

BOARD OF STUDIES
NEW SOUTH WALES

2013 HSC Senior Science Marking Guidelines

Section I, Part A

Multiple-choice Answer Key

Question	Answer
1	A
2	B
3	B
4	A
5	D
6	A
7	B
8	C
9	A
10	D
11	A
12	A
13	D
14	C
15	A
16	C
17	A
18	B
19	D
20	C

Section I, Part B

Question 21 (a)

Criteria	Marks
• States TWO roles	2
• States ONE role	1

Sample answer:

Separates the body from the external environment.
Assists in body temperature control.

Question 21 (b)

Criteria	Marks
• States features and relates these to the maintenance of skin pH	3
• States a feature and relates this to the maintenance of skin pH OR • Identifies TWO or more features relevant to skin pH	2
• Any relevant information	1

Sample answer:

Microflora produce acidic secretions which helps maintain the skin's slightly acidic pH.
Perspiration provides water which is necessary for the production of an acidic environment.

Question 21 (c)

Criteria	Marks
• Outlines TWO advantages	2
• Outlines ONE advantage	1

Sample answer:

A drug is delivered into the body over an extended period of time.
The patient does not need to remember to take the drug.

Question 22 (a)

Criteria	Marks
<ul style="list-style-type: none"> Relates all components to their function Displays information in a table 	3
<ul style="list-style-type: none"> Shows a relationship between a structure its function in a table OR <ul style="list-style-type: none"> Shows the relationship between both structures but NOT in a table 	2
<ul style="list-style-type: none"> Any relevant information or acceptable table 	1

Sample answer:

<i>Structure</i>	<i>Function</i>
Trachea	Allows air to travel from the mouth to the lungs
Alveoli	Traps air and allows gases to diffuse in and out of the capillaries

Table requires columns and rows and includes appropriate headings.

Question 22 (b)

Criteria	Marks
<ul style="list-style-type: none"> Identifies a life support system States a function of this named life support system 	2
<ul style="list-style-type: none"> Any relevant information 	1

Sample answer:

Artificial lungs are a life support system that would be used. Its role would be to remove carbon dioxide and replace it with oxygen so that the patient could survive.

Question 23 (a)

Criteria	Marks
<ul style="list-style-type: none"> States an advantage Gives a reason for the advantage 	2
<ul style="list-style-type: none"> Any relevant information 	1

Sample answer:

Shampoo breaks down quickly in the environment so it does not have long-term detrimental effects on aquatic organisms.

Question 23 (b)

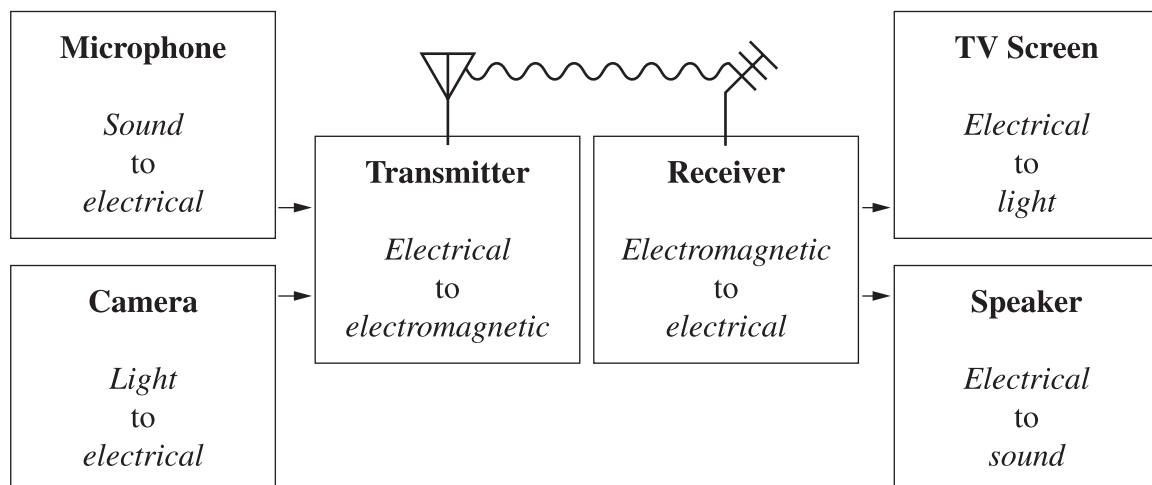
Criteria	Marks
• Relates a problem with shampoos in the use of universal indicator solution	2
• States a relevant problem relating to shampoos or indicators	1

Sample answer:

Some shampoos are coloured. Thus, it can be difficult to see any colour change in the universal indicator solution.

Question 24

Criteria	Marks
• Identifies at least FOUR correct transformations	4
• Identifies THREE correct transformations	3
• Identifies TWO correct transformations	2
• Identifies ONE correct transformation	1

Sample answer:


Question 25

Criteria	Marks
<ul style="list-style-type: none">States THREE biomaterialsRelates each biomaterial to the functioning of the humanLogical, sequential response	4
<ul style="list-style-type: none">States TWO biomaterialsRelates a stated biomaterial to the functioning of the human	3
<ul style="list-style-type: none">States ONE biomaterialRelates the stated biomaterial to the functioning of the human OR	2
<ul style="list-style-type: none">States THREE biomaterialsProvides any relevant information	1

Sample answer:

Some biomaterials have helped keep humans alive. Teflon[®] can be used in heart valves to replace faulty valves to enable the heart to continue to control the flow of blood and the human to have a relatively normal lifestyle. Other biomaterials have helped improve the quality of life of some humans eg UHMWPE and superalloys are two biomaterials used in hip joint replacements. These allow the leg to continue to function and gives the person mobility.

