

4(a)(i)	<i>any three from:</i> scent ; nectar ; large / colourful, petals ; pollen (as a source of food) ; AVP ;
4(a)(ii)	<i>any one from:</i> large ; sticky / spiky / AW ;
4(b)	<i>any two from:</i> (<i>monocots have</i>) narrow / strap / long/AW, leaves ; parallel (leaf) veins ; scattered vascular, tissue / bundles, (in the stem) ; hollow stems ; petals in multiples of three ; fibrous roots ; one cotyledon ; pollen grains have one pore or furrow ; AVP ;;
4(c)	filament labelled ; sepal labelled ; an ovule labelled ;
4(d)	<i>any five from:</i> 1 pollen (released) from the anther ; 2 pollen transferred to stigma ; 3 <u>pollen tube</u> , grows ; 4 (pollen tube goes) down / through, the style ; 5 ref. to ovule / ovary ; 6 pollen / male, nucleus travels down the (pollen) tube / style ; 7 pollen / male, and, ovule / female, <u>nuclei</u> fuse ; 8 fertilisation ; 9 AVP ;
4(e)(i)	sperm (cell) ;
4(e)(ii)	testis / testes ;
4(e)(iii)	meiosis ;
4(e)(iv)	make fluid / semen, for the sperm / male gametes, to swim / AW ;

2(a)(i)	<i>any two from:</i> multicellular / AW ; producer / <i>ref. to</i> photosynthesis / (presence of) chloroplasts or chlorophyll ; cellulose cell wall ; non-motile ; reproduces asexually, and / or, sexually ; AVP ;
2(a)(ii)	<i>any two from:</i> animal ; fungi ; protocist ; prokaryote ;
2(b)	(vascular bundles) would be in a ring / AW ;
2(c)	root hair labelled ; xylem correctly drawn and labelled ; phloem correctly drawn and labelled ;
2(d)	<i>any two from:</i> transport / AW, of water ; transport / AW, of (mineral) ions / minerals ; support / AW ;
2(e)	<i>any five from:</i> 1 girdled trees produced a greater mass of fruit / ora ; 2 comparative data manipulation ; 3 phloem transports, <u>sucrose</u> / <u>amino acids</u> ; 4 leaves, photosynthesise / produce (named), carbohydrates / sugars ; 5 sugars / sucrose / amino acids, used for <u>growth</u> of fruit ; 6 <i>idea that</i> (in girdled tree) sucrose / sugar / amino acids, stays in the branch / cannot be transported downwards ; 7 <i>ref. to</i> translocation ; 8 leaves are the source ; 9 (growing) fruit is the sink ;
2(f)	pectinase ;

3(a)(i)	single clear outline with no shading ; width of drawing greater than 93 mm ; detail 1 : 5 arms and enclosed shape in middle that doesn't touch the edges ; detail 2 : indication of where colour changes on all limbs
3(a)(ii)	length of line PQ : 93 ± 1 (mm) ; 290 ;;

3(a)(iii)	<i>max two differences from:</i> <table border="1"> <thead> <tr> <th>spiny starfish / Figure 3.2</th><th></th><th>necklace starfish / Figure 3.3</th></tr> </thead> <tbody> <tr> <td>spines / AW</td><td>AND</td><td>smooth / scales / no spines ;</td></tr> <tr> <td>light / bright, in centre</td><td>AND</td><td>dark in centre ;</td></tr> <tr> <td>has five, ossicles / AW, in the centre or has a central pentagon shape</td><td>AND</td><td>does not have five, ossicles / AW, in the centre or no central pentagon shape ;</td></tr> <tr> <td>no white ends to the limbs</td><td>AND</td><td>white ends to the limbs ;</td></tr> <tr> <td>more uniform shaped limbs</td><td>AND</td><td>less uniform shaped limbs ;</td></tr> <tr> <td>straight limbs</td><td>AND</td><td>bent / curved / AW, limbs ;</td></tr> <tr> <td>lines going down the arms</td><td>AND</td><td>no lines going down the arms ;</td></tr> </tbody> </table> <i>max one similarity from:</i> <i>(both have)</i> five, arms / AW ; circle in the middle ; dark arms / arms that are a different colour to the centre ; tapering limbs ; radial symmetry ;		spiny starfish / Figure 3.2		necklace starfish / Figure 3.3	spines / AW	AND	smooth / scales / no spines ;	light / bright, in centre	AND	dark in centre ;	has five, ossicles / AW, in the centre or has a central pentagon shape	AND	does not have five, ossicles / AW, in the centre or no central pentagon shape ;	no white ends to the limbs	AND	white ends to the limbs ;	more uniform shaped limbs	AND	less uniform shaped limbs ;	straight limbs	AND	bent / curved / AW, limbs ;	lines going down the arms	AND	no lines going down the arms ;
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3(b)(i)	<i>any two from:</i> same region ; same <u>size</u> of area / 20 m ² , (sampled) ; same day / same time of year / both in July / same date ; depth measured at, same time of tide / high tide / when water at its highest ;
3(b)(ii)	axes labelled with units ; suitable linear scale on number of starfish axis and ranges given for depth axis and data occupies at least half the grid in both directions ; five accurate plots $\pm$ half a small square ; bars of equal width $\pm$ half a small square with no gaps between them ;
3(b)(iii)	<u>10–19.9</u>
3(b)(iv)	<i>total number of starfish photographed:</i> 3428 ; <i>percentage in the 0.0–9.9m range:</i> 10 (%) ;;

