



MICRO WORLDS

ANSWER SHEET

INCREDIBLE POLLINATORS

Explore Micro Worlds and watch videos on Asian honey bees. Answer the questions below.



- 1 What type of pollination is taking place in the video?

Insect pollination

- 2 Based on the video, explain how bees find flowers and communicate the presence of flowers to other bees in the colony.

Honey bees use sight and smell to find flowers, with the sun as a compass for navigation. Back at the hive, they perform a dance to share information on the distance and location of the flowers.

- 3 Approximately what percentage of human food production depends on pollination by bees?

33%

- 4 State one threat to bee populations. Other than the example mentioned in the video, explain one other way a decline in bee populations can affect ecosystems.

Threat: Pesticide use or habitat loss.

A decline in bee populations will reduce pollination activities, resulting in fewer fruits and seeds being produced. This will cause plant populations to decrease, leaving less food for animals and us. Most importantly, the decline will disrupt the balance of the ecosystem.



FROM LEARNING TO ACTION

What action can you, your school, or your community take to support pollinators? Discuss.

Grow flowering plants • Build insect hotels • Avoid using pesticides • Protect green spaces • Spread awareness



ANSWER SHEET

MICROBES: SMALL HELPERS, BIG IMPACT

Explore the Human Microbiome Interactive Orbs and answer the questions below.

1 Most microbes are tiny, measuring less than **1/100** the width of a hair.

2 Microbes aid digestion, produce vitamins and protect us from harmful germs. Based on the video, identify **two types** of microbes and explain how each helps keep us healthy.

(Pick any 2)

Microbe	Location	How they keep the human body healthy
Face mites	Skin	Remove dead skin cells.
Mouth bacteria <i>(Streptococcus salivarius)</i>	Mouth	Keep gums healthy and breath fresh.
Probiotic bacteria	Gut	Break down food and help absorb nutrients for healthy digestion.
Gut bacteria <i>(Bacteroides uniformis)</i>	Gut	Support metabolism and overall gut health.
Skin bacteria <i>(Cutibacterium acnes)</i>	Skin	Break down sweat and oil to keep skin glowing.
Skin bacteria <i>(Staphylococcus hominis)</i>	Skin	Fight off harmful germs.

3 How might microbiome research change the way diseases are treated?

It could help scientists further understand microbes, leading to the development of new treatments and medicines for many diseases.

TAKE IT FURTHER

Discuss why antibiotics used to kill harmful bacteria can also have unintended effects on human health.



CAVERN OF MYSTERIES

Investigate the tunnels to discover how animals survive in the cave ecosystem. Answer the questions below.



1 Complete the table below based on your observations.

(Pick any two consumers)

Name of animal	Ecosystem Role	Adaptation(s) for survival in the cave habitat
Cave Cockroach	Decomposer	Uses its antennae to detect scents and find food in the dark.
Horseshoe Bat	Consumer	Uses ultrasonic waves to navigate and locate objects in the dark (echolocation).
Cuban Boa		Has heat-sensing spots around its mouth to detect heat and locate prey.
Cave Spider		Sensitive legs detect vibrations in the web when prey is trapped.
New Zealand Glowworm		Glow to attract insects, then traps them using sticky mucus threads.
Mexican Blind Cave Fish		Uses sensory organs called neuromasts to detect water movement, navigate, and find food.

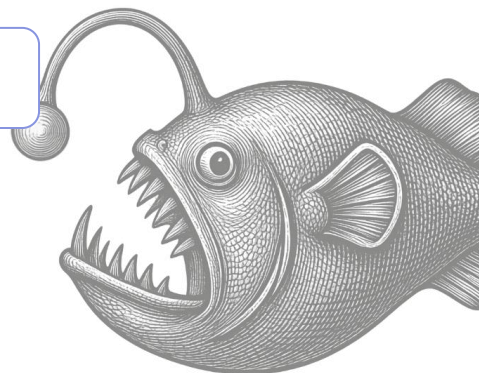
2 In a balanced ecosystem, nutrients are continuously recycled. Based on your observations, explain how the cave cockroach contributes to nutrient cycling in the cave ecosystem.

Cave cockroaches break down guano (bat droppings) and return nutrients to the ecosystem through their waste. They also serve as food for larger cave animals.



TAKE IT FURTHER

Discuss the roles of cockroaches in urban spaces such as drains, food stores, and homes. Consider both their ecological importance and their effects on people.

