Unit 27 · Animal Adaptation

ANSWER KEY · FOR TEACHERS

Full marks 35

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. adaptation → **h.** the inherited fitting of an organism to its habitat
2. secondary aquatic → **g.** living in water, with ancestors that lived on land
3. cursorial → **f.** adapted for running fast on the ground
4. fossorial → **c.** adapted for digging and living underground
5. scansorial → **a.** adapted for climbing
6. unguligrade → **b.** standing on the hoofed tips of the toes
7. autotomy → **j.** breaking off a part of one's own body to escape
8. patagium → **i.** a fold of skin stretched out as a wing

Each carries 0.5 mark. K · 4

2 Label the diagram

1. gill cover
2. pectoral fin
3. swim bladder (inside)
4. scales with mucus
5. lateral line
6. caudal fin

Each carries 0.5 mark. K · 3

3 Multiple choice

i. **b.** digitigrade — K · 1

Cats walk on their toes with soft pads underneath and the heel raised: **digitigrade**.

ii. **b.** scansorial animals — K · 1

Scansorial (Latin *scandere*, to climb) is another word for arboreal, climbing animals.

iii. **c.** physiological — U · 1

It is about how an organ **works** (the kidney concentrating urine), so it is **physiological**. A structural adaptation would be a body part's shape; a behavioral one, something the animal does, such as staying in its burrow by day.

iv. **b.** its ancestors were land mammals that returned to the sea — U · 1

"Secondary" means the line went back to water **after** living on land. Whales still have land-mammal features: lungs, hair on the snout of a newborn, milk, small hipbones, and finger bones inside the flipper. A whale never comes on land and has no gills.

v. **c.** large eyes and long outer ears — A · 1

Underground there is little light, and large eyes or ears would only fill with soil, so fossorial animals have **tiny eyes and small or no outer ears**. The rest are all features for digging.

4 Very short answers

a. MARKING SCHEME — K · 1

✓ Water movement (currents, vibrations, pressure changes).

b. MARKING SCHEME — K · 1

✓ The left ovary.

c. MARKING SCHEME — U · 1

✓ Blubber keeps it warm in water, which draws heat away fast.

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5 Short answers

a. MARKING SCHEME — U · 2

- ✓ The swim bladder's gas makes the fish's density equal the water's, so it hangs at any depth.
- ✓ A shark has none, so it is denser than water and sinks when it stops.

b. MARKING SCHEME — A · 2

- ✓ A longer leg and longer stride; light lower leg; springy tendons.
- ✓ It loses steadiness and grip (can't grasp, climb or dig).

c. MARKING SCHEME — U · 2

- ✓ Millions of tiny hair tips on its toe pads held by van der Waals forces.
- ✓ Not suction: it sticks in a vacuum too.

d. MARKING SCHEME — U · 3

- ✓ Any one feature, e.g. a compact body or conical snout.
- ✓ Any second, e.g. short, clawed, shovel-like forelimbs.
- ✓ Any third, e.g. tiny eyes and ears or a short tail, with an example.

6 Long answers

a. ANSWER — U · 4

Alike: both live in water and have a **streamlined** body, and limbs or fins shaped as paddles, for swimming.

Primary aquatic animals	Secondary aquatic animals
Their ancestors always lived in water.	Their ancestors lived on land; they returned to water.
Fishes.	Whales, dolphins, dugongs, seals, turtles, crocodiles, penguins.
Breathe dissolved oxygen by **gills**.	Breathe air by **lungs**; must surface to breathe.
Body covered by scales and mucus.	Skin smooth or with little hair; feathers in penguins.
No blubber; most are cold-blooded.	Blubber under the skin (whales, seals); mammals and birds are warm-blooded.
Most bony fishes have a swim bladder.	No swim bladder; lungs give buoyancy.
Tail fin upright, beats from side to side.	Tail fluke flat, beats up and down (whales).
A lateral line senses water movement.	No lateral line; dolphins find their way by echoes.

MARKING SCHEME

- ✓ Alike: both live in water with a streamlined body and paddle-like limbs or fins.
- ✓ Primary: ancestors always in water (fishes); secondary: ancestors on land (whales, dolphins, turtles).
- ✓ Gills against lungs, surfacing to breathe.
- ✓ Any one more, e.g. scales against blubber, swim bladder, upright tail against a flat fluke, lateral line.

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b. ANSWER U · 4

Alike: both are built for **fast movement**, with a streamlined body, powerful muscles and light limbs, and both need much oxygen and energy.

Volant animals	Cursorial animals
Fly or glide through the air.	Run fast on the ground.
Forelimbs changed into **wings** (birds, bats) or skin folds (patagia) for gliding.	All four limbs (two in the ostrich) are long legs for running.
Body covered by **feathers** (birds) or held up by a wing membrane (bats).	Body covered by hair or skin; no flight surfaces.
Pneumatic (hollow) bones and **air sacs** (birds).	Solid, strong limb bones; no air sacs.
Keeled sternum for the flight muscles.	Flat breastbone; strong shoulder and thigh muscles.
Hindlimbs used for perching and landing.	Digitigrade or unguligrade feet for running.
Examples: pigeon, bat, *Draco*, flying fish.	Examples: cheetah, horse, deer, ostrich.

MARKING SCHEME

- ✓ Alike: built for fast movement; streamlined, powerful muscles, light limbs.
- ✓ Volant fly or glide with wings or patagia; cursorial run on long legs.
- ✓ Volant: feathers, pneumatic bones, air sacs, keeled sternum; cursorial: solid limb bones, flat breastbone.
- ✓ Examples of each, e.g. pigeon and bat against cheetah and horse.

7 Think

ANSWER HA · 3

It breathes air with **lungs** and must come up to breathe, through a blowhole on top of its head; its flat tail **fluke beats up and down**, as a running mammal's back bends, while a fish's tail beats from side to side; its flipper has the **arm and finger bones** of a land mammal; it is warm-blooded, with blubber, and feeds its young on **milk**; small hip bones remain inside.

MARKING SCHEME

- ✓ Any one, e.g. lungs and a blowhole.
- ✓ Any second, e.g. a fluke that beats up and down.
- ✓ Any third, e.g. finger bones in the flipper, milk, or hip bones.

8 Activity: Adaptations in the laboratory (Activity 9.2)

(not marked)

WHAT STUDENTS SHOULD FIND

For example: rohu, fresh water, primary aquatic, fins and gills under an operculum; turtle, water, secondary aquatic, flippers and lungs; pigeon, air, volant, feathers and a keeled sternum; bat, air, volant, a patagium on long fingers; house lizard, walls, scansorial, toe pads and autotomy; mole, underground, fossorial, shovel hands and tiny eyes. A bat and a bird both have wings from their forelimbs, and a dolphin and a fish both have a streamlined body: the same problem solved in the same way by unrelated animals.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	11	18	3	3	**35**

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