Grade 11 Biology, Explained

Unit 24 · Animalia: body plans, sponges to annelids

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. diploblastic → **i.** developed from two germ layers, with mesoglea between them
2. deuterostome → **g.** an animal whose blastopore becomes the anus
3. pseudocoelom → **e.** a body cavity from the blastocoel, lined by mesoderm on one side only
4. schizocoel → **c.** a true coelom formed by the splitting of mesoderm
5. metameric segmentation → **d.** segments of one age, repeated outside and inside
6. ovoviviparous → **b.** eggs hatch inside the mother; the young live on the yolk
7. uricotelic → **j.** giving out nitrogen mainly as uric acid
8. flame cells → **a.** excretory cells of flatworms with a flickering tuft of cilia

Each carries 0.5 mark. K · 4

2 Label the diagram

1. a. Acoelomate flatworms
2. no cavity: parenchyma
3. b. Pseudocoelomate roundworms
4. pseudocoelom
5. c. Coelomate annelids to chordates
6. true coelom

Each carries 0.5 mark. U · 3

3 Multiple choice

i. **d.** glass rope sponge — K · 1

Hyalonema is anchored by a long twisted rope of glassy silica spicules: the **glass rope sponge**. The bath sponge is *Euspongia*; the urn sponge *Sycon*.

ii. **b.** flame cells — K · 1

Flatworms excrete through **protonephridia** with **flame cells**. Renette cells belong to roundworms, nephridia to annelids, coxal glands to *Limulus* and spiders.

iii. **c.** a starfish — U · 1

Blastopore to anus means a **deuterostome**: echinoderms (the starfish) and chordates. Earthworms, cockroaches and snails are protostomes: their blastopore becomes the mouth.

iv. **c.** Anthozoa — U · 1

Anthozoa (sea anemones and corals) are polyps all their lives. Scyphozoa are mostly medusae; many Hydrozoa have both.

v. **b.** Oligochaeta — A · 1

Few setae and a clitellum, with no head or parapodia: **Oligochaeta**, the earthworms. Polychaetes have parapodia with many setae and a head; leeches have suckers and no setae.

4 Very short answers

a. MARKING SCHEME — K · 1

✓ Calcarea, Hexactinellida and Demospongiae.

b. MARKING SCHEME — K · 1

✓ Planula.

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c. MARKING SCHEME U · 1

✓ Hemoglobin is dissolved in the plasma.

5 Short answers

a. MARKING SCHEME U · 2

✓ Blind sac: one opening for food and waste, e.g. *Hydra*.

✓ Tube within tube: mouth and anus, food moves one way, e.g. the earthworm.

b. MARKING SCHEME A · 2

✓ The male is smaller and thinner, with a curved tail; the female larger, with a straight tail.

✓ The male has penial spicules at its cloacal aperture; the female has a vulva about a third of the way from the front.

c. MARKING SCHEME A · 2

✓ Cestoda; pseudosegmentation.

✓ The proglottids are of different ages, budding from the neck; true segments are of one age and form together.

d. MARKING SCHEME U · 3

✓ Any one difference, e.g. head or no head.

✓ Any second, e.g. parapodia with many setae against a few setae.

✓ Any third (clitellum, sexes, larva), with an example of each (*Nereis*, *Pheretima*).

6 Long answers

a. ANSWER U · 4

Alike: both are aquatic, many-celled, **diploblastic** animals with a central cavity, no coelom, no respiratory, circulatory or excretory system, and both reproduce asexually by **budding** and **regeneration** as well as sexually.

Different:

Hydra	*Sycon*
phylum **Coelenterata**, class Hydrozoa	phylum **Porifera**, class Calcarea
fresh water	sea water
tissue grade	**cellular** grade
radially symmetrical	radially symmetrical (many sponges asymmetrical)
cavity is the **coelenteron** (gastrovascular cavity), lined by gastrodermis	cavity is the **spongocoel**, lined by choanocytes
one opening, the **mouth**, ringed by **tentacles**	many small **ostia** and one **osculum**; no mouth or tentacles
nematocysts (stinging cells)	no stinging cells; a skeleton of **calcareous spicules**
digestion extracellular and intracellular	digestion intracellular only
a **nerve net**	no nerve cells
can glide and somersault	fixed (sessile)
larva: **planula** (in most coelenterates; *Hydra* develops directly)	larva: **amphiblastula**

MARKING SCHEME

✓ Alike: aquatic, diploblastic, no coelom, budding and regeneration.

✓ *Hydra* is a coelenterate at the tissue grade; *Sycon* a sponge at the cellular grade.

