Government of **Western Australia**
School Curriculum and Standards Authority

Science: Biological sciences

Teaching, learning and assessment exemplar

Year 7

Classification

Acknowledgement of Country

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

Background

This teaching, learning and assessment exemplar (the exemplar) has been developed by the School Curriculum and Standards Authority (the Authority) as part of the *School Education Act Employees (Teachers and Administrators) General Agreement 2017* (Clause 61.1–61.3).

Disclaimer

Any resources, such as texts and websites, that may be referred to in this document are provided as examples of resources that teachers can use to support their learning programs. Their inclusion does not imply that they are mandated or that they are the only resources relevant to the course. Teachers must exercise their professional judgement as to the appropriateness of any resources they may wish to use.

This resource utilises electronic web-based resources, such as videos and image galleries. Teachers should be present while an electronic resource is in use and close links immediately after a resource, such as a video has played to prevent default 'auto play' of additional videos. Where resources are referred for home study, they should be uploaded through Connect, or an equivalent system, that filters advertising content.

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Contents

The Western Australian Curriculum

The *Western Australian Curriculum and Assessment Outline* (the *Outline* – https://k10outline.scsa.wa.edu.au/) sets out the mandated curriculum, guiding principles for teaching, learning and assessment, and support for teachers in their assessment and reporting of student achievement. The *Outline* recognises that all students in Australian schools, or international schools implementing the Western Australian Curriculum, are entitled to be given access to the eight learning areas described in the *Alice Springs* (*Mparntwe*) *Education Declaration*, December 2019.

The Science curriculum

The mandated curriculum is presented in the year level syllabus documents.

The Science curriculum delivers a sequential and age-appropriate progression of learning with the following key elements:

- a year level description that provides an overview of the context for teaching and learning in the year
- a series of content descriptions, populated through strands and sub-strands, that sets out the knowledge, understanding and skills that teachers are expected to teach and students are expected to learn
- an achievement standard that describes an expected level that the majority of students are achieving by the end of a given year of schooling. An achievement standard describes the quality of learning (e.g. the depth of conceptual understanding and the sophistication of skills) that would indicate the student is well placed to commence the learning required in the next year.

This exemplar

This Science exemplar articulates the content in the *Outline* and approaches to teaching, learning and assessment reflective of the Principles of Teaching, Learning and Assessment. This exemplar demonstrates a sequence of teaching and learning, including suggested assessment points, for 12 lessons.

Catering for diversity

This exemplar provides a suggested approach for the delivery of the curriculum and reflects the rationale, aims and content structure of the learning area. When planning the learning experiences, consideration has been given to ensuring that they are inclusive and can be used in, or adapted for, individual circumstances. It is the classroom teacher who is best placed to consider and respond to (accommodate) the diversity of their students. Reflecting on the learning experiences offered in this exemplar will enable teachers to make appropriate adjustments (where applicable) to better cater for students' gender, personal interests, achievement levels, socio-economic, cultural and language backgrounds, experiences and local area contexts.

Safety

Science learning experiences may involve the use of potentially hazardous substances and/or hazardous equipment. It is the responsibility of the school to ensure that duty of care is exercised in relation to the health and safety of all students and that school practices meet the requirements of the *Work Health and Safety Act 2011* (Cth), in addition to relevant State health and safety guidelines.

Using this exemplar

This teaching, learning and assessment exemplar provides suggestions to support the delivery of the mandated curriculum content. The exemplar provides:

- a teaching and learning sequence
- the mandated curriculum content to be taught at each point of the teaching and learning sequence, suggested resources, a sample assessment task and marking key
- the number of lessons to deliver the teaching and learning experiences
- learning intentions and support notes that may provide focus questions and additional information and/or examples to assist with the interpretation of curriculum content
- support notes to assist teachers to unpack the content and support teaching and learning experiences
- teaching and learning experiences that outline the structure of the lesson. These explicitly state each activity that the lesson will progress through and the key focus area for that activity.

Links to electronic resources

This sequence of lessons may utilise electronic web-based resources, such as videos and image galleries. Teachers should be present while an electronic resource is in use and close links immediately after a resource, such as a video, has played to prevent default 'auto play' of additional videos. Where resources are referred for home study, they should be uploaded through Connect, or an equivalent system, that filters advertising content.

Best practice

Teaching and learning

The teaching and learning opportunities offered in this exemplar are not exhaustive. Thus, teachers are encouraged to make professional decisions about which learning experiences, and the sequence in which they are delivered, are best suited to their classroom context, taking into account the availability of resources and student ability.

This sample may prove a useful starting point for amplifying creativity in the classroom, while presenting the embedded expectations of the Western Australian Curriculum: Science.

Teachers may find opportunities to incorporate the General Capabilities and the Cross-curriculum Priorities into the teaching and learning program.

Ways of teaching – teachers can locate additional information on the Ways of teaching from the School Curriculum and Standards Authority (the Authority) website https://k10outline.scsa.wa.edu.au/home/wa-curriculum/learning-areas/science/overview/science-ways-of-teaching.