**ANSWER SHEET**

DEEP SEA-CRETS

Dive into the deep sea and explore the interactive games. Answer the questions below.

1 One of the interactive games features a non-living material commonly found in our oceans. Explore the game and answer the questions below.

(a) What is the non-living thing?

Plastic Bag

(b) How much of this material enters the ocean each year?

10 million tonnes

(c) Explain how your answer in (a) can move through a marine food web and affect different organisms.

Marine animals may mistake plastics for food or ingest microplastics unknowingly, causing intestinal blockages, poor nutrient absorption, and poisoning. Toxins can accumulate through the food web (biomagnification) and eventually affect us as we consume seafood.

2 Biomimicry is the practice of learning from nature to solve human challenges and improve our quality of life. Search for either deep-sea creature on the right and identify one adaptation that inspired an invention or technology.



Paddles through water like a marine centipede, which inspired new robotic technology.



Flashes blue light to "scream" for help, which inspired ideas on how to communicate underwater.

3 Why is it important to protect marine biodiversity? Use evidence from Questions 1 and 2 to support your answer.

Marine biodiversity is important because every species plays a role in maintaining healthy food webs and ecosystems. Marine biodiversity also inspires new innovations through biomimicry.



FROM LEARNING TO ACTION

What action could you, your school or your community take to reduce plastic waste entering the ocean? Discuss.

Raise awareness that litter on land can enter waterways and reach the ocean • Organise clean-ups • Reduce the use of disposables and packaging



ANSWER SHEET

THE SINGING FORESTS

Explore the Interconnected Tree to discover how rainforest animals communicate and survive across different forest layers. Answer the questions below.

1 A healthy rainforest is filled with animal calls. Explore the interactive and identify the animal described by each sound or communication behaviour.

Animal	Sound or Communication Behaviour
Howler Monkey	Loudest roar of any land mammal – its calls can travel up to 4 km through the forest.
Red-Eyed Tree Frog	At night, males puff their throats and croak sharp calls, using sound and vibration to attract mates and warn rivals.
Straw-Headed Bulbul	Their song is so prized, singing competitions are held just to hear it.
Common Bush Cricket / Dragon-Headed Katydid	At night, they rub their wings to create calls to attract mates.

2 The variety of animal calls reflects the biodiversity of a healthy rainforest. Explain how deforestation reduces this diversity and disrupts the rainforest ecosystem.

Deforestation destroys habitats, causing animal populations and biodiversity to decline. The loss of species disrupts food webs and ecological relationships, destabilising forest ecosystems.

FROM LEARNING TO ACTION

Discuss some factors that contribute to deforestation in Singapore and around the world.

What actions could you take to help protect forests in Singapore and elsewhere?

Choose sustainable (FSC) products • Support forest restoration • Protect green spaces • Use less paper • Reuse and recycle





ANSWER SHEET



THE LIVING REEFS

Explore the coral reef ecosystem and the interactive games.
Answer the questions below.

- 1 Coral reefs provide essential resources for many marine organisms. Complete the sentence below.

Coral reefs are vibrant underwater neighbourhoods, providing shelter ,
breeding grounds , and food for a quarter of all marine life!

- 2 Marine organisms have adaptations that help them avoid predators or locate prey. Identify one example of each from the interactive games.

Avoiding Detection	Locating Prey
- Pygmy seahorse: mimics the colours of its coral home - Decorator crab: dresses up using seaweed and coral - Leafy sea dragon: mimics drifting seaweed - Mimic octopus: mimics other sea animals or its environment	Shark: uses specialised sensors (electroreceptors) to detect faint electric fields from living animals

- 3 Every species plays a role in maintaining a healthy ecosystem. Identify the reef’s tiny clean-up crew, explain its role, and predict what might happen if its population declines.

The bluestreak cleaner wrasse removes parasites and dead skin from larger fish. If its population declined, parasite loads and infections among fish could increase, reducing overall fish health and disrupting food chains within the reef ecosystem.