✓ *Hydra* has a coelenteron with one mouth and tentacles; *Sycon* a spongocoel with ostia and an osculum.

✓ *Hydra* has nematocysts and a nerve net; *Sycon* has calcareous spicules and no nerve cells.

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b. ANSWER U · 4

Metagenesis, the alternation of an asexual **polyp** generation with a sexual **medusa** generation, occurs in the phylum **Coelenterata** (Cnidaria), for example in *Obelia*.

Unique features:

a. The first animals with the **tissue grade** of organization; **diploblastic**, with mesoglea between the two layers.
b. **Nematocysts** (stinging cells) for catching prey and defense.
c. A single internal cavity, the **coelenteron** (gastrovascular cavity), with one opening, the mouth: an **incomplete** gut.
d. **Polymorphism**: polyp and medusa forms.
e. **Radial** (or biradial) symmetry, with **tentacles** round the mouth.
f. A diffuse **nerve net**, with no brain.
g. A free-swimming **planula** larva; some build **coral reefs**.

MARKING SCHEME

✓ Coelenterata (Cnidaria), e.g. *Obelia*: polyp (asexual) alternating with medusa (sexual).
✓ Tissue grade, diploblastic; nematocysts.
✓ A coelenteron with one opening (incomplete gut); polymorphism.
✓ Radial symmetry with tentacles; a nerve net; a planula larva (any two).

7 Think

ANSWER HA · 3

Hydra has a **blind sac**: one opening is both mouth and anus, so food and waste must use it in turn. The earthworm has a **tube within a tube**, with a mouth and an anus, so food moves **one way**: it can take in food at one end while waste leaves at the other. Because food passes in order, **different parts** of the tube can **specialize**, one to grind, one to digest, one to absorb, like a factory line.

MARKING SCHEME

✓ *Hydra*: a blind sac with one opening, so eating and getting rid of waste happen in turn.
✓ Earthworm: tube within tube, mouth and anus, food moving one way.
✓ Parts of a one-way gut can specialize (grind, digest, absorb).

8 Activity: Sort the museum (Activity 8.5)

(not marked)

WHAT STUDENTS SHOULD FIND

For example: a sponge, cell aggregate, asymmetrical, none; *Hydra*, blind sac, radial, none; a tapeworm, no gut at all, bilateral, pseudo; *Ascaris*, tube within tube, bilateral, none; an earthworm, tube within tube, bilateral, metameric; a starfish, tube within tube, radial (adult), none. Every segmented animal is **bilateral**, and every radial one has a blind sac or is an adult echinoderm.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	8	19	5	3	**35**

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Grade 11 Biology, Explained

Unit 24 · Animalia: arthropods to chordates

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. ecdysis
2. ommatidia
3. radula
4. hemocyanin
5. madreporite
6. pedicellariae
7. notochord
8. syrinx

K · 4

Each carries 0.5 mark.

2 Label the diagram

1. gill cover (operculum): the gills are under it
2. pectoral fins (pair)
3. scales
4. dorsal fin
5. pelvic fins (pair)
6. lateral line

K · 3

Each carries 0.5 mark.

3 Multiple choice

i. **b.** *Limulus* — K · 1

Limulus, the horseshoe (king) crab: its group goes back about 445 million years, and fossils from the age of the dinosaurs look much like it.

ii. **c.** muscular foot — K · 1

Mollusks move on a ventral **muscular foot**. Tube feet belong to echinoderms, jointed appendages to arthropods, parapodia to polychaetes.

iii. **a.** dorsal, above the notochord, and hollow — U · 1

A chordate's nerve cord is **dorsal**, **hollow** and **single**, lying **above** the notochord. The ventral, solid, double cord with segmental ganglia is the plan of annelids and arthropods.

iv. **b.** *Herdmania* — U · 1

Urochordates (**tunicates**, such as *Herdmania*) have the notochord only in the **tail** of the larva, lost when it settles. In the lancelet (*Branchiostoma*) it runs the whole length of the body all its life; *Balanoglossus* has only a stomochord in its proboscis.

v. **a.** a cartilaginous fish, such as a shark or ray — A · 1

Cartilage, uncovered gill slits, no swim bladder: **Chondrichthyes**. Bony fishes have an operculum over four pairs of gills and usually a swim bladder; a lamprey has no jaws or paired fins.

4 Very short answers

a. MARKING SCHEME — K · 1

✓ Arthropoda; Mollusca.

b. MARKING SCHEME — K · 1

✓ Bipinnaria (then brachiolaria).