Assessing

Assessment, both formative and summative, is an integral part of teaching and learning. Assessment should arise naturally out of the learning experiences provided to students. In addition, assessment should provide regular opportunities for teachers to reflect on student achievement and progress. As part of the support it provides for teachers, this exemplar includes suggested assessment points. It is the teacher's role to consider the contexts of their classroom and students, the range of assessments required, and the sampling of content descriptions selected to allow their students the opportunity to demonstrate achievement in relation to the year level achievement standard. Teachers are best placed to make decisions about whether the suggested assessment/s are used as formative or summative assessment and/or for moderation purposes.

Ways of assessing – a range of assessment strategies that can enable teachers to understand where students are in their learning is available on the Authority website https://k10outline.scsa.wa.edu.au/home/teaching/curriculum-browser/science-v8/overview/ways-of-assessing.

Reflecting

Reflective practice involves a cyclic process during which teachers continually review the effects of their teaching and make appropriate adjustments to their planning. The cycle involves planning, teaching, observing, reflecting and replanning.

This exemplar supports reflective practice and provides flexibility for teachers in their planning. The exemplar shows how content can be combined and revisited throughout the year. Teachers will choose to expand or contract the amount of time spent on developing the required understandings and skills according to their reflective processes and professional judgements about their students' evolving learning needs.

Classification

The teaching and learning sequence will develop students' understanding of how classification is used to organise diverse groups of organisms. In addition to explicit teaching, students are provided with opportunities to compare familiar and unfamiliar organisms, looking for similarities and differences in characteristics. Students will be provided opportunities to apply and create classification keys from their observations of organisms.

The teaching and learning sequence enables students to develop the knowledge and skills to create and apply various classification keys for grouping and identifying organisms. They will explore real-world applications of classification and consider its ongoing evolution as new species are discovered. This prepares them to effectively demonstrate their understanding in the summative assessment.

Year level description

In the early adolescence phase of schooling, students align with their peer group and begin to question established conventions, practices and values. Learning and teaching programs assist students to develop a broader and more comprehensive understanding of the contexts of their lives and the world in which they live.

Science provides opportunities for students to continue developing their understanding of important concepts and making connections between different areas of science and applications observed in their daily life.

In Year 7, students explore the diversity of life on Earth and continue to develop their understanding of the role of classification in ordering and organising information. They use and develop models, such as food chains and food webs, to represent energy flow in ecosystems and predict impacts of human activity. They use the particle theory to explain the motion and arrangement of atoms and molecules in the different states of matter and select appropriate techniques to separate pure substances from mixtures. They explore different types of celestial objects, investigate relationships in the Earth-Sun-Moon system and use models to predict and explain events. They consider the impact of forces acting on objects, represent and predict the effects of unbalanced forces on motion and determine the type of mechanical advantage provided by simple machines.

Students propose questions and make predictions based on scientific knowledge. They recognise risks when planning and conducting reproducible investigations. They construct appropriate representations to organise and process data. They analyse data to describe patterns and relationships and use evidence to support conclusions. They identify possible sources of error in their methods and suggest improvements. They use appropriate language and text features for their purpose and audience when communicating their ideas and findings. They examine situations where development of scientific knowledge has benefited from collaboration and influenced the development of human activity.

Achievement standard

By the end of the year:

Students use classification tools to classify and group organisms based on observable features. They represent the flow of energy in ecosystems and predict the impacts of human activity. They describe the motion and arrangement of atoms and molecules in solids, liquids and gases and describe techniques to separate pure substances in a mixture. They can classify celestial objects based on their observable properties and describe how the relative positions of Earth, the Sun and Moon affect phenomena on Earth. They can identify situations when friction, gravitational, magnetic and electrostatic forces are acting, represent and predict the effects of unbalanced forces on motion and identify the type of mechanical advantage provide by simple machines.

Students plan and conduct reproducible investigations to test relationships and aspects of scientific models. They identify risks involved in conducting investigations. They use equipment to generate and record data with precision. They construct appropriate representations to organise data and information. They analyse data and information to describe patterns and relationships. They identify possible sources of error in methods and suggest improvements to their methods. They draw simple conclusions that identify patterns or relationships evident in their data. They identify evidence to support their conclusions and support or dispute claims. They select and use language and text features appropriately for their purpose and audience when communicating their ideas and findings. They identify situations where development of scientific knowledge has benefited from collaboration and has influenced the development of human activity.

Lessons 1–12

Classification

Lesson 1: Need for classification

The Western Australian Curriculum content addressed in this lesson is below.

Science understanding

Biological sciences

- Classification helps to order and organise the diversity of life on Earth into a hierarchy from kingdom to species; classification tools, including dichotomous keys, can be developed and used to classify organisms

Science inquiry

Collaborating and applying

- Illustrate how science understanding and skills have influenced the development of individual, community and workplace practices

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Teacher information

- Classification is the arranging of objects into orderly groups using a system.
- Classification is used to help order, organise, find and identify things and make sense of the world.
- Observable characteristics are characteristics that can be seen in living, preserved or dead specimens and photographs or drawing.