Question 26 (a)

Criteria	Marks
<ul style="list-style-type: none">States a correct property	1

Sample answer:

Reflection

Question 26 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides a judgement about the diagram Outlines inaccuracies in the diagram 	3
<ul style="list-style-type: none"> Provides a judgement about the diagram Outlines an inaccuracy in the diagram OR <ul style="list-style-type: none"> Outlines inaccuracies in the diagram 	2
<ul style="list-style-type: none"> Provides any relevant information 	1

Sample answer:

Optical fibres are solid rather than hollow cylinders.
 The light is not travelling through the centre of the cylinder.
 Therefore the diagram is not very accurate.

Answers could include:

The diagram is accurate because it shows total internal reflection.
 Correct drawings onto the diagram are acceptable.

Question 26 (c)

Criteria	Marks
<ul style="list-style-type: none"> States similarities and a difference between the systems OR <ul style="list-style-type: none"> States differences and a similarity between the systems 	3
<ul style="list-style-type: none"> States a similarity and a difference OR <ul style="list-style-type: none"> States similarities or differences 	2
<ul style="list-style-type: none"> Provides any relevant information 	1

Sample answer:

Microwave links through the satellite are composed of microwaves, whereas the optical fibres use light waves. Optical fibres need a hard-wired link while microwaves can travel through the air and space and so don't need a physical link. However, both optical fibres and microwaves transfer energy and carry information.

Question 27

Criteria	Marks
<ul style="list-style-type: none">• Provides some details about a development• Links the development to effects on society and impacts on individuals	4
<ul style="list-style-type: none">• Provides some details about a development• Links the development to effects on society or on individuals	3
<ul style="list-style-type: none">• Identifies a development• Links the development to an effect on society or on individuals	2
<ul style="list-style-type: none">• Provides any relevant information including effects on individuals or on society	1

Sample answer:

Anti-rejection drugs dramatically increased long-term survival rates for heart transplant recipients. This means that they can carry out normal daily activities, lead productive lives and contribute to society. However, the ongoing medical costs and medicines required are costly to society.

Question 28

Criteria	Marks
<ul style="list-style-type: none">• Provides a detailed explanation of the use of electricity in biomedical and communication technologies	4
<ul style="list-style-type: none">• Provides a sound explanation of the use of electricity in biomedical and communication technologies	3
<ul style="list-style-type: none">• Provides a basic explanation of the use of electricity in biomedical and communication technologies	2
<ul style="list-style-type: none">• Provides any relevant information	1

Sample answer:

Electricity is used by pacemakers and mobile phones. In a mobile phone, electricity is used to vibrate the speaker to produce sound which the person can hear. In pacemakers, batteries store energy which can be used to produce electricity that can stimulate the heart to beat with the correct rhythm.

Question 29 (a)

Criteria	Marks
• Any correct response	1

Sample answer:

Results of all trials would be similar.

Question 29 (b)

Criteria	Marks
• Identifies an example of an investigation and a relevant advantage for the use of the data logger	2
• Identifies an example of an investigation that could involve a data logger OR • Identifies an advantage of using a data logger	1

Sample answer:

During the investigation into levels of carbon dioxide and oxygen in inhaled and exhaled air, we used a data logger because it measured the change in the level of these gases over time.

Question 29 (c)

Criteria	Marks
• Demonstrates an understanding of destructive and non-destructive testing • Provides an example of each type of testing	2
• Provides any relevant information	1

Sample answer:

Destructive testing means that the materials cannot be used after the experiment eg when universal indicator is added to shampoo to determine the pH, since the shampoo may not be safe to use after the experiment. Non-destructive testing means that the materials can be reused again after the experiment, eg when silicone is added to water to test its imperviousness, the silicone can be reused after the experiment.

Question 29 (d)

Criteria	Marks
<ul style="list-style-type: none">• States an example• Relates a feature of models to their usefulness	3
<ul style="list-style-type: none">• States an example OR <ul style="list-style-type: none">• Relates a feature of models to their usefulness• States a feature of a model	2
<ul style="list-style-type: none">• Any relevant information	1

Sample answer:

Balloons in a bell jar can be used to model the function of lungs. Models can make a concept easier to understand because they are simpler representations of the real world. They help to visualise the concept and see how it is working.

Question 30

Criteria	Marks
<ul style="list-style-type: none"> Identifies an example from each area Demonstrates a thorough understanding of the scientific advance in each category Clearly links the scientific advance to its contribution Assesses the contribution of each advance Clear, logical progression of ideas using scientific terminology 	8
<ul style="list-style-type: none"> Identifies an example from each area Demonstrates a sound understanding of the scientific advance in each category Links the scientific advance to its contribution Assesses the contribution of at least ONE advance 	6–7
<ul style="list-style-type: none"> Identifies an example from TWO or more areas Demonstrates a basic understanding of the relevant scientific advance Describes an advantage of the contribution(s) 	4–5
<ul style="list-style-type: none"> Identifies examples Identifies some advances and/or advantages 	2–3
<ul style="list-style-type: none"> Provides any relevant information 	1

Answers could include:

	<i>Scientific advance</i>	<i>Example</i>	<i>Assessment of its contribution</i>
Chemicals	The ability to make colloids ie substances with particles that remain suspended for long periods of time.	Mayonnaise	Significant contribution as now it looks better, has a smooth texture and uniform flavour
	The ability to make drugs available in different forms with different solubilities.	Enteric coated aspirin	Significant contribution as it now prevents stomach bleeding that can be caused by the aspirin
Biomaterials	The ability to develop Teflon®/pyrolytic carbon which is low friction and biocompatible.	Teflon® in artificial heart valves	Significant contribution as the material can now be used in the repair of faulty valves without the problems of rejection and lasts longer than natural or animal valves
Communication	The ability to produce high transparency glass that is flexible and allows total internal reflection.	Optical fibres	Significant contribution as now our communications can be faster and have greater bandwidth

