Cambridge Assessment International Education

Cambridge International A Level

Grade Descriptions for Cambridge International A Level Marine Science 9693

What are Grade Descriptions?

Grade descriptions describe the level of performance typically demonstrated by candidates achieving the different grades awarded for a qualification. For Cambridge International A Levels, they describe performance at three levels – grades 'E', 'C' and 'A'.

Grade descriptions sit alongside other key documents that illustrate examination standards, including:

- the syllabus, which presents what students should be taught over a course of study and explains how this is assessed
- the specimen assessment materials, which exemplify the structure of the assessment and the kinds of tasks that candidates complete
- grade thresholds, which show the total mark required to achieve a grade.

Grade descriptions are produced with a wide range of audiences in mind. For teachers, they support lesson planning and curriculum development, while students may gain useful insights into what is required to achieve a high grade and what candidate performance at lower grades typically looks like. For university admissions staff and employers, and those less familiar with Cambridge, they paint a picture of typical performance at different grades.

Cambridge publishes grade descriptions for a qualification once examinations have taken place for the first time and we review them when a qualification is substantially revised. They are developed by highly experienced examiners who understand performance standards in the subject area and have studied samples of candidate work.

How do I use this resource?

Grade descriptions are presented as a grid, with content areas at the start of each row and the different grades at the top of each column.

The content areas group together various aspects of the syllabus – they reflect topics, assessment objectives, key concepts, syllabus aims and/or components. The way they are organised is specific to each subject.

For each content area there is a descriptor for each grade. Reading across the row from left to right, the descriptors represent increasing levels of performance, with each grade descriptor building on, and including, the last.

Each column represents overall performance at a particular grade. Reading down the column from top to bottom, the descriptors capture the range of knowledge, understanding and skills that a candidate comfortably achieving the grade is likely to demonstrate.

Where content areas for the first and second halves of the A Level are distinct, they are also assessed a different standards. Performance for content areas assessed at AS Level is therefore described separately in this document.

Cambridge produces grade descriptions to support teaching and learning and the interpretation of candidate scores and grades. We do not use them to set grade thresholds. As such, they cannot be used to challenge the grade awarded to any individual candidate.

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Grade Descriptions

Area of knowledge, understanding and skills	Typical performance at grade E	Typical performance at grade C	Typical performance at grade A
Physiology of marine organisms	Students identify organelles from a photomicrograph or a drawing of a cell, but identification is usually limited to the nucleus, chloroplast, mitochondrion and ribosomes. They understand that animal cells are surrounded by a cell membrane and have some idea that the cell membrane allows substances to pass through it into or out from cells. They state that during gas exchange in marine organisms diffusion of oxygen and carbon dioxide occurs. They can describe simple diffusion in marine organisms such as coral polyps.	Students identify most organelles from a photomicrograph or drawing of a cell and can state the correct function of some of these organelles. They can describe the cell membrane as made up of a bilayer of phospholipids and various proteins. They have limited knowledge that some of these proteins are carrier proteins. They describe some of the features of ventilation in larger organisms such as grouper and tuna, but descriptions of pumped ventilation are limited to when the mouth and operculum open and close.	Students demonstrate comprehensive knowledge of cell structures and their functions, showing an understanding of the relationships within the cell. They can describe how carrier proteins are arranged in a cell membrane and how they are involved in both facilitated diffusion and active transport to control the entry or exit of substances into or out from a cell. They can describe in detail the main features of pumped and ram ventilation. They know that pumped ventilation in grouper is an active process requiring ATP, whereas ram ventilation in tuna and sharks is a passive process.
Energy production and use in marine organisms	Students recognise that photosynthesis is a process where chlorophyll traps light energy from the Sun. They can complete a word equation to represent photosynthesis and state that this process occurs in a chloroplast. They recognise that chemosynthesis is a process which uses chemical energy instead of light and that this can occur at hydrothermal	They state a word equation for photosynthesis and understand that this is a two-stage process used to produce glucose and release oxygen as a waste product. They can identify some of the structures in a chloroplast. They provide examples of chemicals in dissolved substances used to provide energy and can describe the mutualistic relationship	They write a balanced equation for photosynthesis and outline the main stages involved in the light-dependent and light-independent reactions. They can describe the role of accessory pigments. They can explain how *Endoriftia* uses hydrogen sulfide to fix the energy, so producing organic compounds which are then

