At-a-glance unit content, assessment criteria and guidance

To help you with assignment writing as well as assessing assignments, this table maps the Unit 4 content against the Unit 4 assessment criteria and assessment guidance, taken from the specification. For further advice and help on writing and assessing assignments please contact TeachingScience@pearson.com.

Unit 4 Learning Aim A – Investigate the relationships that different organisms have with each other and with their environment

Unit content	Assessment criteria	Assessment guidance
		Coverage of learning aim A could be obtained by producing wall displays, presentations or information leaflets that provide learners with the opportunity to use their imagination and creative talents, as well as to encourage tiered learning that promotes access to the higher grades.
A.1 The characteristics of organisms vary within and across species: a. genetic variation – variation in characteristics can be caused by genes, including genetic mutation b. environmental variation – some characteristics can be influenced by the environment.	**1A.1** Distinguish between variation due to genes and variation due to environmental factors.	For **1A.1**, learners will be expected to identify the different ways in which organisms vary and how this variation is brought about. They will be able to **distinguish** between simple genetic characteristics and characteristics that are a result of the environment. At this level, learners will not be expected to describe characteristics that are influenced by both genes and the environment. The information that learners submit could be presented in a simple, clear table.
	2A.P1 Describe the role of genes and the environment in variation.	For **2A.P1**, learners will be expected to **describe** how genes and the environment influence variation with evidence to show understanding of how genetic factors can also be influenced by lifestyle or the environment. Learners will be able to draw on their knowledge and understanding of information gained in Unit 1 to describe how genes determine the basis for many

		characteristics and could demonstrate their understanding of this using genetic diagrams or Punnett squares. Learners should be able to identify genetic characteristics that can be altered by the environment, for example, weight or height – and give a brief description of how lifestyle or the environment affects these characteristics.
A.4 Organisms are classified depending on their characteristics: a. the main characteristics of the five kingdoms b. division of the animal kingdom into vertebrates and invertebrates c. the main characteristics of vertebrates. **A.5** Construct and use keys to show how organisms can be identified. **A.3** Interdependence of organisms can be illustrated using food chains and webs, and by predator–prey relationships.	**1A.2** Construct simple keys to classify organisms.	For **1A.2**, learners will be able to pick out key characteristics of organisms and use these characteristics to classify the organisms into appropriate groups. Learners will be expected to know the main characteristics of the five kingdoms, as well as the main characteristics of the vertebrates and invertebrates, giving examples of organisms that fall into each group.
	1A.3 Construct food chains and food webs.	This will involve the **construction** and use of keys to cover the criterion for **1A.3** to help identify organisms, food chains and food webs.
	2A.P2 Describe how characteristics are used to classify organisms.	For **2A.P2,** learners need to classify organisms using characteristics and **describe** how to do this.
	2A.P3 Describe the different ways in which organisms show interdependence.	Learners may link this information to the interdependence of organisms to provide evidence for **2A.P3** by stating how the characteristics of organisms determine their place in food chains and webs. Further evidence for this criterion could be provided in annotated diagrams, posters or flow charts that give details on the different ways in which organisms depend on each other, other than just feeding relationships. It is expected that learners will provide information on at least two different types of interdependent relationships, which will include the detail derived from food chains and webs.
	2A.M2 Discuss the factors that affect the relationship between different organisms.	At Merit level, **2A.M2**, learners need to **discuss** how different factors affect the relationship between different organisms.
A.2 Evolution is a gradual process, involving gene mutation	**2A.M1** Explain the role of genes and the environment in evolution.	Learners at Merit grade, **2A.M1**, will develop their understanding further to link strong characteristics with survival of the

and natural selection, that can lead to the development of new species: a. populations or organisms show variation b. organisms less well adapted to their environment are less likely to survive due to competition for resources, predation and environmental influences c. organisms best adapted to their environment will survive to breed and pass on their genes to the next generation d. over a period of time the proportion of individuals with the favourable adaptation will increase and the individuals without the adaptation may disappear altogether.		organism, showing in their evidence how natural selection is one of the key processes involved in evolutionary change.
	2A.D1 Evaluate the impact of genes and the environment on the survival or extinction of organisms.	At Distinction level, **2A.D1**, learners will provide clear evidence in their **evaluation** of how genes and the environment impact on evolution, including information on how these factors, as well as gene mutation, can lead to the extinction of species or the formation of new species.

