



Section 1: Characteristics Of Mammals

• How do mammals survive in hot climates?

Mammals are warm-blooded, and can regulate their own body temperature to keep it constant. This is known as homeostasis. To live in hot climates, mammals must be able to keep themselves cool. African elephants live in extremely hot environments, and use their huge ears to keep cool. Each ear is packed with a network of capillaries, so as warm blood flows through the ears it releases excess heat into the air, cooling the elephants.

• Suggested Films

- African Elephants
- Elephants
- Forest

Extension Question

Q1. How can elephants increase heat loss from their ears?

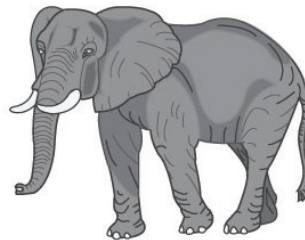
Elephants can often be seen flapping their ears back and forth. This action helps move air over the surface of the ear, causing heat to escape at a faster rate. This is the same reason why blowing on a hot drink cools it down quicker.

DIAGRAM 01:

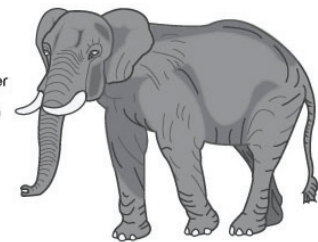


Surface Area and Keeping Cool

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Large ears with a large surface area help to keep the elephant cool.



Smaller ears with a smaller surface area would mean losing heat more slowly.

• How do mammals keep warm in cold climates?

All mammals have fur at some point in their development, even dolphins. For some mammals, fur is essential for their survival. The snow leopard, for example, lives high in the frozen mountains of Pakistan, 5000 metres above sea level. As it hunts prey through the snow, its thick fur insulates its body from the freezing air, minimising heat loss.

• Suggested Film

- Snow Leopard

Extension Question

Q2. Which other characteristics help the snow leopard survive?

Walking in deep snow consumes large amounts of energy, so the snow leopard has wide feet to help spread its weight. Its stocky body shape and small ears help reduce heat loss, while its large nasal cavities help warm the cold, thin air before it reaches the leopard's lungs.



Snow leopards are adapted for living in cold mountainous environments.

• How do mammals reproduce?

Mammals are viviparous, which means they give birth to live young. The offspring begin as embryos and develop inside the mother's body, drawing nutrients through an organ called the placenta. Once born, the mother feeds the young with milk, via specialised mammary glands. It is these glands that give mammals their name.

• Suggested Film

– What is a Mammal?

Extension Questions

Q3. Do all mammals give birth to live young?

Monotremes are mammals that reproduce by laying eggs. The duck-billed platypus of Australia builds a nest and lays several eggs. When the young hatch, they are blind and hairless, relying on their mother for nourishing milk.



Mammals are the only animals that suck milk from their mothers and have hair.

Section 2: Evolution Of Mammals

• How did mammals evolve?

When amphibians first adapted to land, they split into two branches – the sauropsids, or “true reptiles”, and the synapsids, or “mammal-like reptiles”. Over millions of years, the synapsids and their descendants evolved the characteristics we recognise in mammals today – including specialised teeth, such as incisors and canines for biting and smaller teeth for chewing.

• Suggested Film

– How Did Mammals Evolve?

Extension Questions

Q4. Why did mammals survive when dinosaurs became extinct?

Around 66 million years ago, the Earth's climate changed rapidly and dinosaurs and many other species became extinct. Mammals survived this mass extinction, and began to flourish into the abundance of species we see today. This may be due to a number of reasons, including the fact that the mammals lived in protective burrows and were able to survive on a wider range of food. This flexibility helped mammals to adapt to their new environment and diversify further.

DIAGRAM 02:



The Function of Teeth

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Incisors

Their function is to bite through food.

Canines

Their function is to rip and tear food.

Premolars

Their function is to hold and crush food.

Molars

Their function is to grind food.

• Are mammals still evolving?

Mammals have continued to evolve since the dinosaurs became extinct. Human beings are mammals, and only appeared on Earth within the last 200,000 years or so. Similarly, the humpback whale evolved from early mammals that lived on land. As these early whales began to adapt to an aquatic habitat, their back legs shrank and eventually disappeared, while their front feet became flippers that are more paddle-like and suitable for swimming.

