National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Exemplar for Internal Achievement Standard

Technology Level 2

This exemplar supports assessment against:

Achievement Standard 91362

Demonstrate understanding of the nature of technological outcomes

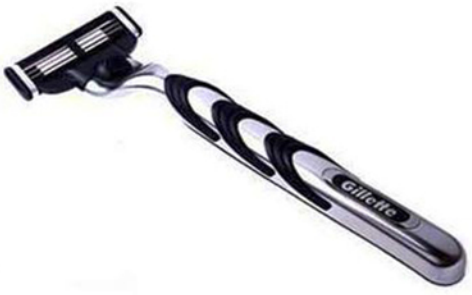
An annotated exemplar is an extract of student evidence, with a commentary, to explain key aspects of the standard. These will assist teachers to make assessment judgements at the grade boundaries.

New Zealand Qualification Authority

To support internal assessment from 2014

	Grade Boundary: Low Excellence
1.	For Excellence, the student needs to demonstrate comprehensive understanding of the nature of technological outcomes. This involves discussing how the fitness for purpose of a technological outcome is related to its physical and functional nature and the environment where it is located. This student has discussed the design elements of razors, as they relate to the physical and functional attributes, including both the 'how' and 'why', for two different razors. For the Mach 3 Turbo razor, this included discussing the handle, the lubricant strip, the blades and the detachable head (1). The Venus razor was similarly discussed, including why it has protective cushions rather than a lubricating strip (2). The discussion of fitness for purpose includes both the physical environment (2) (for example, in the shower) and the social environment (3) (for example, colour and male vs. female). There was also some consideration of other points of view (3). For a more secure Excellence, the student could broaden and deepen the discussion to show the relationship between fitness for purpose and the physical and functional nature of the razors and where they are used.

[1] The Mach 3 Razor is coloured predominantly black with grey moulded plastic on the handle. It has three stainless steel blades which are set into a detachable plastic head guard, which also features a coloured lubricant strip. The handle of the razor is ergonomically round and sized so that it can be easily held in the hand of the average male user. It is also made of durable metal. Most of each blade is guarded from contact with the user by the plastic head. The lubricant strip is imbued with a moisturising lubricant to help reduce friction while shaving. Overall the outcome is designed with elements reflecting priorities of safety, convenience, comfort and ease of use.



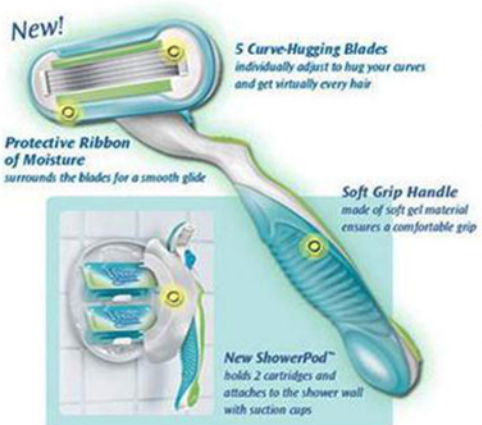
Having only the edge of the blades come in contact with the user makes the Mach 3 razor a type of safety razor. Safety razors were historically developed as an alternative to straight razors which consisted of a simple blade. One of the advantages of a safety razor is that it makes it much more difficult to suffer a serious injury. Even if the user makes a mistake, because most of the blade is guarded, only a minor cut will be sustained.

Early safety razors had only one blade, but the Mach 3 razor has three. The blades are made of stainless steel. Stainless steel is a good choice because it can be cleaned easily and is sharp enough to cut the hairs, as well as being light. Having three blades means that the user can cut off more hair with one stroke, which makes the process of shaving quicker. When the Mach 3 razor was first developed, most safety razors available on the market had only two blades at a maximum, so this design feature enhanced the Mach 3 razor's fitness for purpose. At the present time, however there are 4-bladed and 5-bladed razors on the market. A department store in the Netherlands even stocks a 6-bladed razor. The Mach 3 razor is therefore priced below these newer razors, representing a balance between performance and value, rather than simply prioritising performance.

The detachable head is an important design feature of the Mach 3 razor. As the razor is used, the edge of the blades becomes blunted through contact with hair. Over time this means that the blades become less effective, eventually becoming unusable – if the blades are not sharp enough to cleanly cut the hair, during use of the razor hairs are instead pulled out by friction which painful for the user. However, this wear and tear does not affect the handle of the razor, which is made of sturdier material than the head. The handle is made of sturdier and more expensive material (usually stainless steel) than the blade guard because it is expected to last much longer. Having a detachable head is an advantage because when the blades become too blunt to be effective, only the head needs to be discarded.