Section II

Question 31 (a) (i)

Criteria	Marks
• States TWO synthetic polymers	2
• States a synthetic polymer	1

Sample answer:

Polyester
Polystyrene

Question 31 (a) (ii)

Criteria	Marks
• Outlines a property and a use of each synthetic polymer	2
• Any relevant information	1

Sample answer:

Polyester stretches easily so is used for stockings. Polystyrene doesn't conduct heat so it can be used for coffee cups.

Question 31 (b) (i)

Criteria	Marks
• States a hypothesis	1

Sample answer:

The polymer will reduce the flammability of the fabric.

Question 31 (b) (ii)

Criteria	Marks
<ul style="list-style-type: none">• Outlines a method which tests the stated hypothesis with clear sequential steps that includes the following features:<ul style="list-style-type: none">– A control– At least ONE variables that is controlled– Repeats or replicates– A data collection method	4
<ul style="list-style-type: none">• Outlines a method which tests the stated hypothesis and includes appropriate features	3
<ul style="list-style-type: none">• Outlines a method and includes an appropriate feature	2
<ul style="list-style-type: none">• Any relevant information	1

Sample answer:

1. Get 20 pieces of 10 cm squares of the same fabric. Make sure the pieces are the same thickness
2. Add fire retardant to 10 pieces and leave 10 pieces without fire retardant
3. Weigh each piece of fabric
4. Set each piece of fabric in a flame for 10 s
5. Let fabric continue burning until flame extinguishes itself
5. Weigh each piece of fabric
6. Compare the weights before and after burning

Question 31 (b) (iii)

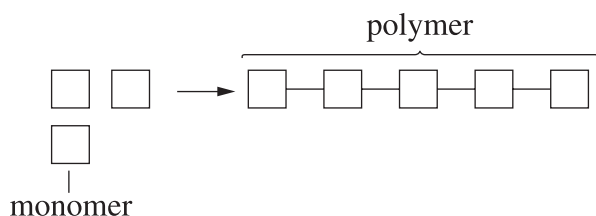
Criteria	Marks
<ul style="list-style-type: none">• States a risk and a way to eliminate or mitigate the risk	2
<ul style="list-style-type: none">• States a risk OR states a way to avoid an unnamed risk	1

Sample answer:

Wear safety goggles to avoid smouldering fabric burning your eyes.

Question 31 (c)

Criteria	Marks
<ul style="list-style-type: none"> A correct diagram including labels 	3
<ul style="list-style-type: none"> A correct diagram with a label OR	2
<ul style="list-style-type: none"> A partially correct diagram with labels 	
<ul style="list-style-type: none"> Any relevant information 	1

Sample answer:

Question 31 (d)

Criteria	Marks
<ul style="list-style-type: none"> States a similarity and a difference of each plastic with an example of both plastics 	4
<ul style="list-style-type: none"> States a similarity or a difference of each plastic with an example of each 	2–3
<ul style="list-style-type: none"> Any relevant information 	1

Sample answer:

Both plastics are hard at low temperatures. However, Plastic A is also hard at a high temperature while Plastic B is soft at a high temperature. Therefore plastic A is a thermosetting plastic eg polyester while Plastic B is a thermoplastic eg PVC.

Question 31 (e)

Criteria	Marks
<ul style="list-style-type: none"> Identifies examples of polymers Demonstrates a thorough understanding of the scientific developments that have led to polymers Provides a clear link between the properties and uses of polymers Clear, logical progression of ideas using scientific terminology 	7
<ul style="list-style-type: none"> Identifies examples of polymers Demonstrates a sound understanding of the scientific developments that have led to polymers Provides a sound link between the properties and uses of polymers 	5–6
<ul style="list-style-type: none"> Identifies an example of polymer Outlines relevant scientific developments Provides a basic link between the properties and uses of polymers 	3–4
<ul style="list-style-type: none"> Identifies an example of a polymer Identifies a property and/or use 	2
<ul style="list-style-type: none"> Any relevant information 	1

Answers could include:

Scientific developments have increased our versatility of polymers. Originally natural polymers such as wool and cotton were used, however new technology led to the development of plastics such as polyester and lycra.

Scientific developments have allowed the properties of synthetic polymers to be enhanced by a wide range of additives. This makes them more lightweight, flexible, and also strong, making them more versatile. They can be resistant to chemical attack so have replaced many metals in appliances as they will not corrode eg PVC.

Scientific developments have caused plastics to replace many materials such as timber, leather and metal. Kevlar is an example of a polymer that is strong and yet lightweight to be used as a protective fabric.

Since scientific advances have produced synthetic polymers that are not attacked by bacteria or fungi (unlike hair, fur and wool), they can be used for food containers as they are hygienic. They are not affected by moisture so they can be used as linings in food containers eg HDPE.

Scientific developments have produced plastics that are good thermal and electrical insulators and can be used in coatings for wiring, saucepan handles and coffee pots. They can be moulded into shapes or mixed with solvents to become adhesives or paints.

Question 32 (a) (i)

Criteria	Marks
• States TWO relevant microbes	2
• States a relevant microbe	1

Sample answer:

E. coli

Salmonella

Question 32 (a) (ii)

Criteria	Marks
• Provides a reason for a stated advantage	2
• Any relevant information	1

Sample answer:

It kills microbes without affecting the food.