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c. MARKING SCHEME U · 1

✓ It is a chelicerate (Merostomata), not a crustacean.

5 Short answers

a. MARKING SCHEME U · 2

✓ It is a cyclostome (Agnatha), not in Pisces, which are jawed vertebrates.

✓ Any two features: no jaws, no paired fins, no scales, one nostril, gills opening by pores.

b. MARKING SCHEME A · 2

✓ Chelicerata, Arachnida.

✓ A correct example, e.g. a spider or scorpion.

c. MARKING SCHEME U · 2

✓ Complete: egg, larva, pupa, adult, e.g. the butterfly.

✓ Incomplete: nymphs like small adults, no pupa, e.g. the cockroach.

d. MARKING SCHEME U · 3

✓ Any one difference, e.g. two pairs against one pair of legs a segment.

✓ Any second, e.g. poison claws.

✓ Any third, e.g. body shape, speed or food.

6 Long answers

a. ANSWER U · 4

a. They are **all marine**, and benthic.

b. The adults are **radially symmetrical** (in fives), though their **larvae are bilateral** and they come from bilateral ancestors: no other group changes symmetry like this.

c. They have a **water vascular system**, found in no other animals, which works the **tube feet** used in moving, feeding and breathing.

d. They have an **endoskeleton** of calcareous ossicles in the skin, with **spines** ("spiny skin"); other invertebrates have an exoskeleton or none.

e. Many have tiny pincers, **pedicellariae**.

f. They have **no head, brain, heart or excretory system**.

g. They are **deuterostomes** and **enterocoelomates**, like the chordates: the invertebrates closest to us.

h. They have great powers of **regeneration**.

MARKING SCHEME

✓ All marine; radial adults with bilateral larvae.

✓ A water vascular system with tube feet.

✓ An endoskeleton of calcareous ossicles with spines; pedicellariae.

✓ No head, brain, heart or excretory system; deuterostome enterocoelomates; regeneration (any two).

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b. ANSWER A · 4

Both fly, with wings made from their **forelimbs**, but the pigeon is a bird (class **Aves**) and the bat a mammal (class **Mammalia**).

Pigeon	Bat
body covered with **feathers**	body covered with **hair** (fur)
the wing is a forelimb carrying **flight feathers**; the fingers are reduced and fused	the wing is a **skin membrane** (patagium) stretched over very **long fingers**
toothless **beak**	jaws with **teeth**
no external ear (pinna); one ear ossicle	an external ear (**pinna**), often large; **three** ear ossicles
no sweat glands; only a preen gland	**sweat**, sebaceous and **mammary** glands
no diaphragm; lungs with air sacs	a **diaphragm**; no air sacs
red blood cells **nucleated**	red blood cells **without a nucleus**
uricotelic; no urinary bladder	ureotelic; a urinary bladder
lays eggs (oviparous)	gives **birth** to young and feeds them **milk** (viviparous)
active by day; finds its way by sight	most fly at night; many find their way by **echolocation**

MARKING SCHEME

- ✓ Pigeon a bird (Aves), bat a mammal (Mammalia); feathers against hair.
- ✓ Wing of flight feathers against a skin membrane over long fingers.
- ✓ Toothless beak against teeth.
- ✓ Any one more, e.g. no pinna against a pinna, or eggs against live young fed on milk.

7 Think

ANSWER HA · 3

An arthropod has an **exoskeleton** of chitin, which must be **shed** to grow; a bigger animal needs heavier armor to carry its weight and stays soft and helpless longer after each molt. Insects breathe by **tracheae**, which carry air only a short way by **diffusion**, so a large body could not get enough oxygen. In the **sea** the water holds up the animal's weight, so a crab can be much bigger.

MARKING SCHEME

- ✓ The exoskeleton must be shed to grow; big animals need heavy armor and are soft longer after a molt.
- ✓ Tracheae carry air only a short way by diffusion.
- ✓ Water supports the body's weight in the sea.

8 Activity: The vertebrates around you (Activity 8.6)

(not marked)

WHAT STUDENTS SHOULD FIND

For example: Pisces, rohu, fins and gills under an operculum, food; Amphibia, toad, moist skin without scales and a three-chambered heart, eats insect pests; Reptilia, house lizard, dry scaly skin and eggs with a leathery shell, eats insects; Aves, house sparrow, feathers and a beak, eats grain and insects; Mammalia, cow, hair and mammary glands, milk and work. Only the **bird** and the **mammal** are warm-blooded (homeothermic).

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	11	14	7	3	**35**

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