The lubricating strip serves two purposes. Having lubricating fluid reduces friction between the blades and the skin which makes it less likely that the user will suffer minor cuts or the tearing (as opposed to the cutting) of hair. This is the primary function of the lubricating strip. A secondary function is that the lubricating strip is coloured – as the razor is used, the amount of lubricating fluid diminishes and the colour of the strip becomes less vivid. The amount of lubricating fluid is related to the level of protection that the lubricating strip offers, so the colour of the strip lets the user see how much protection remains at a glance. Additionally, the amount of lubricating fluid present when the razor is first used is set so that in normal use, the lubricating fluid will run out at approximately the same time that the blades become too blunt to use. The user may therefore avoid the possibility of using an uncomfortably dry and blunt razor by discarding the head when the lubricating strip loses its colour.

[2] The Gillette Venus razor is also a safety razor, with three stainless steel blades guarded by a plastic detachable head. The handle of the Venus razor is made of translucent coloured plastic (the original is light blue) with a soft rubber grip towards the end of the handle. On the head of the razor are soft protective cushions to reduce friction. The handle is shaped to fit ergonomically into an average woman's hand.



Having a plastic handle means that the Venus razor is lighter and easier to hold. Plastic is also a good choice because the Venus razor is designed to be used in the shower – it therefore needs to be waterproof. The soft rubber at the end of the handle is intended be easier to grip when it is wet.

Instead of a lubricating strip, which would be ineffective in the shower environment because the lubricant would all be washed away too easily, the head of the Venus razor features soft protective cushions. These serve a similar purpose to the lubricating strip on the Mach 3 razor by reducing friction and the likelihood of minor cuts.

In most respects the Venus razor is similar to the Mach 3 razor, but the differences in the design features are a reflection of both the different patterns of usage that are expected and also social factors relating to gender. In general terms, the two razors are almost interchangeable – a man could use a Venus razor and a woman could use a Mach 3 razor. However, various design elements have been prioritised differently and have therefore differentiated the two outcomes. The head of the Venus razor is larger and this might prove unwieldy if it was used to remove facial hair, but for the larger area of the legs, this is not a problem, and the designers have prioritised comfort over finesse.

[3] Fitness for purpose relates to both the social and physical environment of intended use. Some design choices have been made to promote greater fitness for purpose within the physical environment. In both of these two outcomes, these include the encasing of most of the blades in the plastic head, the detachability of the head, the number of blades, and the use of plastic/rubber grips.

One advantage of the safety razor is that it requires less skill to use. Use of a straight razor required better-than-average co-ordination. Most men therefore would go to a professional barber who would be skilled enough to use a straight razor, and historically women did not shave their legs. This design feature means that every man and woman can use a razor in their own home, which is much more convenient.

The detachability of the head reduces waste. This increases fitness for purpose in terms of environmental sustainability. Some other types of razor are wholly disposable, and do not feature a detachable head. Instead of being made of stainless steel, the handles of these wholly disposable razors are made of plastic, which is cheaper to produce, but can break more easily – increases risk of malfunction. Having a detachable head means that the manufacturer has prioritised durability ahead of production cost for the handle.

Both outcomes are intended for use in a physical environment that is likely to feature a lot of water. The Mach 3 razor therefore has moulded plastic grips, while the Venus razor has a softer rubber grip. Both of these design features aid fitness for purpose, and the choice of plastic and rubber for the Venus razor handle is a reflection of the fact that it is intended to be used in a shower environment.

With respect to the social environment, the two outcomes are distinguished by aesthetic design choices. "Mach 3 Turbo" is a name which evokes expensive and sophisticated technology, relating specifically to aircraft and speed. The user is thus encouraged to associate the specific outcome of the razor with other desirable and traditionally masculine outcomes such as fighter jets or racing cars. "Venus" is a reference to the goddess of love in Roman mythology, which relates to encouraging the user to associate the razor with notions of desirability and perfection.

The choice of colour is also significant – the light blue colour of the Venus razor is seen as traditionally feminine, rather than the more industrial black and grey of the Mach 3 razor. This is related to fitness for purpose within the social environment. The Mach 3 razor is designed to be used for the removal of facial hair, which is an almost exclusively male concern. The colours of black and grey are traditionally masculine, but a razor coloured light blue like the Venus razor has strong feminine connotations. Other razors made by Gillette for women are pink, or light green, which are more traditionally feminine colours. When a man is using a razor to remove facial hair, he is involved in a quintessentially masculine activity, and it is unlikely that a feminine coloured razor would sell well – even though in purely functional terms design choices around colour are not important at all. The same principle applies in reverse to the Venus razor.