Lesson outline

Learning intentions
Students will: • define classification • explain the need for classification • provide examples of everyday uses of classification.

Introduction

- Ask the students: 'How do supermarkets arrange products?'
  - Supermarkets arrange products into sections or aisles; for example, fruit and vegetables, frozen foods, canned food, cereals. Products in these sections are grouped even further.
- Ask the students: 'How are products in the frozen food section sorted further?'
  - Categories may include vegetables, desserts, frozen meals.
  - All of these products are arranged using a system based on features or use.
- Ask the students: 'Why do supermarkets arrange their products using this system?'
  - Reasons may include: to help customers find products easily, to keep records of stock and to know where to put stock.
  - The arranging of objects into orderly groups using a system is called classification.
  - Classification is used to order, organise, find and identify things to make sense of the world.
- Ask the students: 'What are some other places where you see objects classified?
  - Examples may include: libraries, museums, zoos, plant nurseries, hardware stores, TV shows and computer files.

Lesson activities

Activity

- Students divide items in their pencil case or school bag or list 10 common items from one location (e.g. a fridge or pantry) into two groups based on common characteristics.
- Students:
  - give suitable names for each group
  - further subdivide each group into two groups (resulting in four groups) based on observable characteristics and give suitable names for each sub-group
  - continue to subdivide each group and give names to the new groups based on their observable characteristics until they can no longer divide their items.
- Students swap their items with their partner and repeat the activity for the new items.
- Students compare the groupings and identify similarities and differences.

Concluding activity

- Provide students with a glossary sheet or have students start their own glossary to record definitions they encounter throughout the unit.
- Students record the biology definition for the word 'classification' to their glossary.
- Students record responses to the following in their notebook:
  - Define classification.
  - Explain why we classify things.
  - Provide some examples of where classification is used.

Lessons 2–3: Biological classification – Kingdom to species

The Western Australian Curriculum content addressed in these lessons is below.

Science understanding

Biological sciences

- Classification helps to order and organise the diversity of life on Earth into a hierarchy from kingdom to species; classification tools, including dichotomous keys, can be developed and used to classify organisms

Science inquiry

Processing, modelling and analysing

- Construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information

Communicating

- Communicate ideas, findings and information for specific purposes and audiences, including selection of appropriate content, language and text features, using digital tools as appropriate

Collaborating and applying

- Illustrate how science understanding and skills have influenced the development of individual, community and workplace practices

Resources

- Atlas of Living Australia – An introduction to Taxonomy
  https://support.ala.org.au/support/solutions/articles/6000271098-an-introduction-to-taxonomy
- Exploring our fluid earth – Classification of life
  https://manoa.hawaii.edu/exploringourfluidearth/biological/what-alive/classification-life
- ABC Education – Ace Day Jobs: What is taxonomy?
  https://www.abc.net.au/education/ace-day-jobs-what-is-taxonomy/13920370
- Australian museum – What is classification?
  https://australian.museum/learn/species-identification/ask-an-expert/what-is-classification/
- Museum of Natural History Learning Zone – How do scientists classify living things?
  https://learningzone.oumnh.ox.ac.uk/how-scientists-classify-living-things

Lesson outline

Learning intentions
Students will: • define taxonomy • recall the hierarchical system of classification for organisms and the basis on which they are classified • apply the scientific conventions for naming organisms.

Teacher information

- Classification is the arranging of objects into orderly groups using a system.
- Taxonomy is the science of naming, describing and classifying organisms.
- The Linnaean hierarchical system consists of seven categories that increase in specificity. It consists of the following categories: kingdom, phylum, class, order, family, genus and species.
- Binomial nomenclature is the two-term scientific name given to an organism. The first part of the species name is the genus and always starts with a capital letter. The second part is its species within that genus and always starts with a lower case. When typed, names are in italics but are underlined when written. For example, the scientific name for humans is *Homo sapiens*.
- A species is a group of living organisms capable of interbreeding and producing fertile offspring.

Introduction

- Explicitly teach that:
  - scientists classify things to understand them and communicate about them
  - each branch of science uses classification systems, for example:
    - chemistry classifies elements based on their structure and properties
    - geology classifies rocks based on how they are formed
    - astronomy classifies stars based on their colour, luminosity, temperature and evolutionary stage
    - physics classifies forces based on whether they act in contact or at a distance
    - biology classifies organisms based on structural features.
- Introduce classification in biology by showing students an appropriate video.

Lesson activities

Activity 1

- Explicitly teach:
  - the definition of taxonomy
  - the hierarchical system of classification from kingdom to species and provide an example of an organism's classification from kingdom to species; for example, humans
  - how to name and identify organisms using binomial nomenclature.
- Instruct students to take notes on the presented information.

Activity 2

- Model the creation and use of a mnemonic.
- Instruct students to create their own mnemonic to help them remember the seven classification levels.
- Some examples:
  - Kings Park can offer families good service
  - Keep pigs clean or face ghastly smells

Activity 3

- Students choose five animals to research.
- Students:
  - complete the Linnaean classification levels from kingdom to species for each, including their scientific name using the binomial naming system. Record this in a table with headings
  - compare the classification levels of their animals and identify any animals that are classified the same at any of the levels.
- Students discuss their findings/common characteristics in small groups.