Question 32 (b) (i)

Criteria	Marks
• States an appropriate hypothesis	1

Sample answer:

The preservative will preserve the juice for a longer time than the juice without the preservative.

Question 32 (b) (ii)

Criteria	Marks
<ul style="list-style-type: none">• Outlines a method which tests the stated hypothesis with clear sequential steps that includes the following features:<ul style="list-style-type: none">– A control– At least ONE variable that is controlled– Repeats or replicates– A data collection method	4
<ul style="list-style-type: none">• Outlines a method which tests the stated hypothesis and includes appropriate features	3
<ul style="list-style-type: none">• Outlines a method and includes an appropriate feature	2
<ul style="list-style-type: none">• Any relevant information	1

Sample answer:

1. Add 10 g of the preservative to 100 mL of fresh apple juice
2. Get 100 mL of fresh apple juice and do not add preservatives.
3. Place the two samples in the same location at the same temperature and humidity for two weeks
4. Each day, record the colour and cloudiness of each juice, and whether any microbial growth eg mould is visible
5. Repeat the experiment 10 times

Question 32 (b) (iii)

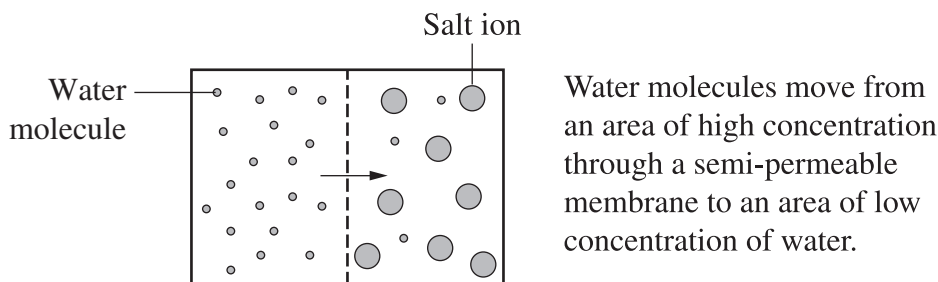
Criteria	Marks
<ul style="list-style-type: none">• States a risk and a way to eliminate or mitigate the risk	2
<ul style="list-style-type: none">• States a risk or states a way to avoid an unnamed risk	1

Sample answer:

Microbes that grow in the juice could cause disease. Wear gloves and a face mask when handling the samples.

Question 32 (c)

Criteria	Marks
<ul style="list-style-type: none"> A correct diagram including labels 	3
<ul style="list-style-type: none"> A correct diagram with a label OR	2
<ul style="list-style-type: none"> A partially correct diagram with labels 	1
<ul style="list-style-type: none"> Any relevant information 	1

Sample answer:

Question 32 (d)

Criteria	Marks
<ul style="list-style-type: none"> Outlines a similarity and differences between the preservation techniques and the growth of <i>Salmonella</i> OR	4
<ul style="list-style-type: none"> Outlines similarities and a difference between the preservation techniques and the growth of <i>Salmonella</i> OR	
<ul style="list-style-type: none"> Outlines similarities and differences between the preservation techniques and the growth of <i>Salmonella</i> 	2–3
<ul style="list-style-type: none"> Outlines one or more similarities and/or differences 	1
<ul style="list-style-type: none"> Any relevant information 	1

Sample answer:

The least effective preservation technique was refrigeration of raw milk after 4 days. The most effective was to use UHT techniques on the milk. Refrigeration of pasteurised milk was partially effective, as the milk still contained some *Salmonella* but the rate remained constantly low over the given time period. Both UHT techniques and pasteurisation were most effective over four days, since the amount of *Salmonella* was constant and did not promote *Salmonella* growth.

Question 32 (e)

Criteria	Marks
<ul style="list-style-type: none"> Identifies examples of preservation techniques used by different cultures Demonstrates a thorough understanding of the preservation techniques used Discusses the effectiveness of the preservation techniques Clear, logical progression of ideas using scientific terminology 	7
<ul style="list-style-type: none"> Identifies examples of preservation techniques used by different cultures Provides a description of the preservation techniques used Identifies the effectiveness of the preservation techniques 	5–6
<ul style="list-style-type: none"> Identifies examples of preservation techniques used by different cultures AND <ul style="list-style-type: none"> Outlines some properties of the preservation techniques OR <ul style="list-style-type: none"> Identifies the effectiveness of the preservation techniques 	3–4
<ul style="list-style-type: none"> Identifies an example of preservation techniques used by different cultures AND <ul style="list-style-type: none"> Identifies a property and/or use OR <ul style="list-style-type: none"> Identifies the effectiveness of the preservation technique 	2
<ul style="list-style-type: none"> Any relevant information 	1

Sample answer:

There are many very effective preservation techniques used by different cultures.

Native Americans, Middle Eastern Cultures – some Native Americans dry their fish and Middle Eastern Cultures dried fruits and vegetables eg apricots. Without any water in the food, bacteria and other microbes do not survive and so the food can be kept for long periods of time. Thus this is an effective technique.

Innuits, Swedes (Laplanders), Danes – some of the people living in these areas use freezing as a method of preservation eg frozen meats. This is an effective method since the cold significantly limits the growth of micro-organisms.

British culture – some of the people in Britain enjoy food that has been preserved through pickling eg pickled onions. When food is pickled, the pH is very low. This inhibits the growth of microbes and allows the food to last for years.

India – some Indians use many spices such as turmeric, cardamon, chilli and cloves. These have antibacterial properties that slow the growth of microbes, thus making it an effective preservation technique.

