   | e  | Ee | ee |
   | e  | Ee | ee |
50% chance

Proficient
1. 
   | W  | w |
   | w  | Ww | ww |
   | w  | Ww | ww |
50% are white and 50% are grey.
2. 
   | B  | b |
   | b  | Bb | bb |
   | b  | Bb | bb |
Genotypes: 25% BB; 50% Bb and 25% bb; Phenotype: 75% are black and 25% are brown.
3. 
   | H  | h |
   | h  | Hh | Hh |
   | h  | Hh | Hh |
All (100%) of the offspring are short-haired because the dominant allele (H) is present in all the genotypes of the offspring.
4. 
   | E  | e |
   | e  | Ee | ee |
   | e  | Ee | ee |
There is a 50% chance of the offspring being ee and so being lactose intolerant.

Advanced
1. 
   | B  | b |
   | B  | BB | Bb |
   | b  | Bb | bb |
Genotypes: 25% BB; 50% Bb and 25% bb; Phenotype: 75% are black and 25% are brown.
2. 
   | H  | H |
   | h  | Hh | Hh |
   | h  | Hh | Hh |
All (100%) of the offspring are short-haired because the dominant allele (H) is present in all the genotypes of the offspring.
3. 
   | H  | H |
   | h  | Hh | Hh |
   | h  | Hh | Hh |
Even if both parents are heterozygous, the offspring could still be 100% short-haired as there is only a 50% chance of a long-haired guinea pig.
4. 
   | C  | c |
   | c  | Cc | cc |
   | c  | Cc | cc |
Both parents would need to be heterozygous for cystic fibrosis which means a 1/25 chance. So, 1/25 x 1/25 = 1/625 chance of matching up. Then it is another 1/4 chance of producing the needed cc genotype so 1/625 x 1/4 = 1 in 2 500 chance of producing a child with cystic fibrosis.
5. 
   | X  | X |
   | X  | XX | XX |
   | Y  | XY | XY |
The male has the Y chromosome and so the presence of the Y chromosome from the male determines whether the offspring is male (XY) rather than female (XX).

Life processes (pp 20–22)

Basic
1. Movement, Reproduction, Sensitivity, Growth, Respiration, Excretion, Nutrition
2. (a) A rock has none of the seven life processes so it is non-living.
   (b) A clock can only move and it has none of the other six life processes so it is non-living.
   (c) A blade of grass has all seven of the life processes (including movement as it can grow towards the sun) so it is living.
3. A tree can move – it can grow towards the light and move in the breeze – so it is living.
4. A car cannot grow, cannot reproduce and is not sensitive.
Profiicient
1. Movement, Reproduction, Sensitivity, Growth, Respiration, Excretion, Nutrition
2. A tree can move – it can grow towards the light and move in the breeze – so it is living.
3. A car cannot grow, cannot reproduce and is not sensitive.
4. Fire can do six of the seven life processes; however, it is not sensitive so cannot be considered living.

Advanced
1. A tree can move – it can grow towards the light and move in the breeze – so it is living.
2. A car cannot grow, cannot reproduce and is not sensitive.
3. Fire can do six of the seven life processes; however, it is not sensitive so cannot be considered living.
4. A seed is living because it can do six of the seven life processes and has the potential to reproduce.

Living or non-living (pp 23–25)

Basic
1. Movement (b), Reproduction (a), Sensitivity (b), Growth (b), Respiration (d), Excretion (d), Nutrition (c)
2. (a) Living
   (b) Living
   (c) Non-living
   (d) Non-living
3. (a) A rock cannot respire, sense, reproduce, excrete or eat.
   (b) Water cannot respire, sense, reproduce, excrete, grow or eat.
   (c) A fire cannot sense.
4. A car cannot reproduce, sense, excrete or grow.

Proficient
1. Movement (b), Reproduction (a), Sensitivity (b), Growth (b), Respiration (d), Excretion (d), Nutrition (c)
2. (a) A plant is living because it can move, reproduce, sense, grow, respire, excrete waste and make its own food.
   (b) Water is non-living because it cannot respire, sense, reproduce, excrete, grow or eat.
   (c) A car is non-living because it cannot reproduce, sense, excrete or grow.
   (d) A log of wood is non-living because it cannot move, reproduce, sense, grow, respire, excrete or eat.
3. A fire is non-living because it cannot sense. It can do the other six life processes but, to be considered living, all seven life processes must be present.