Concluding activities

- Students record their responses to the following.
  - List the hierarchical levels of classification in order from Kingdom to species.
  - Which organisms are more similar, organisms in the same:
    - kingdom or family?
    - phylum or order?
    - genus or species?
  - Write the scientific name for an organism and identify its genus and species.

- Students add definitions for new terms to their glossary sheet.

Optional activities

Creation of scientific names

- Create scientific names for organisms using a list of Greek or Latin terms, such as
  - Exploring our fluid earth – Classification of life
    https://manoa.hawaii.edu/exploringourfluidearth/biological/what-alive/classification-life
- ABC BTN – Taxonomy
  https://www.abc.net.au/btn/classroom/taxonomy/104301058
  Activities linked to the video 'Taxonomy' are found under Related – Taxonomy – TR (PDF), including:
  - New species profile
  - How do animals get their names?
  - Create a new species

Classification of plants

- ABC BTN – AAR – Taxonomy
  https://www.youtube.com/live/sM3-tsm1K3U
  This video focuses on classification of plants, finding and classifying new species.

Lessons 4–6: Constructing and using dichotomous keys

The Western Australian Curriculum content addressed in these lessons is below.

Science understanding

Biological sciences

- Classification helps to order and organise the diversity of life on Earth into a hierarchy from kingdom to species; classification tools, including dichotomous keys, can be developed and used to classify organisms

Science inquiry

Processing, modelling and analysing

- Construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information

Communicating

- Communicate ideas, findings and information for specific purposes and audiences, including selection of appropriate content, language and text features, using digital tools as appropriate

Collaborating and applying

- Illustrate how science understanding and skills have influenced the development of individual, community and workplace practices

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Resource

- How to Construct a Dichotomous Key | Science Teaching Guide
  https://www.youtube.com/watch?v=pvzoIeWxsI0

Teacher information

- Dichotomous keys are split into two (‘di’) to ensure only one characteristic is considered at a time.
- Two main types of dichotomous keys include flow chart/graphical and written/tabular keys.
- A flow chart/graphical key is set out with the use of branches with two answers.
- A written/tabular key also has only two answers but is presented as a table of questions.
- Observable characteristics are characteristics that can be seen in living, preserved or dead specimens and photographs or drawings.

Lesson outline

Learning intention
Students will: • use and create dichotomous keys to identify objects.

Introduction

- Use six shapes or images (large enough to be visible to students when attached to the board or pin-up board) to model the process for developing a dichotomous key.
- Start by asking students to identify observable characteristics that could be used to sort the objects into groups. Record characteristics on the board.
- Ask students to select one characteristic and use this to physically sort the objects into two groups. Record the characteristic used.
- Select one of the two groups and sort the objects into two further groups, recording the characteristics used to sort the objects. Repeat this process with the second group.
- Use the recorded characteristics to develop a flow chart dichotomous key. When selecting an observable characteristic for each branch of the key there should only be two possible answers: either 'yes, they have the characteristic' or 'no, they don't have the characteristic'; for example, by asking 'Does it have more than three sides?'. Scientists call this a dichotomy.
- Introduce another object to test the key.

Lesson activities

Activity 1

- Demonstrate and explain how to develop and use flow chart dichotomous keys to identify organisms.
- Provide pairs or groups of students six objects (different types of buttons, shells, laboratory equipment, pasta or lollies). Students write down ways the objects could be grouped based on their observable characteristics and create a flow chart dichotomous key for their six objects.
- Once completed, students swap with another pair or group and provide feedback on its usability.

Activity 2

- Demonstrate and explain how to use written dichotomous keys.
- Provide students with examples of flow charts and written dichotomous keys to identify objects.

Concluding activity

- Provide students with a worksheet or questions on developing and using dichotomous keys.
- Students add definitions for new terms to their glossary sheet.

Optional activities

- Students convert flow chart dichotomous keys into written/tabular dichotomous keys.
- Students work individually to prepare a dichotomous key poster for 8–10 animals. The poster includes: a title; images of the animals around the outside of the poster; the name of the animal underneath each image; and a dichotomous key for the animals in the centre of the poster. The poster may be prepared electronically then printed to display in the classroom.

Lessons 7–8: Classifying organisms into taxonomic groups – Kingdoms and phyla

The Western Australian Curriculum content addressed in these lessons is below.