Question 33 (a) (i)

Criteria	Marks
• Correctly identifies TWO causes of inflammation	2
• Correctly identifies ONE cause of inflammation	1

Sample answer:

- Injury (damage to skin/membranes)
- Trauma
- Infection
- Environmental conditions, eg pollen (allergens)

Question 33 (a) (ii)

Criteria	Marks
• Gives a reason for the benefit of the inflammation response	2
• Outlines an advantage of the inflammation response	1

Sample answer:

The release of histamines attracts white blood cells to the site to fight infection.

Question 33 (b) (i)

Criteria	Marks
• States a correct hypothesis	1

Sample answer:

The antibiotic will destroy/inhibit most bacteria.

Question 33 (b) (ii)

Criteria	Marks
<ul style="list-style-type: none"> • Outlines a method which tests the stated hypothesis with clear sequential steps that includes the following features: <ul style="list-style-type: none"> – A control – At least ONE variable that is controlled – Repeats or replicates – A data collection method 	4
<ul style="list-style-type: none"> • Outlines a method which tests the stated hypothesis and includes appropriate features 	3
<ul style="list-style-type: none"> • Outlines a method and includes an appropriate feature 	2
<ul style="list-style-type: none"> • Any relevant information 	1

Sample answer:

- Prepare 11 sterile agar plates
- Inoculate 10 plates with the same type of bacteria
- Leave one plate unopened
- Add the antibiotic to five of the bacterial plates and leave the other five without antibiotic
- Incubate for four days at 30°C
- Compare plates and count colonies/percentage cover

Question 33 (b) (iii)

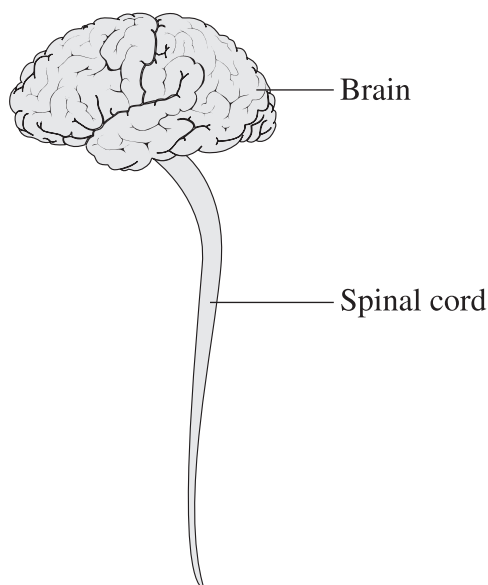
Criteria	Marks
<ul style="list-style-type: none"> • States a risk and a way to eliminate or mitigate the risk 	2
<ul style="list-style-type: none"> • States a risk or states a way to avoid an unnamed risk 	1

Sample answer:

Microbe colonies grown could be dangerous to health, so destroy the agar plates without opening them.

Question 33 (c)

Criteria	Marks
<ul style="list-style-type: none"> A correct diagram including labels 	3
<ul style="list-style-type: none"> A correct diagram with a label OR	2
<ul style="list-style-type: none"> A partially correct diagram with labels 	
<ul style="list-style-type: none"> Any relevant information 	1

Sample answer

Question 33 (d)

Criteria	Marks
<ul style="list-style-type: none"> Describes a similarity and a difference in reaction time Refers to data in graph Outlines reaction pathway 	4
<ul style="list-style-type: none"> Outlines a difference or similarity and/or Briefly outlines reaction pathway 	2–3
<ul style="list-style-type: none"> Any relevant information 	1

Sample answer:

The reaction time in males and females is the same in the very young and in the 70 year-olds. In males the reaction time is generally faster than in females. The stimulus is detected by the receptors in the ear and passes along sensory neurones to the brain. The information is analysed and a response returns along the motor neurones.

Question 33 (e)

Criteria	Marks
<ul style="list-style-type: none"> Identifies examples of chemical compounds Demonstrates a thorough understanding of the scientific developments that have led to pharmaceutical substances Provides a clear link between the chemical compounds and the treatment of illness Clear, logical progression of ideas using scientific terminology 	7
<ul style="list-style-type: none"> Identifies examples of chemical compounds Demonstrates a sound understanding of the scientific developments that have led to pharmaceutical substances Provides a sound link between the chemical compounds and the treatment of illness 	5–6
<ul style="list-style-type: none"> Identifies an example of a chemical compound Outlines relevant scientific developments Provides a basic link between the chemical compound and the treatment of illness 	3–4
<ul style="list-style-type: none"> Identifies an example of a chemical compound Identifies an illness or a scientific development 	2
<ul style="list-style-type: none"> Any relevant information 	1

Answers could include:

There is a range of chemical compounds that is used to treat illnesses. Scientific developments have produced different coatings on chemicals that have not only different rates of solubility, but are also affected by pH. This means that enteric-coated medication may be taken to bypass mouth and stomach, and be absorbed directly in the intestine, where the high pH breaks down the coating.

The development of capsules allows a more soluble form of the analgesic to be given. The capsule encases the solution and is released in the stomach when the capsule is broken down by the stomach acids. These advances in technology have allowed doctors to target different areas in the digestive system, to get a faster and more efficient response to the medication.

The discovery and refining of antibiotics like penicillin has helped victims respond to bacterial infections. Scientific advances have led to the development of new antibiotics like vancomycin and Noroxin[®] that can target specific bacteria, rather than broad spectrum that kills a large range of bacteria. This is an improvement because it does not remove ‘good’ bacteria.