Advanced
1. (a) A plant is living because it can move, reproduce, sense, grow, respire, excrete waste and make its own food.
   (b) Water is non-living because it cannot respire, sense, reproduce, excrete, grow or eat.
   (c) A car is non-living because it cannot reproduce, sense, excrete or grow.
   (d) A log of wood is non-living because it cannot move, reproduce, sense, grow, respire, excrete or eat.

2. Mel is correct as fire does not do all seven life processes: it is not able to sense. Terry was correct in saying it needs fuel and can reproduce but it needs to do all seven life processes in order to be alive.
3. Strawberry plants are living because they do all seven life processes. They do reproduce but their mode of reproduction is asexual – they don’t need another plant to reproduce.
4. A seed is living because it can do six of the seven life process and has the potential to reproduce.

Pedigree charts (pp 26–28)

Basic
1. White fur is dominant because there are more white individuals in the pedigree chart than grey.

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2. Both mouse 1 and mouse 2 are heterozygous for fur colour and are white themselves. However, there is a 1/4 chance that any of their offspring will be grey (ww).

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3. Mouse 7 must be heterozygous as its mate (mouse 6) has grey fur so must be ww. So, in order to have grey offspring (mouse 11), both parents must have a recessive allele which means mouse 7 has to be Ww.

Proficient
1. Mouse 1 and mouse 2 are both heterozygous for fur colour, which means that they can have offspring with grey fur (mouse 6) and offspring with white fur (mouse 5).

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2. White fur is dominant as when the grey mouse (mouse 6) mates with the white mouse (mouse 7), the offspring are 3 white and 1 grey mice. So mouse 7 must be heterozygous as mouse 11’s genotype has to be ww, which means one allele comes from one parent and the other from the other parent.
Photosynthesis (pp 29–31)

Basic
1. Photosynthesis (d); Sun (c); Energy (b); Chloroplast (a)
2. Photosynthesis occurs inside the leaves in a plant.
3. For the cardboard-covered leaf, there would be no reaction with the indicator so it would stay colourless. For the other leaves not covered by cardboard, the Sun could hit them and the indicator would turn blue-black, showing that carbohydrate has been made.
4. The leaves on plants in darker areas are larger because the plants need more leaf surface to make their food as the light levels are lower.
5. The waxy, almost waterproof coating is to stop the leaves from losing water as water is needed to make carbohydrate by photosynthesis.

Proficient
1. Photosynthesis occurs inside the leaves in a plant.
2. For the leaf that the cardboard was covering, there would be no reaction with the indicator so it would stay colourless. For the other leaves not covered by cardboard, the Sun could hit them and the indicator would turn blue-black, showing that carbohydrate has been made.
3. The leaves on plants in darker areas are larger because the plants need more leaf surface to make their food as the light levels are lower.
4. The waxy, almost waterproof coating is to stop the leaves from losing water as water is needed to make carbohydrate by photosynthesis.

Advanced
1. White fur is dominant as when the grey mouse (mouse 6) mates with the white mouse (mouse 7), the offspring are 3 white and 1 grey mice. So mouse 7 must be heterozygous as mouse 11’s genotype has to be wW, which means one allele comes from one parent and the other from the other parent.

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2. To find out the genotype of mouse 12, there would need to be a test cross done with a homozygous recessive (ww) grey mouse. If mouse 12 is homozygous dominant, the following ratio would be seen in the offspring:

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Respiratory diseases (pp 32–34)

Basic
1. (a) Inhaled means to breathe in.
   (b) Exhaled means to breathe out.
2. The cilia line the airways to filter and trap any foreign objects that may be in the air (eg, smoke, dust).
3. Chronic means ongoing or continuing so a chronic condition is one that you have for a long time.
4. You should continue to use your inhaler for asthma even if you haven’t had an attack recently because the inhaler helps keep attacks at bay by reducing inflammation in the airways. Another reason for using it is that an attack can happen at any time.
5. Smoking kills off the cilia that line the airway to the lung and fills the lungs with tar. Because of the smoke, a smoker’s oxygen levels in the blood are lower than a non-smoker’s and their circulation may be reduced.