- Suggested Film
 - Humpback Whales

Extension Question

Q5. Could an animal as large as a blue whale survive on land?

Blue whales are the largest animals to have ever lived. They can grow up to 30 metres long and weigh about the same as 40 African elephants. If a creature of that size lived on land it would need a huge skeleton to support its body and allow it to breathe, which would make it extremely heavy and cumbersome. However, the blue whale lives in the ocean and is supported by water, meaning that it doesn't have to hold up its own weight against gravity.



Humpback whales sing intricate songs in order to communicate.

• Have all mammals evolved similarly?

While all mammals share many common characteristics, there are some significant evolutionary divergences. For example, marsupials are warm-blooded, have fur, and give birth to live young, but their young are born very underdeveloped, and must remain in a pouch until they are older. Kangaroos and wombats are both examples of marsupials. A newly born kangaroo joey has to crawl through its mother's fur to reach the pouch, where it will stay for up to eight months.

- Suggested Films
 - Marsupials
 - Duck-Billed Platypus
 - Echidna

Extension Question

Q6. Why are there so many marsupials in Australia?

During the time period that marsupials were evolving, the continent of Australia drifted away from South America due to the movement of the Earth's tectonic plates. This isolated the mammals in Australia, allowing them to develop independently.



Marsupials develop in their mother's marsupium.

Section 3: Mammals In Different Habitats

• How have mammals evolved to survive food scarcity?

Hibernation is a common strategy for dealing with food scarcity. For grizzly bears in North America, the winters are incredibly harsh but the summers are bountiful with food. To cope with the changing seasons, grizzly bears hibernate through the frozen winter. When they wake up in the spring, they must immediately start consuming as many calories as possible, to build up the fat stores that will enable them to survive the next winter. Grizzly bears are omnivores, and they eat roots, grasses, berries, insects, clams and lots of protein-rich salmon.

• Suggested Film

– Grizzly Bears

Extension Questions

Q7. When do grizzly bears give birth?

Grizzly bears give birth to their cubs during hibernation. For the first month the cubs feed on milk from the mother, which means that by the time spring arrives they have enough strength to venture outside and follow their mother as she forages.



Grizzly bears need to build up significant fat reserves in order to survive their winter hibernation.

• Why have many mammals evolved to live in groups?



The gelada baboon's large social group is key for its survival.

Animals often live in groups for protection. Gelada baboons live in social groups of up to 800 individuals, and have evolved complex communication methods to interact with each other. By working together they are able to forage for food and keep watch for predators, keeping the whole group safe and fed. If a predator is spotted, a warning signal is given and the entire group retreats to the safety of nearby cliffs.

• Suggested Films

– Gelada Baboons

– Koala

Extension Questions

Q8. How do gelada baboons communicate with each other?

Gelada baboons communicate using a diverse set of noises. The complexity of this system is thought to be close to the level of humans. They are able to pass visual signals through facial expressions and body postures, often flipping their upper lip back to display their teeth.

• How have mammals evolved to catch prey?

Some mammals ambush their prey; others rely on speed. The cheetah can accelerate from 0 to 100 km/h in 3 seconds, making it the fastest land animal. Its body is slender, with a supple backbone and loose hips, giving it a longer stride. Its enlarged nostrils, lungs and heart all help draw in more oxygen to power its muscles during the chase.