Question 34 (a) (i)

Criteria	Marks
• Identifies correctly TWO types of earthquake waves	2
• Identifies correctly ONE type of earthquake waves	1

Sample answer:

P waves and L waves.

Question 34 (a) (ii)

Criteria	Marks
• Identifies differences between TWO types of earthquake waves	2
• Identifies a difference between TWO types of earthquake waves	1

Sample answer:

P waves are compression waves, whereas S waves are transverse waves. P waves travel faster than S waves.

Question 34 (b) (i)

Criteria	Marks
• States a hypothesis	1

Sample answer:

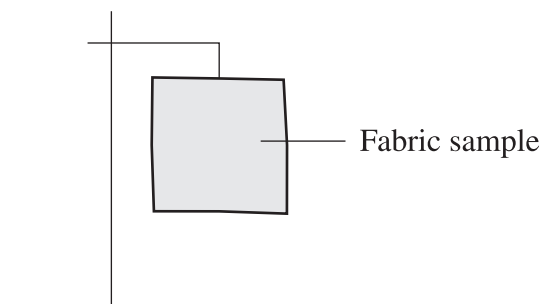
The fire-retardant polymer will prevent fabrics, which contain the polymer from burning when exposed to a flame.

Question 34 (b) (ii)

Criteria	Marks
<ul style="list-style-type: none"> • Outlines a method which tests the stated hypothesis with clear sequential steps that includes the following features <ul style="list-style-type: none"> – A control – At least ONE variable that is controlled – Repeats or replicates – A data collection method 	4
<ul style="list-style-type: none"> • Outlines a method which tests the stated hypothesis and includes appropriate features 	3
<ul style="list-style-type: none"> • Outlines a method and includes an appropriate feature 	2
<ul style="list-style-type: none"> • Any relevant information 	1

Sample answer:

1. Cut 10 samples of fabric with the new fire retardant substance of same shape and size, and weigh each one and record in a table.
2. Cut 10 samples of same fabric minus the fire retardant substance of same shape and size, and record in a table.
3. Attach each sample as per diagram below.
4. Set fire to each sample in a fume cupboard for the same amount of time. Weigh each burnt sample and record weight.



Question 34 (b) (iii)

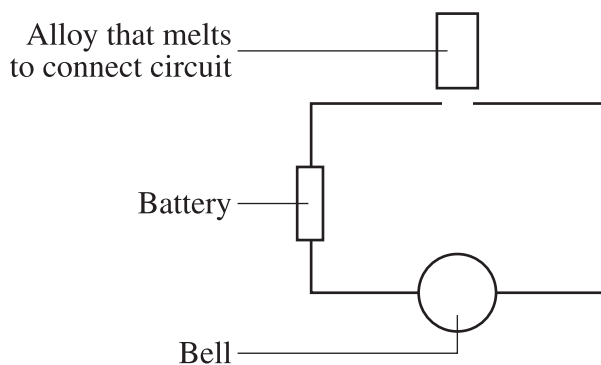
Criteria	Marks
• States a risk and a way to eliminate or mitigate the risk	2
• States a risk or states a way to avoid an unnamed risk	1

Sample answer:

To minimise the risk of exposure to toxic gas, conduct investigation in a fume cupboard.

Question 34 (c)

Criteria	Marks
• A correct diagram including labels	3
• A correct diagram with a label OR	2
• A partially correct diagram with labels	
• Any relevant information	1

Sample answer:


Question 34 (d)

Criteria	Marks
<ul style="list-style-type: none">Clearly describes how long-term weather patterns contribute to bushfire riskClearly describes how short-term conditions contribute to bushfire riskRefers to stimulus	4
<ul style="list-style-type: none">Describes long-term weather patterns or short term conditions linked to bushfire riskRefers to stimulus	3
<ul style="list-style-type: none">Describe long-term weather patterns and short-term conditions but not linked to bushfire risk OR <ul style="list-style-type: none">Describes long-term weather patterns or short-term conditions with a referral to the stimulus	2
<ul style="list-style-type: none">Any relevant information	1

Sample answer:

Long-term weather patterns which produce high rainfall and mid-range temperatures such as 20–30°C over a period of a decade or more allow vegetation in forests and bushland to grow extensively, resulting in high fuel load levels.

Short-term weather patterns such as the high-pressure system in the weather chart above produce high winds and often extreme temperatures in the Australian summer, which can contribute to fuel drying out and making it vulnerable to burning.

Unstable weather patterns, which produce lightning combined with a high-pressure system, can also contribute to a high bushfire risk, as recently experienced in 2013 with the fires in Western NSW.

Question 34 (e)

Criteria	Marks
<ul style="list-style-type: none"> Identifies examples of technologies used to predict weather Demonstrates a thorough understanding of how the methods are used to predict weather patterns Relates in detail the effects of technology on the methods used to predict weather patterns Clear, logical progression of ideas using scientific terminology 	7
<ul style="list-style-type: none"> Identifies examples of technologies used to predict weather Provides a description of how the methods are used to predict weather patterns Relates some effects of technology on the methods used to predict weather patterns 	5–6
<ul style="list-style-type: none"> Identifies example/s of technologies used to predict weather AND <ul style="list-style-type: none"> Outlines how some method/s is/are used to predict weather patterns OR <ul style="list-style-type: none"> Outlines some effect/s of technology on the methods used to predict weather patterns 	3–4
<ul style="list-style-type: none"> Identifies an example of a technology used to predict the weather Identifies how a method is used to predict weather patterns 	2
<ul style="list-style-type: none"> Any relevant information 	1

Answers could include:

The manner in which scientists have predicted weather patterns has changed significantly over the past 100 years. Technology such as satellites and computers have been very effective in predicting weather patterns. Scientists are able to detect high-altitude weather and predict weather out to 7 day forecasts or even longer.