Area of knowledge, understanding and skills	Typical performance at grade E	Typical performance at grade C	Typical performance at grade A
	vents. They know that some of the organisms living here have symbiotic relationships. They understand that all organisms require energy provided by respiration. They can complete a word equation for respiration and state that this process occurs in a mitochondrion.	between *Riftia* and *Endoriftia*. Students state a word equation for respiration and describe the difference between aerobic and anaerobic respiration. They can identify some of the structures in a mitochondrion.	available for consumers, allowing the formation of a food chain. Students write a balanced equation for respiration and state the exact site where aerobic and anaerobic respiration take place. They understand that the energy released from respiration is in the form of ATP.
Fisheries for the future	Students recognise that life cycles can be simple or complex and can quote an example of each. They can state an advantage and a disadvantage of internal and external fertilisation. They understand that modern fishing methods can lead to overharvesting. They provide a reason for the effect of unrestricted fishing by foreign vessels on local communities, such as loss of employment or loss in income. They know that quotas can be introduced to limit catch. They understand that aquaculture is an alternative to harvesting from the wild and that it can be extensive or intensive. They demonstrate some knowledge of salmon aquaculture and can list some of the obvious benefits.	Students can state the differences between simple and complex life cycles and can describe metamorphosis. They know that care of offspring differs in tuna, sharks and whales. They understand that fishing can be sustainable if information is collected on fish stocks and fishing is regulated. They provide further examples of how to limit fishing, including restricting the gear used and imposing restrictions on fishing methods, such as minimum mesh sizes. They describe the differences between extensive and intensive aquaculture. They outline some of the challenges involved in growing salmon in a land-based facility, for example high set-up costs and the need to monitor abiotic factors.	Students can outline the importance of different stages in the life cycle of sessile and non-sessile organisms. They can explain how the care of offspring differs in tuna, sharks and whales. They understand that the lack of fish caught due to unsustainable methods results in a reduced food supply for the local population and subsequent reduction in health benefits. They can describe the value of consumer-orientated tools such as labelling to promote sales of sustainably caught fish. They have a good understanding of salmon aquaculture and can explain the requirements for long-term success. They can also describe the environmental impacts of growing fish in land-based facilities and sea cages.

Area of knowledge, understanding and skills	Typical performance at grade E	Typical performance at grade C	Typical performance at grade A
Human influences in local and global contexts	Students describe how human activities, for example agriculture or oil exploration, produce sediment, which is released into the marine environment and can impact water quality. They are aware that ocean acidification is increasing. They understand that ocean acidification occurs when carbon dioxide from the air dissolves in sea water to produce acidic conditions. They understand that conservation can help reduce harmful effects on marine ecosystems. They list a positive role of marine zoos and aquaria in the conservation of marine species, such as protection of endangered species or their role in educating the public about conservation.	Students describe some of the impacts of increased sediment, such as causing increased turbidity, which leads to a reduction in light available for photosynthesis or to blocking the gills of fish. They can state that carbon dioxide concentrations in the atmosphere are increasing due to burning fossil fuels and that the dissolution of carbon dioxide forms carbonic acid in our oceans, which erodes the shells of molluscs. They identify the importance of marine zoos and aquaria in generating funding for conservation and acting as research facilities with captive breeding and release programmes.	Students explain how a reduction in photosynthesis can impact food availability for marine animals, how blocking gills leads to suffocation and how sediment might contain toxins which bioaccumulate along food chains. They can describe in detail how carbonic acid is formed and then dissociates and the effect of acid and decreased carbonate availability on mollusc shells and subsequent increased risk of predation. As well as identifying the positive role of marine zoos and aquaria, they also consider some of the negative aspects such as inbreeding and a reduction in genetic diversity.
Handling and applying information and data	Students present accounts containing some of the main ideas for topic sections in which they show confidence. Answers involving extended responses frequently require more detail to be provided and they may repeat the same ideas in different ways.	Students present accounts of the main principles and facts from several different topic sections, using the correct scientific terms. They produce extended responses that contain relevant information, but this is not always sufficient to provide a complete response.	Students are confident bringing together relevant material from across the syllabus to present a complete response for synoptic questions. They produce well-expressed extended responses which contain minimal or no superfluous content.