Science understanding

Biological sciences

- Classification helps to order and organise the diversity of life on Earth into a hierarchy from kingdom to species; classification tools, including dichotomous keys, can be developed and used to classify organisms

Science inquiry

Communicating

- Communicate ideas, findings and information for specific purposes and audiences, including selection of appropriate content, language and text features, using digital tools as appropriate

Collaborating and applying

- Illustrate how science understanding and skills have influenced the development of individual, community and workplace practices

Resources

- Museum of Natural History Learning Zone – What are kingdoms? https://learningzone.oumnh.ox.ac.uk/what-are-kingdoms
- Museum of Natural History Learning Zone – What is the tree of life? https://learningzone.oumnh.ox.ac.uk/the-tree-of-life

Teacher information

- Living things can be classified into five groups called kingdoms based on their cell structure, body organisation (unicellular or multicellular) and mode of nutrition (autotrophs or heterotrophs).
- The Kingdom Monera contains organisms that are unicellular and have no nucleus and can be either autotrophs or heterotrophs.
- The Kingdom Protista contains organisms that are unicellular, have a nucleus and can be either autotrophs or heterotrophs.
- The Kingdom Fungi can be unicellular or multicellular. Fungi cells have a nucleus and chitin cell wall and are heterotrophs.
- The Kingdom Plantae contains organisms that are multicellular with cells that contain a nucleus and cellulose cell wall, and are autotrophs.
- The Kingdom Animalia contains organisms that are multicellular, with cells that contain a nucleus and no cell wall, and are heterotrophs.
- Autotrophs are organisms that make their own food by converting inorganic compounds into organic compounds; for example, green plants make their own food by the process of photosynthesis.
- Heterotrophs are unable to make their own food; they need to obtain organic compounds from other organisms.

Lesson outline

Learning intentions
Students will: • recall the distinguishing characteristics of the five kingdoms • use a dichotomous key to classify animals into phyla.

Introduction

- Explicitly teach the:
  - five kingdoms, including the characteristics of each
  - reason why classification of organisms has changed over time.
- Provide examples of how the classification of organisms has changed over time.
- Provide students with a suitable worksheet or graphic organiser to name, give examples of organisms and summarise the main characteristics of each kingdom during the presentation.

Lesson activities

Activity 1

- Place around the room images and/or preserved specimens of animals (familiar and unfamiliar) from some or all the main phyla within the animal kingdom. Include: Chordata, Echinodermata, Arthropoda, Annelida, Mollusca, Cnidaria and Porifera.
- Students use a dichotomous key to categorise each specimen into its phylum based on observable characteristics.
- Label specimens A–E and complete a table with headings, including:
  - specimen
  - observable characteristics
  - predicted classification group for the specimen
  - actual classification group for the specimen.

Concluding activity

- Discuss and review class observations of specimens. Students self-assess and complete the end column during the review.
- Students add definitions for new terms to their glossary sheet.

Lesson 9: Classifying organisms into taxonomic groups – Arthropods

The Western Australian Curriculum content addressed in this lesson is below.

Science understanding

Biological sciences

- Classification helps to order and organise the diversity of life on Earth into a hierarchy from kingdom to species; classification tools, including dichotomous keys, can be developed and used to classify organisms

Science inquiry

Communicating

- Communicate ideas, findings and information for specific purposes and audiences, including selection of appropriate content, language and text features, using digital tools as appropriate

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Resource

- Museum of Natural History Learning Zone – How do we divide the animal kingdom? https://learningzone.oumnh.ox.ac.uk/how-we-divide-the-animal-kingdom

Teacher information

- Invertebrates are animals without a vertebral column or backbone.
- Vertebrates are animals with vertebral column made of bone or cartilage.
- Some invertebrate phyla are: Porifera, Cnidaria, Annelida, Mollusca, Arthropoda and Echinodermata.
- The phylum Arthropoda is divided into five classes, Crustacea, Insecta, Arachnida, Diplopoda (millipedes) and Chilopoda (centipedes).

Lesson outline

Learning intentions
Students will: • explain the difference between vertebrates and invertebrates • use a dichotomous key to classify arthropods into the main arthropod groups.

Introduction

- Lead a class discussion on the difference between invertebrates and vertebrates. Show examples of organisms from the different invertebrate groups.

Lesson activities

Activity 1

- Explicitly teach the main classes of the arthropod phylum (Crustacea, Insecta, Arachnida, Diplopoda and Chilopoda), including the characteristics of each.
- Provide students with a suitable worksheet or graphic organiser to name, give examples of and summarise the main characteristics of each arthropod class during the presentation.

Activity 2

- Distribute images and/or preserved specimens of a range of arthropods (familiar and unfamiliar) around the room for students to complete as a circuit activity.
- Students use a provided dichotomous key to categorise each specimen into its arthropod group based on observable characteristics.
- Label specimens A–E, (for example) and students complete a table with headings such as:
  - specimen
  - observable characteristics
  - predicted classification group for the specimen
  - actual classification group for the specimen.

Concluding activity

- Discuss and review the class observations of specimens. Students self-assess and complete the end column during the review.
- Students add definitions for new terms to their glossary sheet.

Lessons 10–11: Classifying organisms into taxonomic groups – Vertebrates

The Western Australian Curriculum content addressed in these lessons is below.