Unit 4 Learning Aim B – Demonstrate an understanding of the effects of human activity on the environment and how these effects can be measured

Unit Content	Assessment criteria	Assessment guidance
		The study of learning aim B should lead learners to realise why it is important for us to take measures to ensure that the future of our planet is safe, and that there are practices that can be put in place to reduce or counteract the effects of the

		pollutants that are released into ecosystems.
B.1 How human activities alter ecosystems through: a. deforestation to supply timber and clear land for agriculture b. agriculture to meet an increasing demand for food c. transportation – of food and for travel. **B.2** How pollutants produced as a result of human activity can affect ecosystems: a. overuse of fertiliser causing eutrophication b. toxic herbicides and pesticides that can bioaccumulate and disrupt terrestrial and aquatic food chains.	**1B.4** Identify human activities that affect an ecosystem	For **1B.4**, learners could produce a table of information that details various human activities, the pollutants produced as a result of these activities and brief details on how these pollutants affect an ecosystem. It is expected that learners will cover the material listed in B.1 a, b and c and B.2 a and b of the content to meet this criterion. Less able learners can be supported by being provided with named pollutants that they can research to find out their effects on the environment.
	2B.P4 Describe the impact that different human activities have on ecosystems.	To meet **2B.P4**, learners will need to identify the different human activities that affect ecosystems and **describe** how the polluting effects of these activities cause harm to living organisms and ecosystems.
	2B.M3 Analyse the effects of pollutants on ecosystems	Learners have the opportunity to carry out investigative work to meet this criterion which could also allow greater access to the Merit grade criterion, **2B.M3**, where learners are expected to use data to support the fact that human activities do have polluting effects. For this criterion, learners may wish to study global temperature change over time and relate this to the concentration of carbon dioxide released, or **analyse** the effects of the overuse of fertiliser on ecosystems.
	2B.D2 Explain the long-term effects of pollutants on living organisms and ecosystems.	Learners working at Distinction grade, for **2B.D2**, will be expected, to research information and use their own understanding gained from the study of this unit to **explain** how pollutants could affect the ecosystems in the future. This work will include the effects on living organisms, including species survival, the effect on food chains and webs, and how these may be disrupted, with information that illustrates understanding of how the release of pollutants, if remaining unchecked, will affect humans.
B.3 Living and non-living indicators can be used as a	**1B.5** Identify living and non-living indicators and the type of pollution	For **1B.5**, level 1 learners need to have a knowledge of what living and non-living indicators are. They should be able to

measure of the level of pollution in an ecosystem: a. lichens are sensitive to sulfur dioxide b. algae and freshwater shrimps as indicators of water pollution c. dissolved oxygen and nitrate concentration in water as non-living indicators of water pollution d. limestone buildings can be eroded by acid rain.	they measure.	distinguish between the two and give examples of each, stating the type of pollution that they can be used to indicate.
	2B.P5 Describe how living and non-living indicators can be used to measure levels of pollutants.	For **2B.P5**, learners will recognise the different indicators that can be used to measure levels of specific pollutants, working independently to provide evidence that could be in the form of a report, a case study or a presentation.
B.4 There are measures that can be taken to counteract or reduce the impact of pollutants on ecosystems: a. recycling and reusing materials saves natural resources and reduces the amount of waste produced b. conservation techniques of reforestation, replacement planting and breeding programmes c. use of renewable resources d. using organic fertilisers and biological pest control as an alternative to chemical fertilisers and pesticides.	**1B.6** Describe how recycling and reusing materials can reduce the impact that human activities have on an ecosystem.	To meet the criterion for **1B.6,** learners will be able to identify modern methods used to help reduce the impact of human activity on an ecosystem. They should be able to identify the types of household materials that can be recycled and reused, and **describe** very simply why these methods help to reduce the effects of human activity on an ecosystem. Learners may be able to provide information from their own experiences, such as reusing plastic bags, and some may develop their learning by naming national initiatives such as the use of 'bags for life' that could allow them to access higher grades.
	2B.P6 Describe the different methods used to help reduce the impact of human activities on ecosystems.	For **2B.P6**, learners may focus their study on local schemes that may have been put in place, such as recycling centres or local supermarkets that may have strategies in place to help conserve natural resources or encourage recycling methods. At this level, learners will be expected to understand how such schemes help to counteract the polluting effects of human activities on the environment's ecosystems and provide evidence to show how sustainable activities, such as recycling and reusing materials, will help to conserve natural resources for future generations.