It is interesting to note that these social considerations are quite arbitrary, particularly the association of some colours as masculine and others as feminine. Some of the design choices relate to the different intended functions of the two outcomes, but the choices relating to the social environment show a pre-occupation with notions of masculinity and femininity which are quite distinct from function. Both the removal of facial hair and the removal of leg hair are primarily aesthetic considerations. It is therefore unsurprising that the differing design options which separate the two outcomes are less to do with their functional nature and more to do with the way they will be perceived in their social environments.

Based on all of this both these razors could therefore be judged fit for purpose in terms of their intended physical and social location. Their combined physical and functional attributes – driven by the prioritisation of particular design elements allows for this to be so. However – it could also be argued that gender identity is more 'plural' than the somewhat stereotyped views underpinning the aesthetic considerations in particular.

	Grade Boundary: High Merit
2.	For Merit, the student needs to demonstrate in-depth understanding of the nature of technological outcomes. This involves explaining the fitness for purpose of a technological outcome as related to its physical and functional nature and the environment where it is located. This student explained the design elements of razors, as they relate to the physical and functional attributes of two different razors. For the Mach 3 Turbo razor, this included explaining the handle, the lubricant strip, the blades and the detachable head (1). The Venus razor was similarly explained, including why it has protective cushions rather than a lubricating strip (2). The fitness for purpose as related to the social environments (for example, aesthetics and male vs. female) and physical environments (for example, safety and skill level) were discussed (3). This discussion makes this exemplar a high Merit. To reach Excellence, the student would also need to discuss how the fitness for purpose of the razors is related to the physical and functional nature.

[1] The Mach 3 Razor is coloured predominantly black with grey moulded plastic on the handle. It has three stainless steel blades which are set into a detachable plastic head guard, which also features a coloured lubricant strip. The handle of the razor is ergonomically round and sized so that it can be easily held in the hand of the average male user. It is also made of durable metal. Most of each blade is guarded from contact with the user by the plastic head. The lubricant strip is imbued with a moisturising lubricant to help reduce friction while shaving. Overall the outcome is designed with elements reflecting priorities of safety , convenience, comfort and ease of use.

The Mach 3 razor is a safety razor, meaning that most of the blade is guarded and only the edge of the blade comes into contact with the user. Safety razors were historically developed as an alternative to straight razors which consisted of a simple blade. One of the advantages of a safety razor is that it makes it much more difficult to suffer a serious injury. Even if the user makes a mistake, because most of the blade is guarded, only a minor cut will be sustained.

Early safety razors had only one blade, but the Mach 3 razor has three. The blades are made of stainless steel. Stainless steel is a good choice because it can be cleaned easily and is sharp enough to cut the hairs, as well as being light. Having three blades means that the user can cut off more hair with one stroke, which makes the process of shaving quicker. When the Mach 3 razor was first developed, most safety razors available on the market had only two blades at a maximum, so this design feature enhanced the Mach 3 razor's fitness for purpose. At the present time, however there are 4-bladed and 5-bladed razors on the market. A department store in the Netherlands even stocks a 6-bladed razor. The Mach 3 razor is therefore priced below these newer razors, representing a balance between performance and value.

Another important design feature of the Mach 3 razor is that the head, where the blades are, is detachable from the handle. As the razor is used, the edge of the blades become blunted through contact with hair. Over time this means that the blades become less effective, eventually becoming unusable. However, this wear and tear does not affect the handle of the razor, which is made of sturdier material than the head. The handle is made of sturdier and more expensive material (usually stainless steel) than the blade guard because it is expected to last much longer. It is made of black metal, with hard grey plastic moulded around it to make it easier to grip. Having a detachable head is an advantage because when the blades become too blunt to be effective, only the head needs to be discarded.

On the head of the Mach 3 razor, above the blades, there is a lubricating strip. This is made of a porous foam which is covered in a lubricating fluid. The lubricating strip serves two purposes. Having lubricating fluid reduces friction between the blades and the skin which makes it less likely that the user will suffer minor cuts or the tearing (as opposed to the cutting) of hair. This is the primary function of the lubricating strip. A secondary function is that the lubricating strip is coloured – as the razor is used, the amount of lubricating fluid diminishes and the colour of the strip becomes less vivid. The user may therefore avoid the possibility of using an uncomfortably dry razor by discarding the head when the lubricating strip loses its colour.

[2] The Gillette Venus razor is also a safety razor, with three stainless steel blades guarded by a plastic detachable head. The handle of the Venus razor is made of translucent light blue plastic with a soft rubber grip towards the end of the handle. On the head of the razor are soft protective cushions to reduce friction. The handle is shaped to fit ergonomically into an average woman's hand.