Science understanding

Biological sciences

- Classification helps to order and organise the diversity of life on Earth into a hierarchy from kingdom to species; classification tools, including dichotomous keys, can be developed and used to classify organisms

Science inquiry

Processing, modelling and analysing

- Construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information

Communicating

- Communicate ideas, findings and information for specific purposes and audiences, including selection of appropriate content, language and text features, using digital tools as appropriate

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Resource

- Museum of Natural History Learning Zone: How do we divide the animal kingdom? https://learningzone.oumnh.ox.ac.uk/how-we-divide-the-animal-kingdom

Teacher information

The six main classes of vertebrates are: Chondrichthyes (cartilaginous fish), Osteichthyes (bony fish), Amphibia, Reptilia, Aves (bird) and Mammalia.

Lesson outline

Learning intentions
Students will: • recall the distinguishing characteristics of the six main groups of vertebrates • develop and use a dichotomous key to classify vertebrates into the main vertebrate classes.

Introduction

- Explicitly teach the six main vertebrate classes (Chondrichthyes, Osteichthyes, Amphibia, Reptilia, Aves and Mammalia), including the characteristics of each.
- Provide students with a suitable worksheet or graphic organiser to name, give examples of and summarise the main characteristics of each vertebrate class during the presentation.

Lesson activities

Activity 1

- Students work in pairs or groups to develop a dichotomous key for vertebrates using the main characteristics for each group.
- Students work in pairs or groups to identify images or preserved specimen of vertebrates using their dichotomous key.

Activity 2

- Provide students with a worksheet or graphic organiser to name, provide examples of and summarise the main characteristics of three groups of mammals (monotremes, marsupials and placentals).

Concluding activity

- Provide students with a worksheet or text questions on developing and using dichotomous keys as revision for the summative assessment task.
- Students add definitions for new terms to their glossary sheet.

Optional activities

- ‘What am I?’ game
  - Write the name of a vertebrate on a sticky note and ask each student to place it on the palm of their hand, or forehead if they are comfortable having it there (without reading or looking at what is written on it) so that they cannot see what is written but their partner can.
  - Have students show their sticky note to their partner and ask closed questions (‘yes’ or ‘no’ answers only) about the characteristics of each group of vertebrates to establish which group their animal belongs to.
  - Once the group of vertebrates is correctly guessed, students continue to ask closed questions to try to work out the name of vertebrate on their sticky note.
  - Instruct students to swap roles with their partner.
- Plant groups
  - Provide students with a worksheet showing an image that represents each of the plant classification groups, such as mosses, ferns, conifers and flowering plants. Students complete the plant name and main characteristics of each group.

Lesson 12: Summative assessment

The Western Australian Curriculum content addressed in this lesson is below.

Science understanding

Biological sciences

- Classification helps to order and organise the diversity of life on Earth into a hierarchy from kingdom to species; classification tools, including dichotomous keys, can be developed and used to classify organisms

Science inquiry

Processing, modelling and analysing

- Construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information

Communicating

- Communicate ideas, findings and information for specific purposes and audiences, including selection of appropriate content, language and text features, using digital tools as appropriate

Resource

- Appendix A: Assessment task

Teacher information

- Students work individually, under test conditions, for one 50-minute lesson.

Lesson outline

Learning intentions
Students will: • apply their understanding of observable characteristics, identifying similarities and differences • classify organisms using these characteristics with a dichotomous key • construct a dichotomous key based on observable characteristics.

Introduction

- Follow the instructions provided in the assessment task in Appendix A.

Lesson activities

Activity

- Students complete the assessment task individually, under test conditions.

Appendix A

Assessment task

Classifying organisms

Task details

Title	Classifying organisms
Description	Students classify familiar and unfamiliar organisms using observable similarities and differences with the use of a key. Students create a dichotomous key (flow chart/graphical or tabular) to help classify a group of organisms.
Type of assessment	Summative
Ways of assessing	Completion of student assessment sheet
Evidence to be collected	Student assessment sheet
Suggested time	One 50-minute lesson
Differentiation	Teachers should differentiate their teaching and assessment to meet the specific learning needs of their students, based on their level of readiness to learn and their need to be challenged. Where appropriate, teachers may scaffold or extend the scope of the assessment tasks**.**

Content descriptions

Science understanding

Biological sciences

- Classification helps to order and organise the diversity of life on Earth into a hierarchy from kingdom to species; classification tools, including dichotomous keys, can be developed and used to classify organisms

Science inquiry

Processing, modelling and analysing

- Construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information

Communicating

- Communicate ideas, findings and information for specific purposes and audiences, including selection of appropriate content, language and text features, using digital tools as appropriate

Key concepts

Classification

Instructions for teacher

This task follows the completion of the sequence of lessons. Students have been provided with:

- the opportunity to practise and apply simple varied (flow chart/graphical or tabular) dichotomous keys to identify familiar and unfamiliar organisms.
- the opportunity to construct varied dichotomous keys for a given set of organisms/objects.

Provide students with the student assessment sheet, 'Classifying organisms'. Students:

- apply their understanding of observable characteristics, identifying similarities and differences
- classify organisms using these characteristics with a dichotomous key
- construct a dichotomous key based on observable characteristics.

Students work independently, under test conditions, for one 50-minute lesson.