	2B.M4 Discuss the advantages and disadvantages of methods used to reduce the impact of human activity on ecosystems.	For **2B.M4**, learners will show understanding of the advantages and disadvantages of 'green schemes' such as recycling and this could be presented as an extension to the information submitted for 2B.P6.
	2B.D3 Evaluate the success of methods to reduce the impact of human activity on an ecosystem, for a given scenario.	For **2B.D3**, learners will provide evidence in their **evaluation** to show whether the various methods used to reduce or counteract the effects of pollution are successful and will suggest ways in which methods could be improved, or participation by communities could be improved. Learners may suggest alternative methods that could be introduced that would further help to counteract the effects of pollutants on the environment and ecosystems. Learners will also be expected to extend their understanding to methods not covered at the lower grades, such as coppicing and reforestation techniques.

Unit 4 Learning Aim C – Explore the factors that affect human health

Unit content	Assessment criteria	Assessment guidance
C.6 Physical activity helps to keep the body healthy.	**1C.9** List some benefits of exercise on health.	For **1C.9**, learners will produce evidence to show their knowledge of how exercise benefits health.
C.4 Non-infectious disease can be caused by lifestyle or the environment: a. misuse of recreational drugs can lead to mental illness b. inadequate diet can lead to deficiency diseases c. cigarette smoke can cause	**2C.P9** Describe how lifestyle choices can affect human health.	For **2C.P9**, learners will need a knowledge of how lifestyle choices can affect human health both positively and negatively. This includes smoking, diet, exercise and recreational drug use.

diseases of the circulatory system d. ultraviolet light can cause skin cancer e. excessive consumption of alcohol can lead to liver disease f. poor air quality can lead to asthma.		
C.1 Infectious disease can be caused by microorganisms (bacteria and viruses) that affect living cells: a. bacteria produce toxins that harm living cells b. viruses invade living cells causing cell death.	**1C.7** List the different biological, social and inherited factors that affect human health.	To meet the criterion for **1C.7**, learners will produce evidence to show their knowledge of the factors that affect human health. Learners will be expected to know the effects of at least two pathogens on human health: one bacteria and one virus. It is expected that learners will give brief details of the effects of these factors on the body; this could be produced in the form of a leaflet, a presentation or a report that can provide the opportunity for a vocational context to be incorporated into their work.
	2C.P7 Describe how pathogens affect human health.	Learners will meet the criterion for **2C.P7** by identifying and **describing** the pathogen that affects human health; this will be limited to bacteria and viruses. A description of the action of bacteria and viruses and how this impacts on human health is required.
C.2 The methods used to prevent and treat disease: a. vaccinations can be used to prevent disease b. antibiotics can be used to treat disease caused by bacteria.	**1C.8** Identify measures that can be taken to prevent and treat infectious diseases.	Information to meet the criterion for **1C.8** could also be included here where learners will provide evidence to show their knowledge of the use of vaccinations in the prevention of disease and the use of antibiotics in the treatment of disease. Learners do not need to provide details of how vaccinations instigate an immune response or how antibiotics work to destroy bacteria. Other methods in preventing disease will be covered to provide evidence for 1C.8, limited to personal hygiene and brief details on the safe storage and cooking of

		food.
	2C.P8 Describe two different treatment regimes: one used to prevent a disease and one used to *treat* a disease.	For **2C.P8**, learners will provide evidence to show their knowledge of how disease can be **prevented** using vaccination programmes and **treated** using antibiotics.
	2C.M7 Discuss the advantages and disadvantages of vaccination programmes.	For **2C.M7**, high profile examples such as MMR safety concerns balanced against the dangers of measles give an excellent context for learners to **discuss** using widely available information.
C.3 Bacteria can become resistant to antibiotics.	**2C.M5** Explain how bacteria can become resistant to antibiotics.	At Merit grade, **2C.M5**, learners will need a knowledge of the increasing concern caused by bacterial resistance to antibiotics and the reasons why it is important to follow treatment regimes strictly, as well as to ensure that the use of antibiotics is not abused. The work that learners submit for **2C.M5** should include information on how bacteria have become resistant to treatments and what implications this may have in the future.
C.5 Influence of genes on human health: a. genetic disorders can affect human health b. pedigree analysis can be used to show the inheritance of genetic disease.	**2C.M6** Explain the use of pedigree analysis.	At Merit grade, **2C.M6**, learners will need to show one example of the use of pedigree analysis.
	2C.D4 Evaluate the use of antibiotics, pedigree analysis and vaccination programmes in the treatment and prevention of childhood illnesses.	For **2C.D4**, learners need to extend the Merit level by **evaluating** the use of antibiotics, pedigree analysis and vaccination programmes in the treatment and prevention of childhood illnesses. Historical health campaign information may be useful. One example of each is expected.