Like the Mach 3 razor, the Gillette Venus razor has three blades encased in a guard, which is detachable. The handle of the Venus razor is made of translucent light blue plastic with a soft rubber grip towards the end of the handle. Having a plastic handle means that the Venus razor is lighter and easier to hold. The soft rubber at the end of the handle is intended be easier to grip when it is wet.

Instead of a lubricating strip, the head of the Venus razor features soft protective cushions. These serve a similar purpose to the lubricating strip on the Mach 3 razor by reducing friction and the likelihood of minor cuts.

In most respects the Venus razor is similar to the Mach 3 razor, but the differences in the design features are a reflection of both the different patterns of usage that are expected and also social factors relating to gender. In general terms, the two razors are almost interchangeable – a man could use a Venus razor and a woman could use a Mach 3 razor. However, various designs options have been chosen specifically to differentiate the two outcomes. The head of the Venus razor is larger and this might prove unwieldy if it was used to remove facial hair, but for the larger area of the legs, this is not a problem, and the designers have prioritised comfort over finesse.

[3] Fitness for purpose relates to both the social and physical environment of intended use. Some design choices have been made to promote greater fitness for purpose within the physical environment. In both of these two outcomes, these include the encasing of most of the blades in the plastic head, the detachability of the head, and the use of plastic/rubber grips.

One advantage of the safety razor is that it requires less skill to use. Use of a straight razor required better-than-average co-ordination. Most men therefore would go to a professional barber who would be skilled enough to use a straight razor, and historically women did not shave their legs. This design feature means that every man and woman can use a razor in their own home, which is much more convenient.

The detachability of the head reduces waste. Some other types of razor are wholly disposable, and do not feature a detachable head. Instead of being made of stainless steel, the handles of these wholly disposable razors are made of plastic, which is cheaper to produce, but can break more easily. Having a detachable head means that the manufacturer can prioritise durability ahead of production cost for the handle.

Both outcomes are intended for use in a physical environment that is likely to feature a lot of water. The Mach 3 razor therefore has moulded plastic grips, while the Venus razor has a softer rubber grip. Both of these design features aid fitness for purpose, and the choice of plastic and rubber for the Venus razor handle is a reflection of the fact that it is intended to be used in a shower environment.

With respect to the social environment, the two outcomes are distinguished by aesthetic design choices. "Mach 3 Turbo" is a name which evokes expensive and sophisticated technology, relating specifically to aircraft and speed. The user is thus encouraged to associate the specific outcome of the razor with other desirable and traditionally masculine outcomes such as fighter jets or racing cars. "Venus" is a reference to the goddess of love in Roman mythology, which relates to encouraging the user to associate the razor with notions of desirability and perfection.

The choice of colour is also significant – the light blue colour of the Venus razor is feminine, rather than the more industrial black and grey of the Mach 3 razor. This is related to fitness for purpose within the social environment. The Mach 3 razor is designed to be used for the removal of facial hair, which is an almost exclusively male concern. The colours of black and grey do not have any particularly strong connotations, but a razor coloured light blue like the Venus razor has strong feminine connotations. Other razors made by Gillette for women are pink, or light green, which are also feminine colours.

Both of these razors could be said to be judged fit for purpose in terms of their intended physical and social location. Their physical and functional attributes – driven by the prioritisation of particular design elements has meant each razor is suitable for its target market.

	Grade Boundary: Low Merit
3.	For Merit, the student needs to demonstrate in-depth understanding of the nature of technological outcomes. This involves explaining the fitness for purpose of a technological outcome as related to its physical and functional nature and the environment where it is located. This student explained design elements related to the physical and functional attributes of ovens. This includes a timeline showing the design developments of the oven (1), the design elements of the modern day domestic and commercial microwave oven (2), and design elements of conventional ovens (3). An explanation is given as to how it is considered the ovens are fit for purpose as related to physical and functional nature and the environment where they are used (1) (2) (3). For example, the student explains the limitations of cooking batches of food in a gas oven (4). For a more secure Merit, the student could have given more explanation of fitness for purpose as related to the nature and the environment where ovens are located.

This report demonstrates my understanding of the nature of ovens. My commentary about conventional ovens is on the left hand side and microwave ovens on the right hand side. Discussion of the two types or within one type goes across the page.