Instructions to students

You are required to use your knowledge of applying and constructing dichotomous keys based on observable characteristics for both familiar and unfamiliar organisms.

Attempt all questions on the student assessment sheet. Work independently, under test conditions, during the 50-minute lesson.

Student assessment sheet: Classifying organisms

Answer all the questions in the spaces provided.

Question 1

Dogs and dingoes are species found in the Canidae family of mammals.

Dalmatian

Image: TheOtherKev, 2019

Dingo

Image: pen_ash, 2019

Look carefully at the pictures of the dog and dingo and answer the question below.

(a) Identify one observable similarity, and two differences. (3 marks)

Similarity

One:_____

Differences

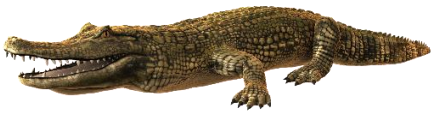
One:_____

Two: _____

Below is a classification key for animals.

Q1	Does it have legs?	Yes – go to Q2
		No – Group Z
Q2	Does it have fur or hair?	Yes – go to Q3
		No – Group W
Q3	Does it have a segmented body?	Yes – Group Y
		No – Group X

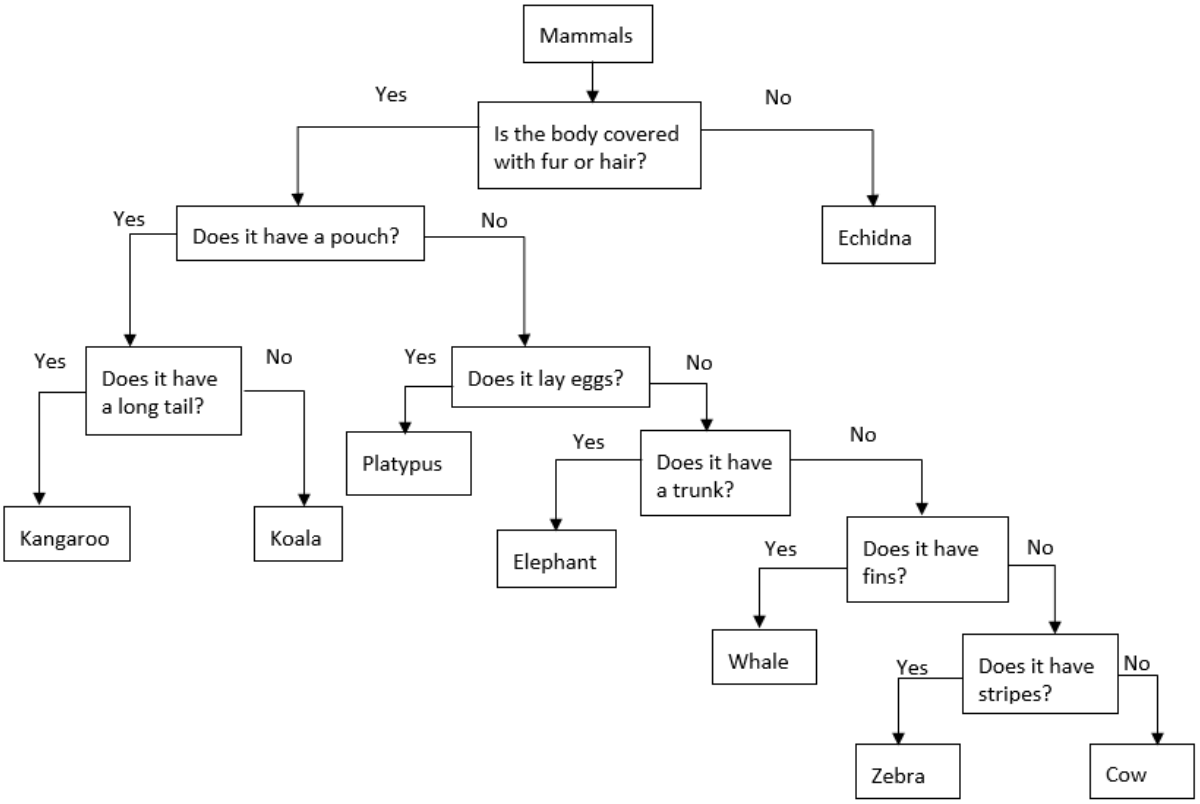
(b) Use the classification key above to identify the group (W, X, Y or Z) for each animal in the table below. (3 marks)

Animal	Picture of animal	Group
Crocodile		
Wombat		
Fish		

Graphic/images: SilviaP_Design, 2016; Callanan, 2005; dina263, 2016

Question 2

Use the key below to answer the questions that follow.