• Suggested Films

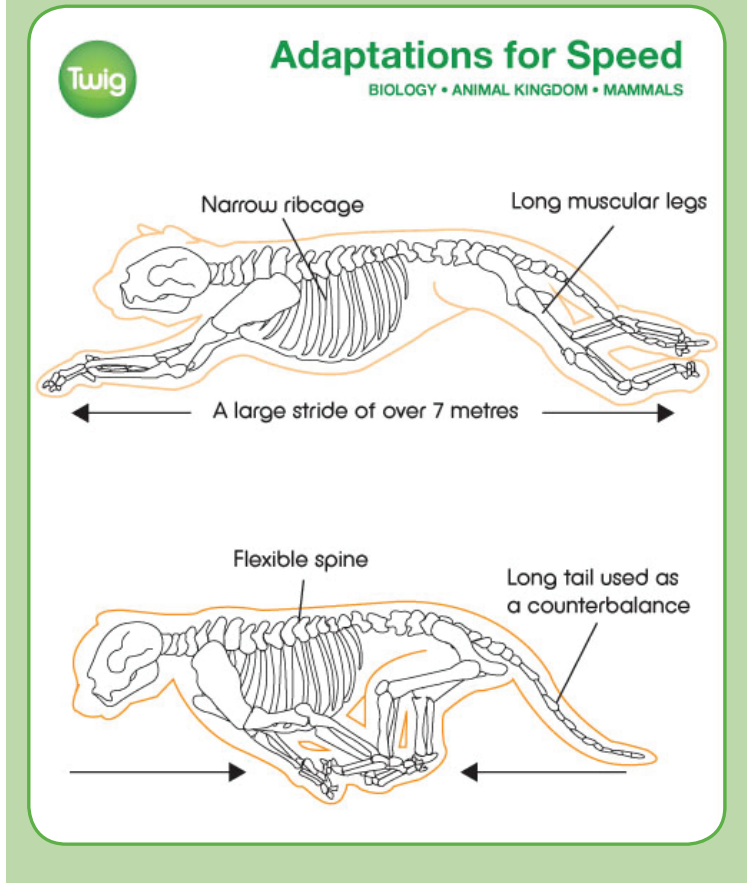
- Cheetah
- African Lions
- Sloth

Extension Question

Q9. For how long can a cheetah run?

At top-speed, a cheetah can run for between 60 and 90 seconds; after this, the heat generated by its powerful muscles starts to become a problem. After a big chase, cheetahs can often be observed lying down and panting to try and cool their body down.

DIAGRAM 03:



• Quizzes

What Is a Mammal?

Basic

• Mammals maintain a warm body temperature through internal processes. This means they are...

- A – thermophiles
- B – warm-bodied
- C – warm-blooded
- D – cold-blooded

• The word "mammal" derives from the word "mammary". What is the function of mammary glands?

- A – keeping the animal warm
- B – storing water
- C – fending off predators
- D – secreting milk for offspring

• The heart of a mammal has how many chambers?

- A – 1
- B – 2
- C – 3
- D – 4

• Which of the following is NOT a common characteristic of all mammals?

- A – warm-blooded
- B – sharp teeth
- C – four-chambered heart
- D – have hair at some stage in their development

Advanced

• Which one of the following is NOT a bone in the ear?

- A – chisel
- B – hammer
- C – anvil
- D – stirrup

• What do archaeologists look for when determining if a fossil is from a mammal?

- A – hair
- B – ear bones and a single jaw bone
- C – a segmented backbone
- D – a large skull

• How does blood leave a mammal's heart to circulate around its body?

- A – through a network of capillaries
- B – through a branched artery
- C – through a single vein
- D – through a single artery

• In mammals, the diaphragm separates the abdomen from what?

- A – the thorax
- B – the legs
- C – the head
- D – the outside

How Did Mammals Evolve?

Basic

• Which of the following were the ancestors of mammals?

- A – dinosaurs
- B – synapsids
- C – sauropods
- D – lizards

• What did a Dimetrodon use to control its body temperature?

- A – sweat glands
- B – a thick coat of fur
- C – a large sail containing blood vessels
- D – underground burrows

• The Diictodon's jaw contained bones that would eventually evolve into the bones found in...

- A – the ears of all mammals
- B – the ears of all amphibians
- C – the ears of all birds
- D – the skull of all mammals

• Which of the following mammals lays eggs?

- A – mouse
- B – cheetah
- C – marmoset
- D – duck-billed platypus

Advanced

• What are synapsids sometimes known as?

- A – mammal-like reptiles
- B – true reptiles
- C – ancient lizards
- D – dinosaurs

• How did a Dimetrodon lower its body temperature?

- A – angle itself towards the sun
- B – bury itself in the sand
- C – restrict the blood vessels in its sail
- D – increase its heart rate

• In which era did dinosaurs dominate the Earth?

- A – Cenozoic
- B – Mesozoic
- C – Paleozoic
- D – Anthropocene

• How did some theropids mark their territory?

- A – by howling
- B – with claw-marks on trees
- C – by building nests
- D – with scent glands

• Answers

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