[1] Early conventional ovens were very much for functional purposes, that is, cooking and heating. The first cast iron and forged steel coal ranges also performed the function of heating water and incinerating rubbish. Heat was controlled by vents in the oven and flue. As a heat source for cooking, gas began to challenge coal and wood in the closing years of the 19th century. A gas stove had some powerful selling points. It could be smaller than a coal or wood-burning stove; most of its surface remained cool; and the labour associated with fuel, ashes etc was eliminated. The development of an oven thermostat in 1915 added to its appeal, as did the increasing use of natural gas, which was cheaper and less toxic than the earlier type. During the 1910's, gas stoves appeared with enamel coatings that made the stoves easier to clean. By 1930 gas ranges outnumbered coal or wood burners by almost two to one. In the 1960's glass windows became common and this made it easier to carry out more precise cooking, as the product could be seen during cooking without opening the door which results in heat loss and therefore diminishing quality of the baked product. Better insulation of the cavity made ovens cook better. Ovens became smaller so they didn't take up so much space and to allow for other appliances in the kitchen. Availability of electricity led to the more conventional ovens (1953) made with pressed steel. They had a splash back and thermostatic controls for oven and cook top. Design became more sophisticated as new materials such as plastics were available around 1960's. One major improvement in electric ovens was the invention of resistor heating coils (turning electric current into heat). Strong colours were introduced in the 1970's to fit in with the house décor style of the times, making ovens more of a feature of a kitchen, rather than just a cooking device. By the 1980's we saw softer curves and new finishes to fit in with the fashion of those times. The 1980's saw the introduction of the fan to circulate heating and therefore cook food more evenly. Current ovens have powerful computer control systems that allow for excellent cooking results and include electronic timers, automatic cleaning systems and removable components for ease of cleaning. Another innovation has been the introduction of ceramic elements both as part of an oven or as a separate component –these have the advantage of having a smooth top with no cavities etc which make cleaning difficult. Now we also see ovens with printed fronts to fit with current trends and individual styles and a more 'commercial' look to appeal to the home entertainer.

The first microwaves developed were heavy, large and expensive, standing about 1.8 metres tall, weighing over 340 kg, costing about $5000 (US) each and consuming a lot of energy (about 3Kw). Though the first microwave oven was stable, it did not meet some of the other elements of functional design such as efficiency (as the magnetron tube needed to be cooled by water) and reliability. They were definitely not ergonomically viable and were lacking hugely in style, colour and appearance. People would not buy microwave ovens as they were too big, heavy, had an imposing form and there were also perceived safety risks.

Although the first microwave ovens performed the function of heating food on order, they only had commercial applications. Restaurants and vending companies could keep products refrigerator-fresh up to the point of service, and then heat to order.

Hence further improvements and refinements were made to render them more reliable, light weight and less expensive. In the 1960s Litton developed a new configuration of the microwave - the short, wide shape that is now common. Rapidly falling price of microprocessors also helped by adding electronic controls to make the ovens easier to use and cheaper for people to buy.

[2] Now the microwave oven is quite energy efficient which makes them a more favourable choice for the energy conscious consumer.

The first microwave ovens performed the function of heating food on order. Their invention meant that restaurants and vending companies could keep products refrigerator-fresh up to the point of service and then heat to order.

Originally because of their size and price, they were not used in the domestic kitchen. A continuously expanding market has produced a microwave that is styled to suit every taste with a size, shape and colour to fit every kitchen so that now microwave ovens are almost always found among the home appliances in domestic kitchens. They very easily sit unobtrusively into a kitchen, and options and features such as the addition of convection heat, probe and sensor cooking meet the needs of virtually every cooking, heating or drying application.

The fast food and food service industry have continued to heavily rely on microwave ovens to meet the demands for quality food served fast. With the introduction of programming, some commercial microwave ovens have fully programmable control panels enabling chefs to pre-programme heating times and settings for items that appear regularly on their menu. Once programmed, only a single button needs to be pressed for heating up the item in question – an invaluable saving of time in a busy environment. Pre-programming also ensures consistent results every time and reduces the likelihood of errors being made by overextended or inexperienced staff

Commercial microwaves typically have higher output levels than a domestic microwave and that translates to reduced heating times. The saving in time is invaluable for the efficient operation of a busy commercial kitchen.

Commercial ovens have a flat ceramic base enables large dishes to be cooked in it.

Commercial microwave ovens are typically made with stainless steel, robust doors and sturdy components. This construction makes them amenable to thorough cleaning, thus being more easily able to comply to food safety and hygiene requirements. Such ovens also incorporate other safety features, e.g. strengthened doors, glass lined inner doors etc. The apparent result is greater protection against microwave radiation.

There continues to be debate on the safety of microwaves in terms of leakage of unsafe levels of electro-magnetic radiation. However, ovens are designed to limit exposure by incorporating gaskets within a secure door closure when operating and also two independent interlock systems that stop the production of micro-waves the moment the latch is released and the door opened.