Proficient
1. The cilia line the airways to filter and trap any foreign objects that may be in the air (eg, smoke, dust).
2. Smoking kills off the cilia that line the airway to the lung and fills the lungs with tar. Because of the smoke, a smoker’s oxygen levels in the blood are lower than a non-smoker’s and their circulation may be reduced.
3. You should continue to use your inhaler for asthma even if you haven’t had an attack recently because the inhaler helps keep attacks at bay by reducing inflammation in the airways. Another reason for using it is that an attack can happen at any time.
4. Antibiotics can only work on bacteria by breaking apart the cell wall; viruses are not affected by antibiotics so there is no point in taking them when viral pneumonia is diagnosed.

Advanced
1. Smoking kills off the cilia that line the airway to the lung and fills the lungs with tar. Because of the smoke, a smoker’s oxygen levels in the blood are lower than a non-smoker’s and their circulation may be reduced.
2. You should continue to use your inhaler for asthma even if you haven’t had an attack recently because the inhaler helps keep attacks at bay by reducing inflammation in the airways. Another reason for using it is that an attack can happen at any time.
3. (a) Antibiotics can only work on bacteria by breaking apart the cell wall; viruses are not affected by antibiotics so there is no point in taking them when viral pneumonia is diagnosed.
   (b) A person may be prescribed bed rest for pneumonia when they have viral pneumonia because the body’s defence system needs to fight the virus; antibiotics are not prescribed as well because they will not be effective against a virus.

Food chains and food webs (pp 35–37)

Basic
1. (a) Producer
(b) Omnivore
(c) Flow of energy
2. Grasses → Kangaroo → Dingo
3. Possible food chains are: Grasses → Kangaroo → Dingo; Gumtree → Possum → Dingo; Grasses → Emu → Magpie
4. Possible food chains are: Sponge → Parrotfish → Tiger shark; Kelp → Clownfish → Sea bass; Kelp → Sea snake → Barramundi → Tiger shark

Proficient
1. Grasses → Kangaroo → Dingo
2. Possible food chains are: Grasses → Kangaroo → Dingo; Gumtree → Possum → Dingo; Grasses → Emu → Magpie
3. Possible food chains are: Sponge → Parrotfish → Tiger shark; Kelp → Clownfish → Sea bass; Kelp → Sea snake → Barramundi → Tiger shark
4. Teacher to check answers.
5. Teacher to check answers.

Advanced
1. Possible food chains are: Grasses → Kangaroo → Dingo; Gumtree → Possum → Dingo; Grasses → Emu → Magpie; Wattle tree → Cricket → Magpie
2. Possible food chains are: Sponge → Parrotfish → Tiger shark; Kelp → Clownfish → Sea bass; Kelp → Sea snake → Barramundi → Tiger shark; Coral → Parrotfish → Tiger shark
3. Teacher to check answers.
4. Teacher to check answers.

Sexual and asexual reproduction (pp 38–40)

Basic
1. (a) Asexual (g) two
   (b) parent (h) male
   (c) offspring (i) female (or (h) and (d) genetically identical (j) can be in reverse (e) plants (k) genetically different
   (f) Sexual (l) genetically different
2. (a) Few
   (b) One
   (c) No, offspring genetically identical to parents
3. (a) Sexual (c) Sexual
   (b) Asexual (d) Asexual
4. Taking a cutting off a rose bush is an example of asexual reproduction because there is only one parent (the rose bush) and so the offspring (the new rose bush) will be genetically the same as the parent.