(a) Identify the mammal from the following characteristics: (2 marks)

(i) Covered with fur or hair; has a pouch; has a long tail

_____

(ii) Covered with fur or hair; does not have a pouch; does not lay eggs; has a trunk

_____

(b) Use the above key to list one characteristic of the following mammals. (2 marks)

(i) Koala

_____

(ii) Whale

_____

Question 3

(a) Construct a dichotomous key for the sea creatures below to allow someone to identify each one based on their observable characteristics. (6 marks)

			
crab	lobster	shark	clown fish

Illustration/images: Venita, 2016; PublicDomainPictures, 2013; Wulschlaeger, 2008; Cubir M, 2008

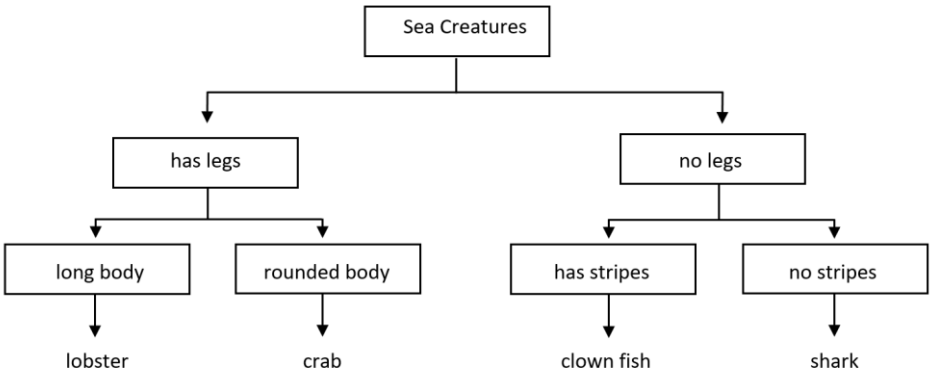
Marking key

Description	Marks
Question 1	
(a) Identify one observable similarity, and two differences	
States a suitable similarity	1
States and compares two suitable differences	1–2
Similarity examples: both have four legs; a tail; covered in fur Differences examples: dog has spotted fur, dingo mostly one colour; dog has long thin tail, dingo has long fluffy tail	
Subtotal	**/3**
(b) Use the classification key above to identify the group (W, X, Y or Z) for each animal in the table below.	
Group of each animal correctly identified	1–3
• Crocodile – group W • Wombat – group X • Fish – group Z	
Subtotal	**/3**
Question 2	
(a) Identify the mammal from the following characteristics	
Identifies 'kangaroo'	1
Identifies 'elephant'	1
Subtotal	**/2**
(b) Use the key to list one characteristic of the following mammals	
Identifies any one of: is covered with fur or hair; has a pouch; does not have a long tail	1
Identifies any one of: is covered with fur or hair; does not have a pouch; does not lay eggs; does not have a trunk; does have fins	1
Subtotal	**/2**

Description	Marks
Question 3	
(a) Construct a dichotomous key for the sea creatures to allow someone to identify each one based on their observable characteristics.	
Draws the dichotomous key correctly and branches off into two each time The key could be either a flow chart/graphical or written/tabular	1
Uses strong key (with characteristics table), e.g.: • legs/no legs • fins/no fins • stripes/no stripes • a hard outer shell (exoskeleton)/no hard shell • a rounded body/long body	1–3
Accurately separates animals in the key into clear, distinguishable groups	1
Correctly includes animals in the key	1
Subtotal	**/6**

An example of each type of key is shown below:

Graphical



Tabular

Q1	legs – go to Q2
	no legs – go to Q3
Q2	a long body – lobster
	a rounded body – crab
Q3	stripes – clown fish
	no stripes – shark

Total	**/16**

Acknowledgements

Appendix A

Student assessment sheet

Question 1(a)

TheOtherKev. (2019). [Photograph of a dalmatian on grass]. Retrieved February, 2026, from https://pixabay.com/photos/dalmatian-dog-dalmatian-dog-4540724/

pen_ash. (2019). [Photograph of a white dingo on a log]. Retrieved February, 2026, from https://pixabay.com/photos/dingo-native-dog-white-dingo-white-4366406/

Question 1(b)

SilviaP_Design. (2016). [Graphic of a crocodile]. Retrieved February, 2026, from https://pixabay.com/illustrations/cayman-crocodile-alligator-reptile-1680371/

Callanan, R. (2005). *Wombat* [Photograph]. Retrieved February, 2026, from https://www.flickr.com/photos/95454538@N00/6164296610
Used under a Creative Commons Attribution-ShareAlike 2.0 Generic licence.

dina263. (2016). [Photograph of a goldfish]. Retrieved February, 2025, from https://pixabay.com/photos/goldfish-carp-fish-1900832/

Question 3(a)

Adapted from: Venita, O. (2016). [Illustration of a crab]. Retrieved February, 2026, from https://pixabay.com/illustrations/fish-collage-vintage-ocean-life-1653753/

PublicDomainPictures. (2013). [Photograph of a lobster]. Retrieved February, 2026, from https://pixabay.com/photos/lobster-lobsters-live-food-meal-164479/

Wulschlaeger, H. (2008). [Photograph of a shark]. Retrieved February, 2026, from https://www.pexels.com/photo/grey-shark-underwater-5045673/

Cubir M. (2008). [Photograph of a clown fish]. Retrieved February, 2026, from https://www.pexels.com/photo/close-up-photo-of-clownfish-128756/