The microwave system cooks by the water in the food absorbing the energy from the waves and beginning to rotate rapidly - this rotation is thought to add heat to the food. There is on-going discussion on what effect the system has on the nutritional quality of the food. However, any type of cooking changes the chemistry of food. It can reduce the levels of some nutrients, just as it can increase the levels of others (e.g. lycopenes), or make them more or less available to the body for us. The prevailing view is that microwaves do not alter foods in ways that are any more harmful than other types of cooking. In fact, some have argued that the faster cooking time may actually preserve more nutrients versus other methods.

Some microwave ovens are childproof with special safety locks to keep little hands away from danger.

Now we have multiple ovens that have introduced steam and grill to a microwave unit. These have been designed to create pure steam without the use of microwave energy, retaining vitamins and nutrients within the food, thus catering for a more health conscious generation.

Because it is safe to operate, busy parents feel comfortable letting children prepare after-school snacks or starting dinner with the microwave.

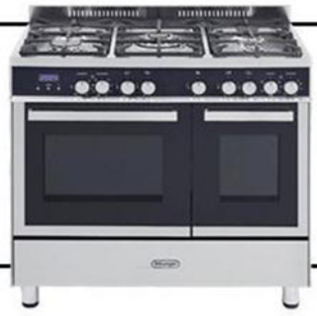
Microwaves allow separate meals to be served at various times, which can be convenient for families who eat at different times and like different things.

[3] Self-cleaning ovens appeal to time saving needs of today.

Recent innovations in ovens include 'Intelligent Ovens' that can be remote controlled away from the home. They can be control by internet and telephone, and come with built-in refrigeration to keep foods fresh before and after cooking. These advanced remote features allow homeowners to communicate with the oven to give cooking, warming, and refrigeration instructions so that 'dinner is ready when you are'.

In some apartments, people might only a microwave oven and hobs for cooking. This is good when space is a premium.

The conventional oven provides the opportunity to still hold onto traditional values of the big family/friends dinner. Food has become a real feature of entertaining and an art in itself. Therefore, people are also looking for bigger ovens that allow them to cook gastronomic delights and cater for crowds in the home. These big ovens and their sleek, modern and professional look have become more of a feature of the kitch-en and are perhaps almost a status symbol as well.



Just like ovens for the home, commercial ovens come in different styles, with different functions.

Some ovens have a bottom oven which is able to be used for warming or cooking another whole meal. People can have gas hobs and electric ovens rather than having to buy as one unit. Convection ovens are good for even, quick cooking. Combination ovens combine convection ovens with a steamer. Conveyor ovens have a conveyor belt that moves food like pizza's through the oven. A pizza oven is a large oven that heats to high temperatures.

[4] Gas ovens are not so good for things that need to be cooked in batches because the temperature can fluctuate by up to five gas marks (50 ° C) from the top to the bottom of the cavity.

	Grade Boundary: High Achieved
4.	For Achieved, the student needs to demonstrate understanding of the nature of technological outcomes. This involves: • explaining design elements as they relate to the physical and/or functional attributes of a technological outcome • explaining how the physical and functional attributes contributed to the overall nature of a technological outcome • explaining how design elements appear to have been prioritised in a technological outcome. The student has explained design elements when they outline the development of conventional ovens and microwave ovens (1). This included explaining the attributes gained as a result of the addition of a thermostat, enamel coatings, glass windows, splash backs, fans etc. to conventional ovens. The student's explanation of how attributes contributed to the overall nature of ovens included highlighting the benefits of the microwave oven being safe to operate (3). The student explained how design elements such as size, shape, colour and the addition of heating and cooking functions appear to have been prioritised in the bid to make the microwave oven a household item (2). To reach Merit, the student would also need to explain the fitness for purpose of ovens as related to their nature and environment where they are used.

This report demonstrates my understanding of the nature of ovens. My commentary about conventional ovens is on the left hand side and microwave ovens on the right hand side. Discussion of the two types or within one type goes across the page.