Satellites can track weather patterns forming over oceans, and also identify conditions which can lead to severe storms using infrared and radar. Satellites also collect data continuously and share it internationally.

Overall, the effects of technology have been very positive in improving accurate predictions which have minimised the risk of loss of life and property damage due to extreme weather patterns.

In the past we used apparatus such as hygrometers and barometers and now with this improved technology we have much greater accuracy.

Question 35 (a) (i)

Criteria	Marks
• Identifies two space stations	2
• Identifies one space station	1

Sample answer:

Skylab, International Space Station (ISS).

Question 35 (a) (ii)

Criteria	Marks
• Identifies a requirement and provides a reason for it	2
• Identifies a requirement to sustain life	1

Sample answer:

Humans must breathe air that contains low levels of carbon dioxide. Carbon dioxide build-up increases blood acidity, which can cause death. Therefore on a space station there must be a system for removing carbon dioxide produced by respiration.

Question 35 (b) (i)

Criteria	Marks
• States a hypothesis	1

Sample answer:

The thermal material reduces the transmission of infrared radiation.

Question 35 (b) (ii)

Criteria	Marks
<ul style="list-style-type: none">• Outlines a method which tests the stated hypothesis with clear sequential steps that includes the following features:<ul style="list-style-type: none">– A control– At least ONE variable that is controlled– Repeats or replicates– A data collection method	4
<ul style="list-style-type: none">• Outlines a method which tests the stated hypothesis and includes appropriate features	3
<ul style="list-style-type: none">• Outlines a method and includes an appropriate feature	2
<ul style="list-style-type: none">• Any relevant information	1

Sample answer:

1. Place a thermometer in a black box 1 m from a switchable source of radiation such as an electric radiator.
2. Switch the heat source on and record the temperature increase of the air in the box over a 10 minute period every 30 seconds.
3. Allow the box/air to return to the original temperature.
4. Place a sheet of the material between the heat source and the black box.
5. Turn on the heat source for 10 minutes and record the temperature at 30 second intervals.
6. Compare the results of the two experiments.
7. Repeat steps 1–6 several times.

Question 35 (b) (iii)

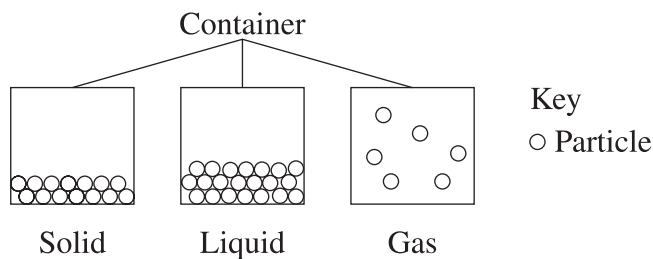
Criteria	Marks
<ul style="list-style-type: none">• States a risk and a way to eliminate or mitigate the risk	2
<ul style="list-style-type: none">• States a risk or states a way to avoid an unnamed risk	1

Sample answer:

Risk – being burnt by touching a hot object (eg source or box). The risk can be reduced by allowing several minutes for the apparatus to cool after it's switched off before touching any part of the apparatus.

Question 35 (c)

Criteria	Marks
<ul style="list-style-type: none"> A correct diagram including labels 	3
<ul style="list-style-type: none"> A correct diagram with a label OR	2
<ul style="list-style-type: none"> A partially correct diagram with labels 	1
<ul style="list-style-type: none"> Any relevant information 	1

Sample answer:

Question 35 (d)

Criteria	Marks
<ul style="list-style-type: none"> Identifies the variation as a circadian cycle, and details ways of controlling the cycle through behaviour and/or environment 	4
<ul style="list-style-type: none"> Identifies the cycle as circadian, and outlines a method of controlling the cycle 	2–3
<ul style="list-style-type: none"> Makes any relevant statement 	1

Sample answer:

Daily variation of body temperature is an example of a circadian cycle.

Because satellites with human astronauts orbit Earth every 90–100 minutes, the variations in light with each variation can disrupt the normal triggers for circadian cycles, which could be further exacerbated by irregular sleep.

To minimise the negative effects, artificial lighting could be used to create a 24-hour cycle of light variation (artificial day/night), and a schedule that required 8-hour sleep in 24 hours at the same time in each 24 hours could be implemented.

Question 35 (e)

Criteria	Marks
<ul style="list-style-type: none">• Demonstrates a thorough understanding of the technology used to collect information• Provides a clear link between the effects of technology and collection of information about the prescribed areas• Clear, logical progression of ideas using scientific terminology	7
<ul style="list-style-type: none">• Demonstrates a sound understanding of the technology used to collect information• Provides a sound link between the effect of technology and collection of information about the prescribed areas	5–6
<ul style="list-style-type: none">• Identifies example/s of a technology used to collect information• Provides a basic link between the effects of technology and collection of information	3–4
<ul style="list-style-type: none">• Identifies an example of a technology• Identifies an aspect of information collection	2
<ul style="list-style-type: none">• Any relevant information	1

Answers could include:

Technology has a variety of interrelated components that have improved the collection of data about the solar system, galaxy and deep space.

Earth-based optical telescopes detect light from planets, and stars within and beyond our galaxy. Technology such as radio telescopes detect radio waves which allow objects that emit little or no light to be imaged and provide information about objects such as quasars.

Satellites have travelled or are travelling to every planet to gather data, including images and magnetic measurements about planets and other objects in the solar system.