Area of knowledge, understanding and skills	Typical performance at grade E	Typical performance at grade C	Typical performance at grade A
	They identify the main patterns and trends from data in familiar situations and can draw straightforward conclusions. They complete a table of data for AS and some A Level statistical tests but are less successful at extracting data to input into formulae.	They identify detailed patterns and trends in data provided. They provide a valid conclusion that is often supported by further explanation. They input data into a formula to complete calculations for statistical tests and provide limited interpretation of the results.	They manipulate the most appropriate graphical and tabular data to support descriptions and can provide evidence for trends and patterns. They interpret the results of statistical tests to provide ratios and include 95% confidence limits or calculate the correct number of degrees of freedom where required. Conclusions are justified and linked to acceptance or rejection of a given hypothesis.
Experimental planning	Students understand that the results of some experiments or data can be predicted. They describe some of the steps involved in setting up an experiment, but terminology used is sometimes poor, for example stating ‘amount’ instead of ‘volume’ or ‘mass’. The apparatus selected is often limited or unsuitable. They find the identification of variables difficult but can usually state a variable to standardise. They have some idea that the experiment needs to be repeated, but wording can be imprecise, such as calculating the ‘average’ instead of calculating a ‘mean’.	Students can make a suitable prediction and can suggest a hypothesis for an experiment or data which is familiar to them. They usually use the correct terminology to describe many of the steps involved in setting up an experiment, especially if this is based on familiar work. They can select some appropriate apparatus to use. They identify the dependent and independent variables, quote at least two variables to be standardised and state that the experiment must be repeated several times to calculate means. They sometimes suggest a safety procedure, but this is rarely linked to risk.	Students can make a suitable prediction and suggest a hypothesis or null hypothesis for experiments or data which require application of existing knowledge. They have a thorough understanding of how to set up an experiment based on application of knowledge. Their method is detailed and set out in a logical manner, using suitable apparatus and scientific language. They identify all variables and suggest how the dependent variable should be measured to generate results. They include safety aspects and link them to the risk involved. They often suggest ways to present the results graphically and may suggest a suitable statistical test to analyse the results.

Area of knowledge, understanding and skills	Typical performance at grade E	Typical performance at grade C	Typical performance at grade A
Presenting data and observations	Students can plot a graph using a limited number of plots. Orientation is usually correct, but they are less confident choosing a suitable scale which covers at least half the grid. They display data as a line graph but are less confident understanding the difference between a bar graph and a histogram. They can produce a biological drawing from a photograph which is usually of a suitable size but often include shading or have features missing. They can usually correctly identify a structure on the drawing to label.	Students can plot a graph using more complex data. Points are usually plotted accurately as a cross or small dot inside a circle using a sharp pencil. Scale is usually correct, but line quality is variable. They display data as a line graph, bar chart or histogram as required. They can produce a large biological drawing from a photograph which has the correct proportions. They can identify and label a structure correctly using a line which touches the structure. They can usually calculate the scale or magnification of a drawing.	Students choose a suitable scale to plot a graph using complex data on two y-axes which are labelled to match the relevant table headings. They understand that a line graph is used to display continuous data, a bar chart for discontinuous data and a histogram for frequency data. Biological drawings are large, have a clear outline, are of the correct size and proportion and include the fine detail required. They can identify and label a structure correctly using a ruled line without arrowheads which touches the structure.
Evaluating procedures and data	Students have a limited ability to evaluate information from a graph or table, usually providing a conclusion only. They demonstrate the ability to evaluate information that is focused on less complex material that is familiar to them.	Students can evaluate information from a graph or table to provide a conclusion and can sometimes support this conclusion with relevant data. They show an understanding of principles and concepts when evaluating information from both familiar and unfamiliar material.	Students evaluate information from a graph or table to provide a conclusion linked to a hypothesis and supported by data. They also consider reasons why the data might not support a hypothesis. They evaluate data from text to make judgements about the strength of evidence that exists to support biological theories