3(a)(i)	outline clear and continuous, no shading ; size greater than half of space provided ; detail 1 : tear-shaped white patch on the left with a border and tear-shaped white patch below the beak ; detail 2 : two or more lines on the beak ;
3(a)(ii)	46 $\pm$ 1 (mm) ; 109.5 (mm) ;;
3(b)	<i>any two from:</i> <i>Gentoo has:</i> less white area / white patch around eye is triangular-shaped vs semicircular-shaped ; rounder / bigger / wider eye ; slimmer / narrower / thinner / sharper, beak ; larger pale area on beak / no stripe vs black-footed has a stripe ; smoother beak ;

3(c)	1 independent variable at least two different thicknesses of insulation (used as an insulator) ; 2 dependent variable change in temperature / time taken for a stated fall in temperature ; 3 and 4 method ;; - method of insulating beaker with named material - measure the starting temperature and final temperature 5, 6 and 7 variables kept constant ;;; - volume of water - size - type of beaker - time left to cool / stated fall in temperature - starting temperature - type of insulator - same surroundings / environmental temperature 8 repeat investigation twice more / at least two replicates ; 9 relevant safety precaution ;
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Question 2 (Answer: B)

- Feathers are unique to birds – no other group has them.
- Birds also lay hard-shelled eggs.
- Hair belongs to mammals, and wings alone are not enough since insects and bats have them too.

Question 3 (Answer: D)

- Chloroplasts and a cell wall suggest a plant, but the organism is *single-celled*.
- A nucleus rules out a prokaryote.
- A single-celled organism with a nucleus and chloroplasts belongs to the protoctists.

4(a)(i)	B – palisade mesophyll ; C – (lower) epidermis ;
4(a)(ii)	<i>any two from:</i> diffusion of (named) gases for photosynthesis / respiration ; diffusion of <u>water vapour</u> for transpiration ; idea of buoyancy / to make the leaf float (to get more light) ;
4(a)(iii)	<i>any two from:</i> traps light energy ; transfers energy from light into energy in chemicals ; (energy) for the synthesis of (named) carbohydrates ;
4(a)(iv)	<i>any two from:</i> - water lilies do not need to prevent water loss ; - carbon dioxide uptake is less restricted / AW ; - use less resources to produce a cuticle ; - allows more light to penetrate ; - to the palisade (mesophyll) layer ; - AVP ;
4(b)(i)	57 300 (stomata per cm ²) ;
4(b)(ii)	<i>any four from:</i> - pondweed is submerged in water so no need for stomata to let air into a leaf ; - oxygen and carbon dioxide can diffuse into, leaf / cells, from water ; - water lily has stomata only on upper surface ; - because lower surface is, on the surface of the water / under the water ; - constant water supply to water lily / no risk of wilting ;
4(c)(i)	<i>any one from:</i> - thin / strap-shaped, leaves ; - parallel veins ;

4(c)(ii)	<i>any three from:</i> 1 reduced <u>aerobic</u> respiration can occur ; 2 less energy released for active transport ; 3 less nitrate ions absorbed ; 4 less amino acids (to make protein) ; 5 less energy released for protein synthesis ; 6 more <u>denitrifying</u> (bacteria) ; 7 less <u>nitrogen fixing</u> (bacteria) ; 8 fewer nitrate ions in the soil ;
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Question 2 (Answer: A)

- Arachnids have four pairs of legs and a pair of pedipalps; insects have three pairs of legs.
- The pedipalp shown is the giveaway – no insect or crustacean has one.
- Myriapods have many body segments each bearing legs, which this animal does not.