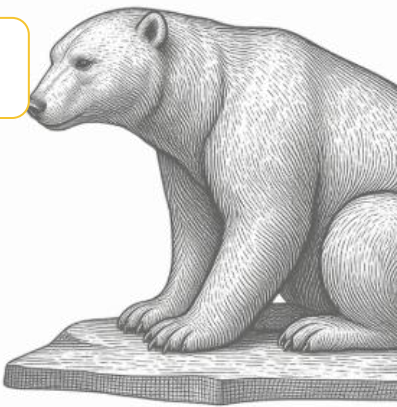


TAKE IT FURTHER

Explain how rising sea temperatures can disrupt the relationships among organisms in a coral reef ecosystem.



ANSWER SHEET



EXTREME SURVIVAL

Step into the simulations to experience life in extreme environments. Answer the questions below.

- 1 Some animals have special adaptations to survive in extreme conditions. Explore the interactive and complete the table below.

Animal	Adaptations for survival
Reticulated python	They use their heat-sensing abilities to hunt for rodents at night in urban spaces.
Polar bear	As sea ice melts due to climate change , they shift from hunting marine prey to terrestrial animals.
Namaqua chameleon	To survive extreme desert temperature swings, they change colour during the day to stay cool and bury themselves in the sand at night to stay warm.
Demoiselle crane	Every winter, they fly at altitudes of over 8,000 metres to migrate to warm places. Their unique respiratory system allows them to survive where oxygen is scarce.

- 2 Watch the video near the desert simulation. Explain how the darkling beetle supports the survival of the Namaqua chameleon and how their relationship demonstrates the importance of biodiversity.

The darkling beetle is both a source of food and water for the chameleon. This shows how species depend on one another and how the loss of one species can affect other species in the ecosystem.



TAKE IT FURTHER

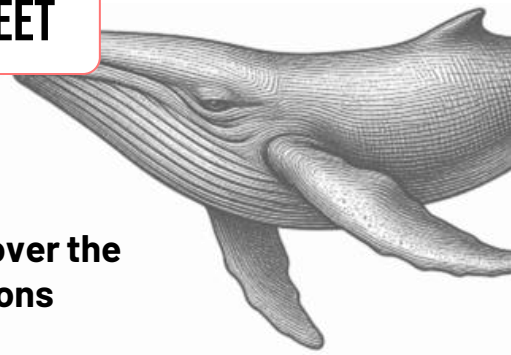
How have human populations adapted to survive in environments with extreme temperatures or high altitudes?

Consider the clothing, shelters, and technologies they use, as well as physiological changes or inherited traits that help their bodies cope.



GIANTS THROUGH TIME

Watch the show and journey through time to discover the giants of the past and present. Answer the questions below.



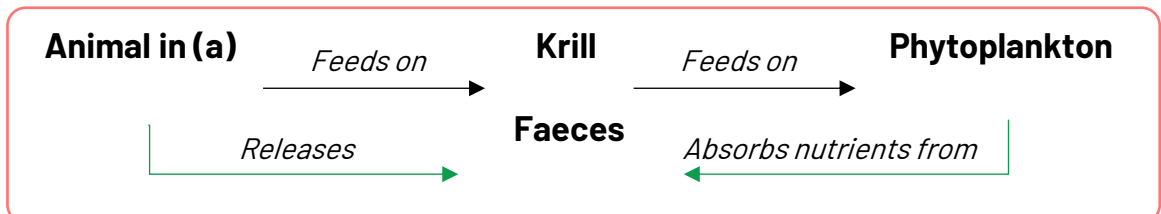
- 1 How much do you know about mass extinctions?
 - (a) **66** million years ago, a colossal asteroid impact caused the mass extinction of dinosaurs, paving the way for mammals to dominate.
 - (b) Earth has experienced **5** mass extinctions, each reshaping life on the planet.
- 2 We are currently living in the Cenozoic Era. Use the clue to identify an animal from this era that is now extinct and complete the information.

Clue: This animal used its muscular tail for support when standing on its hind legs, forming a “tripod” for better balance when reaching for higher vegetation.

Animal name: **Giant ground sloth**

Reason for extinction: **Driven to extinction by human hunting**

- 3 Find the interpretive featuring the largest animal alive today.
 - (a) Identify the animal and state how many million krill it can eat each day.
A blue whale can eat 3 million krill each day.
 - (b) The diagram shows a nutrient feedback loop involving this animal.



Using the diagram, predict how a decline in its population might affect the marine ecosystem.

Fewer blue whales may initially increase krill numbers, but less nutrient-rich faeces will slow phytoplankton growth, eventually leaving less food for krill and disrupting the marine food web.