Proficient
1. (a) Few
   (b) One
   (c) No, offspring genetically identical to parents
2. (a) Sexual (c) Sexual
   (b) Asexual (d) Asexual
3. (a) It is sexual reproduction because two parents are required.
   (b) It is asexual reproduction because it involved only one parent.
   (c) It is sexual reproduction because the male and female pine trees “mated” and produced the pine seed.
   (d) It is asexual reproduction because it involved only one parent. (This situation has occurred but is very unusual: when tested, the offspring was genetically identical.)
4. Taking a cutting off a rose bush is an example of asexual reproduction because there is only one parent (the rose bush) and so the offspring (the new rose bush) will be genetically the same as the parent.

The human body’s systems (pp 41–43)

Basic
1. Breathing (a); Respiratory system (d); Circulatory system (b); Digestive system (c); Respiration (a)
2. Mouth, oesophagus, stomach, small intestine, large intestine, rectum
3. Teacher to check answers.

Proficient
1. (a) nose, throat, larynx, trachea, bronchi, lungs
   (b) heart, blood vessels, blood
2. Mouth, oesophagus, stomach, small intestine, large intestine, rectum
3. **Teacher to check answers.**
4. The left side of the heart pumps blood to the body so needs to be larger than the right side, which only pumps blood to the lungs a short distance away.
5. Your metabolic rate is the rate at which your body converts food into energy. Exercising increases this rate because it forces the respiratory and circulatory systems to work harder.

### Advanced
1. Breathing is the actual process of moving air in and out of the lungs whereas respiration is the exchange of CO₂ and O₂ that occurs between the alveoli and blood vessels.

**Teacher to check answers.**
2. The left side of the heart pumps blood to the body so needs to be larger than the right side, which only pumps blood to the lungs a short distance away.
3. Food would stay in very large chunks if the teeth and tongue did not move it around the mouth and make it into small pieces with a much larger surface area. The enzymes in the saliva then work on the larger surface area to break the food down further before it gets to the stomach.
4. Metabolism is the net sum of the chemical processes occurring in the body, which include both catabolic and anabolic reactions. Catabolic reactions are where big molecules are broken down to release energy and anabolism is where molecules are built which need energy. The usual metabolic rate is the rate at which each type of reaction occurs within the body, producing an overall excess of energy or a deficit of energy.