[1] Early conventional ovens were very much for functional purposes, that is, cooking and heating. The first cast iron and forged steel coal ranges also performed the function of heating water and incinerating rubbish. Heat was controlled by vents in the oven and flue. Inventors began making improvements to wood burning stoves primarily to contain the bothersome smoke that was being produced. As a heat source for cooking, gas began to challenge coal and wood in the closing years of the 19th century. A gas stove had some powerful selling points. It could be smaller than a coal or wood-burning stove; most of its surface remained cool; and the labour associated with fuel, ashes etc was eliminated. The development of an oven thermostat in 1915 added to its appeal, as did the increasing use of natural gas, which was cheaper and less toxic than the earlier type. During the 1910's, gas stoves appeared with enamel coatings that made the stoves easier to clean. In the 1960's glass windows became common and this made it easier to carry out more precise cooking, as the product could be seen during cooking without opening the door which results in heat loss and therefore diminishing quality of the baked product. Better insulation of the cavity made ovens cook better. Ovens became smaller so they didn't take up so much space and to allow for other appliances in the kitchen. Availability of electricity led to the more conventional ovens (1953) made with pressed steel. They had a splash back and thermostatic controls for oven and cook top. Design became more sophisticated as new materials such as plastics were available around 1960's. Glass windows became common. Strong colours were introduced in the 1970's to fit in with the house décor style of the times, making ovens more of a feature of a kitchen, rather than just a cooking device. By the 1980's we saw softer curves and new finishes to fit in with the fashion of those times. The 1980's saw the introduction of the fan to circulate heating and therefore cook food more evenly. Current ovens have powerful computer control systems that allow for excellent cooking results and include electronic timers, automatic cleaning systems and removable components for ease of cleaning. Another innovation has been the introduction of ceramic elements both as part of an oven or as a separate component –these have the advantage of having a smooth top with no cavities etc which make cleaning difficult. Now we also see ovens with printed fronts to fit with current trends and individual styles and a more 'commercial' look to appeal to the home entertainer.	The first microwaves developed were heavy, large and expensive, standing about 1.8 metres tall, weighing over 340 kg, costing about $5000 (US) each and consuming a lot of energy (about 3Kw). Though the first microwave oven was stable, it did not meet some of the other elements of functional design such as efficiency (as the magnetron tube needed to be cooled by water) and reliability. They were definitely not ergonomically viable and were lacking hugely in style, colour and appearance. Further improvements and refinements were made to render them more reliable, light weight and less expensive. In the 1960s Litton developed a new configuration of the microwave - the short, wide shape that is now common. Rapidly falling price of microprocessors also helped by adding electronic controls to make the ovens easier to use and cheaper for people to buy.
	Now the microwave oven is quite energy efficient.
	[2] Originally because of their size and price, they were not used in the domestic kitchen. A continuously expanding market has produced a microwave that is styled to suit every taste with a size, shape and colour to fit every kitchen so that now microwave ovens are almost always found among the home appliances in domestic kitchens. They very easily sit unobtrusively into a kitchen, and options and features such as the addition of convection heat, probe and sensor cooking meet the needs of virtually every cooking, heating or drying application.
	The fast food and food service industry have continued to heavily rely on microwave ovens to meet the demands for quality food served fast. With the introduction of programming, some commercial microwave ovens have fully programmable control panels enabling chefs to pre-programme heating times and settings for items that appear regularly on their menu. Once programmed, only a single button needs to be pressed for heating up the item in question. Pre-programming also ensures consistent results every time.

People preferred using the traditional appliances like the stove and the traditional oven (rather than the microwave) to cook food that required browning, caramelising and other flavour enhancing techniques.

Commercial ovens have a flat ceramic base, which enables large dishes to be cooked in it.

Commercial microwaves are typically made with stainless steel, robust doors and sturdy components. This construction makes them easy to clean. Such ovens also incorporate other safety features, e.g. strengthened doors, glass lined inner doors etc. The apparent result is greater protection against microwave radiation.

There continues to be debate on the safety of microwaves in terms of leakage of unsafe levels of electromagnetic radiation. However, ovens are designed to limit exposure by incorporating gaskets within a secure door closure when operating and also two independent interlock systems that stop the production of microwaves the moment the latch is released and the door opened.

The microwave system cooks by the water in the food absorbing the energy from the waves and beginning to rotate rapidly - this rotation is thought to add heat to the food. There is ongoing discussion on what effect the system has on the nutritional quality of the food. The prevailing view is that microwaves do not alter foods in ways that are any more harmful than other types of cooking. In fact, some have argued that the faster cooking time may actually preserve more nutrients versus other methods.

Some microwave ovens are childproof with special safety locks to keep little hands away from danger.

Now we have multiple ovens that have introduced steam and grill to a microwave unit. These have been designed to create pure steam without the use of microwave energy, retaining vitamins and nutrients within the food.

[3] Because it is safe to operate, children can prepare food themselves with the microwave.

Recent innovations in ovens include 'Intelligent Ovens' that can be remote controlled away from the home. They can be control by internet and telephone, and come with built-in refrigeration to keep foods fresh before and after cooking.

Some ovens have a bottom oven which is able to be used for warming or cooking another whole meal. Gas hobs and electric ovens can be purchased separately. Convection ovens are good for even, quick cooking. Combination ovens combine convection ovens with a steamer. Conveyor ovens have a conveyor belt that moves food like pizza's through the oven. A pizza oven is a large oven that heats to high temperatures.