Content areas assessed at AS Level standard

Area of knowledge, understanding and skills	*Typical performance at grade e*	*Typical performance at grade c*	*Typical performance at grade a*
The science of water	*Students understand that sea water is a solution made of different solutes dissolved in water. They can identify an environmental factor which affects gas solubility in sea water.* *They understand that atoms are linked by bonds and can state that a water molecule is formed when two hydrogen atoms bond with an oxygen atom.* *They know that the concentration of salts in sea water can change due to environmental factors and can state a factor which causes this change.*	*Students describe how environmental factors such as temperature or salinity can increase or decrease gas solubility in sea water.* *They can name the three types of bonds linking atoms together and can state that in a water molecule, electrons are shared between the hydrogen and oxygen atoms.* *They identify factors such as precipitation and evaporation and state if these cause an increase or a decrease in the salinity of sea water.*	*Students explain the term solubility and can describe the implications of an increase or decrease in gas solubility for marine organisms.* *They can represent bonding in a water molecule diagrammatically. They can explain how hydrogen bonds form between water molecules.* *They can define the term salinity and can explain the significance of different salinities of sea water having different densities.*
Forming and shaping the ocean floor and coastlines	*Students show some understanding of the terms 'erosion' and 'sedimentation' and can state that these processes are important in shore formation.* *They understand that during the tidal cycle the levels of seas and oceans rise and fall twice a day. They can identify water temperature as a factor that would be affected by the tidal cycle in a lagoon.*	*Students understand the causes of erosion and that sand particles are deposited to form a sandy shore. They can state that sedimentation is greatest on muddy shores.* *They suggest how changes in the tidal cycle affect abiotic factors such as temperature and salinity but are less confident describing how changes in the tidal cycle effect biotic factors.*	*Students can explain the role of erosion and sedimentation in the formation of a sandy shore and a muddy shore and can also explain how the particles move and why they settle.* *They identify a range of both abiotic and biotic factors, such as food availability, competition and desiccation, that would change in a lagoon due to the tidal cycle.*

Area of knowledge, understanding and skills	Typical performance at grade e	Typical performance at grade c	Typical performance at grade a
	They understand that water in the oceans mixes via currents which travel around the Earth. *They understand that the Earth's crust is made up of plates which fit together like a jigsaw. They know that the plates are responsible for the formation of different features on the ocean floor, such as hydrothermal vents or volcanoes.*	*They describe and explain some of the features of the global conveyor belt, for example the effect of temperature changes on water density or that the currents cycle from shallow water to deep water.* *They can describe some of the main points in the theory of plate tectonics and can name and describe the different types of plate boundaries.*	*They describe and explain most of the features of the global conveyor belt including the route taken and the physical processes taking place causing warming and cooling of currents.* *They provide examples of evidence such as paleomagnetic stripes on the ocean floor and distribution of fossils to support the theory of plate tectonics.*
Relationships in marine ecosystems	*Students recognise that marine plants such as diatoms can photosynthesise using light energy from the Sun and that these are a food source for consumers.* *They understand that feeding relationships can be represented in a food web. They can draw a simple food chain and can interpret pyramids of numbers.* *They understand that there is a reservoir of nutrients dissolved in the ocean which is available to marine organisms. They can state one or two factors which replenish dissolved nutrients in sea water.*	*Students describe the process of photosynthesis and can state that the glucose formed is an energy source for the food chain.* *They can draw, label and interpret complex food chains and food webs and can also interpret typical pyramids of biomass.* *They explain how run-off and upwelling replenish dissolved nutrients in sea water, though make limited references to the role of bacteria in decomposition.*	*Students understand that photosynthesis involves the conversion of inorganic substances to organic substances, which are used to produce biomass.* *They can interpret pyramids of energy and pyramids of biomass which include those that incorporate parasites and periods of phytoplankton bloom.* *They can explain how tectonic activity, excretion and atmospheric dissolution contribute to replenishing dissolved nutrients in sea water and that these are depleted when nutrients are taken up by marine organisms.*

Area of knowledge, understanding and skills	*Typical performance at grade e*	*Typical performance at grade c*	*Typical performance at grade a*
Classification of marine organisms and the different ecosystems they inhabit	*Students use a key to correctly identify a marine species. They can recognise a main feature of some key groups of marine animals and plants.* *They can state examples of marine ecosystems such as tropical coral reefs and rocky shores. They identify a condition such as 'salt water' or 'tropical temperature' required for the development of a mangrove forest.* *They understand that maintaining a high level of biodiversity in marine ecosystems such as coral reefs is important in providing a range of food sources as well as employment and money for the local economy.*	*Students state the main features of most key groups of marine organisms, though find stating features of the phylum Chordata more challenging.* *They can identify the main features of each marine ecosystem. They can provide some detail on how mangroves reproduce but are sometimes unsure of the difference between seeds and propagules.* *They understand that maintaining biodiversity is important for other factors including controlling climate change and providing a source of medicines such as KLH. They can provide examples of how increased biodiversity would benefit the local economy.*	*Students identify at least two main features from each key group of marine organisms.* *They have excellent knowledge of the conditions suitable for the development of a mangrove forest and can describe in detail how mangroves reproduce using seeds and propagules and why dispersal away from the parent plant is advantageous.* *They have some knowledge that biodiversity can be considered at different levels, for example genetic, species and ecological diversity.*

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