### Using a key to classify organisms (pp 44–46)

#### Basic
1. (a) That thing
(b) Do dakee
(c) Wot’s it
(d) Thingy ma jiggy

**Lines to complete key:**

**Question C:** ... YES – Holden Commodore NO – Go to question D

**Question D:** Does the vehicle have a roll bar? YES – Utility vehicle NO – Convertible

3. **Possible key:**

**Question A:** Is it a flower?
YES – Go to question C NO – Go to question B

**Question B:** Does it have a leaf? YES – Model T Ford NO – Chevy Impala

**Question C:** Does it have branches?
YES – Go to question D NO – Grass

**Question D:** Does it have a trunk that has bark? YES – Tree NO – Bush

#### Proficient
1. (a) That thing
(b) Do dakee
(c) Wot’s it
(d) Thingy ma jiggy

**Possible key:**

**Question A:** Is the vehicle red?
YES – Go to question C NO – Go to question B

**Question B:** Does the vehicle have a fabric top?
YES – Holden Commodore NO – Go to question D

**Question C:** Does the vehicle have a metal roof?
YES – Utility vehicle NO – Convertible

**Question D:** Does the vehicle have a roll bar?
YES – Holden Commodore NO – Go to question D

3. **Possible key:**

**Question A:** Is it a flower?
YES – Go to question B NO – Go to question C

**Question B:** Does it have a leaf? YES – Model T Ford NO – Chevy Impala

**Question C:** Does it have branches?
YES – Go to question D NO – Grass

**Question D:** Does it have a trunk that has bark?
YES – Tree NO – Bush

**Question E:** Does it have white fur on its belly?
YES – Koala NO – Possum

4. **Possible key:**

**Question A:** Is it a beak?
YES – Emu NO – Go to question B

**Question B:** Does it bounce on two legs?
YES – Go to question C NO – Go to question D

**Question C:** Does its feet seem too long for its body?
YES – Kangaroo NO – Wallaby

**Question D:** Does it have thorns?
YES – Cactus NO – Grass

**Possible key:**

**Question A:** Is the vehicle red?
YES – Emu NO – Go to question B

**Question B:** Does it bounce on two legs?
YES – Go to question C NO – Go to question D

**Question C:** Does it have thorns?
YES – Model T Ford NO – Chevy Impala

**Question D:** Does it have a trunk that has bark?
YES – Holden Commodore NO – Go to question D

**Question E:** Does it have white fur on its belly?
YES – Koala NO – Possum

**Question F:** Does it have a long body and a lot of teeth?
YES – Crocodile NO – Platypus

4. (a) **Possible key:**

**Question A:** Is it Australia’s southern-most city?
YES – Hobart NO – Go to question B

**Question B:** Is it Australia’s northern-most city?
YES – Darwin NO – Go to question C

**Question C:** Is it the country’s capital?
YES – Canberra NO – Go to question D

**Question D:** Is it Canberra?
YES – Canberra NO – Go to question D
Factors that affect population size (pp 47–49)

Basic
1. (a) Forest birds (c) Rats
   (b) Forest birds (d) Rats
2. The populations were highest from 1850 until around 1915.
3. As the number of rats and cats grew, the bird populations grew smaller.
4. The size of the populations was affected because the rats and cats were predators to the birds so the birds were hunted and killed.
5. The kiwi were at risk from cats as they could not fly away so the cats hunted and killed them.
6. As the number of cats and rats increased, the number of kiwi and forest birds decreased because the cats and rats are predators to the kiwi and forest birds.

Proficient
1. The forest birds and kiwi populations were highest between 1850 and about 1915 before cats and rats over-ran the island.
2. As the number of rats and cats grew, the bird populations decreased.
3. The size of the populations was affected because the rats and cats were predators to the birds so the birds were hunted and killed.
4. Kiwi were at great risk from cats because they are flightless and have no way of dealing with cats as predators.
5. As the number of cats and rats increased, the number of kiwi and forest birds decreased because the cats and rats are predators to the kiwi and forest birds.
6. The trapping programme was successful: as the graph shows, the populations of rats and cats decreased dramatically and the populations of kiwi and forest birds are slowly recovering.

Advanced
1. As the populations of rats and cats increased, the populations of the forest birds and kiwi decreased.
2. European settlers to New Zealand brought cats with them and rats came on their ships. Both cats and rats settled the offshore island and were natural predators for the kiwi and forest birds.
3. As the number of cats and rats increased, the number of kiwi and forest birds decreased because the cats and rats are predators to the kiwi and forest birds.
4. The population of kiwi was hardest hit as kiwi are flightless birds and had no way of escaping the predators of rats and cats who could attack the kiwi and eat their eggs. The forest birds could fly and so escape the cats and rats more easily.
5. There must have been a programme that eradicated the rats and cats on the island by 2010, allowing the populations of kiwi and forest birds to increase.

Adaptations for survival (pp 50–52)

Basic
1. (a) Drought
   (b) Drought
   (c) Fire
   (d) Fire
   (e) Fire
   (f) Drought
2. Structural (c); Behavioural (a); Functional (b)
3. (a) Functional
   (b) Functional
4. Desert animals became nocturnal as a behavioural adaptation so that they could move about and gather food without needing to protect themselves against the extreme heat of the desert during the day.

Proficient
1. Structural (c); Behavioural (a); Functional (b)
2. (a) Functional
   (b) Functional
3. Desert animals became nocturnal as a behavioural adaptation so that they could move about and gather food without needing to protect themselves against the extreme heat of the desert during the day.
4. The leaves of the eucalyptus trees have a thick, waxy coating (cuticle), which lessens water loss by acting as a barrier to reduce transpiration. This waxy coating also reflects the Sun which helps reduce water loss as well.