Gas ovens are not so good for things that need to be cooked in batches because the temperature can fluctuate by up to five gas marks (50 ° C) from the top to the bottom of the cavity.

	Grade Boundary: Low Achieved
5.	For Achieved, the student needs to demonstrate understanding of the nature of technological outcomes. This involves: • explaining design elements as they relate to the physical and/or functional attributes of a technological outcome • explaining how the physical and functional attributes contributed to the overall nature of a technological outcome • explaining how design elements appear to have been prioritised in a technological outcome. The student has addressed some design elements and how they have been prioritised in two different razors. For example, the Mach 3 razor has particular blade features, with safety, comfort, convenience and ease of use being prioritised (1). The handle of the Gillette Venus razor prioritises ergonomic fit (4) and the head prioritises comfort (5). There is some explanation of how the physical and functional attributes contributed to the nature of the razors. For example, the Mach 3 razor has blades that are easy to clean, are sharp and light, and that make shaving easier (2). The functions of the lubricating strip are also explained (3). For a more secure Achieved, the explanation would need to draw from a wider range of significant design elements. In general, the explanations would need to be more robust.

[1] The Mach 3 Razor is coloured predominantly black with grey moulded plastic on the handle. It has three stainless steel blades which are set into a plastic head guard, which also features a coloured lubricant strip. Most of each blade is guarded from contact with the user by the plastic head. The lubricant strip is imbued with a moisturising lubricant to help reduce friction while shaving. Overall the outcome is designed with elements reflecting priorities of safety, convenience, comfort and ease of use.

The Mach 3 razor is a safety razor, meaning that most of the blade is guarded and only the edge of the blade comes into contact with the user. Safety razors were historically developed as an alternative to straight razors which consisted of a simple blade. One of the advantages of a safety razor is that it makes it much more difficult to suffer a serious injury. Another advantage is that safety razors require less skill to use. It is therefore suitable for use by everyone, everyday and is more convenient.

[2] Early safety razors had only one blade, but the Mach 3 razor has three. The blades are made of stainless steel. Stainless steel is a good choice because it can be cleaned easily and is sharp enough to cut the hairs, as well as being light. Having three blades means that the user can cut off more hair with one stroke, which makes the process of shaving quicker.

[3] On the head of the Mach 3 razor, above the blades, there is a lubricating strip. This is made of a porous foam which is covered in a lubricating fluid. The lubricating strip serves two purposes. Having lubricating fluid reduces friction between the blades and the skin which makes it less likely that the user will suffer minor cuts or the tearing (as opposed to the cutting) of hair. This is the primary function of the lubricating strip. A secondary function is that the lubricating strip is coloured – as the razor is used, the amount of lubricating fluid diminishes and the colour of the strip becomes less vivid.

[4] The Gillette Venus razor is also a safety razor, with three stainless steel blades encased in plastic. The handle of the Venus razor is made of translucent light blue plastic with a soft rubber grip towards the end of the handle.. The handle is shaped to fit ergonomically into an average woman's hand.

Like the Mach 3 razor, the Gillette Venus razor has three blades encased in a guard, which is detachable. The handle of the Venus razor is made of translucent light blue plastic with a soft rubber grip towards the end of the handle. Having a plastic handle means that the Venus razor is lighter and easier to hold. The soft rubber at the end of the handle is intended be easier to grip when it is wet.

[5] In most respects the Venus razor is similar to the Mach 3 razor, but the differences in the design elements are a reflection of the different patterns of usage that are expected. The head of the Venus razor is larger and this might prove unwieldy if it was used to remove facial hair, but for the larger area of the legs, this is not a problem, and the designers have prioritised comfort over finesse.

	Grade Boundary: High Not Achieved
6.	For Achieved, the student needs to demonstrate understanding of the nature of technological outcomes. This involves: • explaining design elements as they relate to the physical and/or functional attributes of a technological outcome • explaining how the physical and functional attributes contributed to the overall nature of a technological outcome • explaining how design elements appear to have been prioritised in a technological outcome. The student has identified some design elements for two different razors. These design elements include the blades (1) and lubricating strip (2) on the Mach 3 razor. The blades (3), handle (4) and head (5) are also identified as design elements of the Venus razor. There is some explanation of how the physical and functional attributes contributed to the nature of the razors. For example, the Mach 3 razor has a lubricant strip to help reduce friction (1) and the handle of the Gillette Venus razor makes it lighter and easier to hold (4). To reach Achieved, the student would need to identify and explain a wider range of design elements. There would also need to be an explanation of how or why certain design elements have been prioritised.

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