Orbiting satellites detect ultraviolet, infrared and x-ray radiation from within and beyond our galaxy. These forms of radiation provide data that improves our knowledge of processes in and composition of the observed objects.

Technology has allowed different types of data about the same object to be collected and thus provide us with a more detailed understanding of the object and others like it.

Senior Science

2013 HSC Examination Mapping Grid

Section I Part A

Question	Marks	Content	Syllabus outcomes
1	1	9.3.2.3.7	H9
2	1	9.2.1.2.3	H8
3	1	9.3.2.2.4	H9
4	1	9.4.1.2.1,5	H10
5	1	9.3.3.3.2	H9
6	1	9.2.1.3.2	H8
7	1	9.2.5.2.3	H8
8	1	9.2.4.3.1	H8
9	1	9.3.3.2.6	H8
10	1	9.4.2.2.1	H10
11	1	9.2.1.2.3, 9.2.5.2.7	H8
12	1	9.4.5.2.3	H10
13	1	9.2.1.2.5	H8
14	1	9.2.1.2.4	H8
15	1	9.3.2.2.3	H9
16	1	9.4.6.3.2, 9.4.6.2.3	H10
17	1	9.2.4.2.4	H8
18	1	9.4.4.2.1	H10
19	1	9.4.1	H10
20	1	9.3.2, H14.1 (a)	H14

Section I Part B

Question	Marks	Content	Syllabus outcomes
21 (a)	2	9.2.3.2.1	H9
21 (b)	3	9.2.3.2.4	H9
21 (c)	2	9.2.4.3.2	H8
22 (a)	3	9.3.4.2.1 H13.1 (e)	H9, H13
22 (b)	2	9.3.4.2.5, 9.3.4.3.3	H7
23 (a)	2	9.2.2.2.6	H8
23 (b)	2	9.2.3.3.2 H11.2 (e)	H11
24	4	9.4.1.2.4,5	H10
25	4	9.3.1.2.1	H8, H9
26 (a)	1	9.4.3.2.3	H10
26 (b)	3	9.4.6.2.1,2, 9.4.6.3.1 H14.1 (c)	H10, H14
26 (c)	3	9.4.4, 9.4.6	H10

Question	Marks	Content	Syllabus outcomes
27	4	9.3.2.3.5	H4
28	4	9.3, 9.4	H3, H10
29 (a)	1	H11.2 (d)	H11
29 (b)	2	H12.2 (a)	H12
29 (c)	2	H11.3 (d)	H11
29 (d)	3	H14.1 (f)	H2, H14
30	8	9.2, 9.3, 9.4	H3, H7, H8, H10

Section II

Question	Marks	Content	Syllabus outcomes
Question 31		Polymers	
(a) (i)	2	9.5.2.2.1	H8
(a) (ii)	2	9.5.2.2.1	H8
(b) (i)	1	H11.1 (a), 9.5.3.3.1	H11
(b) (ii)	4	H11.2 (c), 9.5.3.3.1	H11
(b) (iii)	2	H11.3 (b), 9.5.3.3.1	H11
(c)	3	9.5.1.2.2, H13.1 (e)	H8, H13
(d)	4	9.5.3.2, H12.3 (c), H14.3 (b)	H12, H14
(e)	7	9.5.1, 9.5.2, 9.5.3	H4
Question 32		Preservatives and Additives	
(a) (i)	2	9.6.3.2.1	H7
(a) (ii)	2	9.6.2.3.1	H7
(b) (i)	1	H11.1 (a), 9.6.2.2.2-3	H11
(b) (ii)	4	H11.2 (c), 9.6.2.2.3	H11
(b) (iii)	2	9.6.2.2.2-3, H11.3 (b)	H11
(c)	3	9.6.3.3.3, H13.1 (e)	H13
(d)	4	9.6.2.2.2, H12.3 (c), H14.3b, 9.6.3	H12, H14
(e)	7	9.6.2.3.3	H4, H7

Question 33		Pharmaceuticals	
(a) (i)	2	9.7.3.2.1	H7
(a) (ii)	2	9.7.3.2.3	H7
(b) (i)	1	H11.1 (a), 9.7.4	H11
(b) (ii)	4	H11.2 (c) 9.7.4	H11
(b) (iii)	2	H11.3 (b) 9.7.4	H11
(c)	3	9.7.1.2.1 H13.1 (e)	H13
(d)	4	9.7.1.3.1 H12.3 (c), H14.3b	H12, H14
(e)	7	9.7.3, 9.7.4	H4
Question 34		Disasters	
(a) (i)	2	9.8.3.2.1	H10
(a) (ii)	2	9.8.3.2.1	H10
(b) (i)	1	H11.1 (a), 9.8.5	H11
(b) (ii)	4	H11.2 (c), 9.8.5	H11
(b) (iii)	2	H11.3 (b), 9.8.5	H11
(c)	3	9.8.4.3.2 H13.1 (e)	H13
(d)	4	9.8.3.2.5 H12.3 (c), 14.3 (b)	H12, H14
(e)	7	9.8.2, 9.8.4	H4
Question 35		Space Science	
(a) (i)	2	9.9.5.2.2	H3
(a) (ii)	2	9.9.5.2.1	H7
(b) (i)	1	H11.1 (a), 9.9.5.2.1	H11
(b) (ii)	4	H11.2 (c), 9.9.5.2.1	H11
(b) (iii)	2	H11.3 (b), 9.9.5.2.1	H11
(c)	3	9.9.1.3.1 H13.1 (e)	H13
(d)	4	9.9.3.2.7 H12.3 (c), H14.3 (b)	H14, H12
(e)	7	9.9.5	H4