Advanced
1. (a) Drought; it reduces water loss.
   (b) Drought; they reduce the amount of surface area that could lead to water loss.
   (c) Bush fire; after the fire has been through an area, seeds are able to germinate.
   (d) Drought; they can go looking for soil moisture deep in the ground to help the plant survive with no rain.
   (e) Bushfire; after the fire has passed, a plant can regenerate using the stored energy in the roots.
   (f) Drought; they reduce water loss.
2. Desert animals became nocturnal as a behavioural adaptation so that they could move about and gather food without needing to protect themselves against the extreme heat of the desert during the day.
3. The leaves of the eucalyptus trees have a thick, waxy coating (cuticle), which lessens water loss by acting as a barrier to reduce transpiration. This waxy coating also reflects the Sun which helps reduce water loss as well.
Microorganisms (pp 53–55)

Basic
1. Bacteria (b); Fungi (c); Viruses (a)
2. Examples may include any three of the following: bread, beer, yoghurt, cheese, wine.
3. (a) Hands should be washed after going to the toilet as faecal matter contains many microbes that could be transferred to the food and then passed on to unsuspecting diners, making them ill.
(b) If raw meat is at the bottom of the refrigerator, any drips from it will not fall on other food and so cross-contamination is avoided.
(c) If barbecued meat is cooked right through, there is no chance for microbes to remain in the food and therefore the person eating the food will not become ill.
4. When they did not wash their hands after dealing with a patient with the disease, doctors became the source of the bacteria and transferred them from one patient to another. As a result, lots of patients got the disease and the rate of death was very high.

Proficient
1. Examples may include any three of the following: bread, beer, yoghurt, cheese, wine.
2. (a) Hands should be washed after going to the toilet as faecal matter contains many microbes that could be transferred to the food and then passed on to unsuspecting diners, making them ill.
(b) If raw meat is at the bottom of the refrigerator, any drips from it will not fall on other food and so cross-contamination is avoided.
(c) If barbecued meat is cooked right through, there is no chance for microbes to remain in the food and therefore the person eating the food will not become ill.
3. When they did not wash their hands after dealing with a patient with the disease, doctors became the source of the bacteria and transferred them from one patient to another. As a result, lots of patients got the disease and the rate of death was very high.
4. Fungi need warmth and moisture to reproduce, which are the conditions provided in the summer and after rain, so at these times facial eczema is more likely to flourish.
5. By wearing something on your feet in a communal bathroom, you are less likely to catch athlete’s foot (a common fungal infection).

Advanced
1. (a) Hands should be washed after going to the toilet as faecal matter contains many microbes that could be transferred to the food and then passed on to unsuspecting diners, making them ill.
(b) If raw meat is at the bottom of the refrigerator, any drips from it will not fall on other food and so cross-contamination is avoided.
(c) If barbecued meat is cooked right through, there is no chance for microbes to remain in the food and therefore the person eating the food will not become ill.
2. When they did not wash their hands after dealing with a patient with the disease, doctors became the source of the bacteria and transferred them from one patient to another. As a result, lots of patients got the disease and the rate of death was very high.
3. Fungi need warmth and moisture to reproduce, which are the conditions provided in the summer and after rain, so at these times facial eczema is more likely to flourish.
4. By wearing something on your feet in a communal bathroom, you are less likely to catch athlete’s foot (a common fungal infection).
5. Viruses always cause death to their host cell as they take over the host cell and use it as a factory to make more viruses. They are said to be on the edge of life because they cannot survive outside the host cell.
Differentiation in Science Made Easy

Each book in this series:

- helps teachers to easily differentiate learning in science
- supplies absorbing worksheets on a diversity of science topics, presenting each topic at three different levels of ability
- is designed for independent work that both reinforces learning and challenges students further
- includes worksheet answers, which students can use to mark their own work, further supporting independent learning.

Wouldn’t it be wonderful if everyone in your science class could build on their learning about the same topic at a level that suits their individual needs and abilities? The good news is – there is a series that can help you make this ideal into a reality. The worksheets in Differentiation in Science Made Easy cover the same content at three levels: basic, proficient and advanced. Dealing with a great range of curriculum topics within each of four broad areas of science, the worksheets are carefully designed to achieve an appropriate balance between directly reinforcing learning and challenging higher-order thinking, based on each student’s current level of learning. Another emphasis is on lively questions that clearly make the connection between science topics and everyday life. The net result is a collection of engrossing worksheets that support and motivate students to work independently and productively.