OCR
Oxford Cambridge and RSA

GCE

Biology A

Unit **H020/02:** Depth in biology

Advanced Subsidiary GCE

Mark Scheme for June 2018

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

Annotation	Meaning
DO NOT ALLOW	Answers that are not worthy of credit
IGNORE	Statements that are irrelevant
ALLOW	Answers that can be ALLOWed
( )	Words that are not essential to gain credit
__	Underlined words **must** be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument
_ _ _ _	Subject-specific expected terms and names that should be used rather than described

Marking Annotations

Annotation	Use
BOD	Benefit of Doubt
CON	Contradiction
	Cross
ECF	Error Carried Forward
GM	Given Mark
	Extendable horizontal wavy line (to indicate errors / incorrect science terminology)
I	Ignore
	Large dot (various uses as defined in mark scheme)
	Highlight (various uses as defined in mark scheme)
NBOD	Benefit of the doubt not given
	Tick
^	Omission Mark
BP	Blank Page
L1	Level 1 answer in Level of Response question
L2	Level 2 answer in Level of Response question
L3	Level 3 answer in Level of Response question

Question	Answer	Mark	Guidance
1(a)(i)	**Both must be correct for mark** **U** = amino / amine (group) **and** **V** = carboxyl / carboxylic acid (group) ✓	1	**Additional incorrect answer on either line = 0 marks** **DO NOT ALLOW** imino / amide for **U** **ALLOW** carboxil / spelling that looks and sounds same **DO NOT ALLOW** carbonic / carbonyl for **V**
1(a)(ii)	**Both must be correct for mark** peptide / amide (bond) **and** condensation (reaction) ✓	1	**Additional incorrect answer on either line = 0 marks** **IGNORE** covalent **DO NOT ALLOW** dipeptide **DO NOT ALLOW** hydrolysis
1(b)(i)	**1** gene / DNA**,** copied / transcribed**,** to (m)RNA ✓ **2** (*idea that* RNA goes to / translation is at) ribosome(s) / RER ✓ **3** DNA**,** is too large to / cannot / is not able to**,** leave nucleus / cross nuclear envelope / fit through nuclear pores ✓	2 max	**Read all and mark as prose** **ALLOW** used as a template to create / AW, for 'copied to' **ALLOW** RNA, copies / takes a copy of, gene / DNA **DO NOT ALLOW** replicated for 'copied' **ALLOW ORA** 'RNA, is small enough to / can / is able to' or just 'RNA leaves nucleus' **ALLOW** nuclear membrane for 'nuclear envelope' **DO NOT ALLOW** leave the cell for 'leave nucleus'
1(b)(ii)	90 252 **or** 90 255 **or** 90 258 ✓✓	2	**Correct final answer gets 2 marks**, even if no working is shown. Wrong final answer (which may include a 90 252 stage in the working) = **ALLOW 1 mark for seeing any of these:** 327 x 92 x 3 **OR** 30 084 **OR** 981

Question	Answer	Mark	Guidance
1b(iii)	For answers marked by levels of response: Read through the whole answer from start to finish, concentrating on features that make it a stronger or weaker answer using the indicative scientific content as guidance. The indicative scientific content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the science content of the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, **best** describes the overall quality of the answer using the guidelines described in the level descriptors in the mark scheme. Once the level is located, award the higher or lower mark. **The higher mark** should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met. **The lower mark** should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing. **In summary:** • **The science content determines the level.** • **The communication statement determines the mark within a level.**	6 max	*Communication may be via bullet points, a table of comparisons, labelled diagrams or prose.* Indicative scientific points may include the following: FIBROUS PROTEINS Properties: • insoluble • elongated / long / rods / filaments / ropes / strands • strong / tough • flexible IGNORE size refs / compact / coiled / bond types / hard Functions: Look for the general category or for a named protein or glycoprotein example with supporting detail. Related categories and examples are paired or grouped together: • for structure • collagen in, bone / cartilage / connective tissue / tendons / ligaments / skin / blood vessels • fibrin + role described • for protection • keratin in, skin / hair / nails • to give, elasticity / elastic properties • elastin in, (named) blood vessels / alveoli / cartilage • for, contraction / mechanical movement • actin / myosin, in muscle • microtubules in, cilia / flagella / spindle / cytoskeleton

Question	Answer	Mark	Guidance
	Level 3 (5–6 marks) A detailed comparison of the properties **and** functions of fibrous **and** globular proteins. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated*. **Level 2 (3–4 marks)** A comparison of the properties **and/or** functions of fibrous **and** globular proteins. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.* **Level 1 (1–2 marks)** A limited comparison of the properties **or** functions of fibrous **and** globular proteins. *A basic structure and some relevant information is provided, although a clear line of reasoning may not be present. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.		GLOBULAR PROTEINS Properties: • soluble • spherical / ball-shaped • have, 3D / tertiary / 3o, shape / structure • specific / complementary (to another molecule) • ref. conjugated / contain prosthetic group • temperature / pH, sensitive • hydrophilic on outside IGNORE size refs, compact, round, bond types Functions: Look for the general functional category name or description, or a named protein or glycoprotein example with some supporting detail. • enzymes / metabolic role / to catalyse reaction(s) / to lower activation energy • named enzyme + its specific role described • hormones / receptors / for cell signalling • named hormone / insulin + role described • antibody / for immunity / defence against infection • opsonin / antitoxin / agglutinin + role described • fibrinogen in blood clotting • to transport substances across cell membranes • carrier / channel / pump + role described • to transport substances in blood • haemoglobin + role described e.g. carry oxygen • to, package / organise DNA

Question	Answer	Mark	Guidance
1(b)(iv)	**EITHER** **1** 9300 / 9700 ✓ **2** deaths year $^{-1}$ or deaths per year or deaths / year ✓ **OR** **3** 9.3 / 9.7 ✓ **4** thousand deaths year $^{-1}$ or thousand deaths per year or thousand deaths / year ✓	2	Correct answer to 2 s.f. **with** correct matching units = **2 marks** **ALLOW** mark for unit even if no or wrong figure given **ALLOW** minus sign with number or 'fewer' with unit **ALLOW** from AIDS / of AIDS in unit **ALLOW** mp 3 so long as the **word thousand** appears afterwards or in the units (even if the unit is wrong in another respect) **DO NOT ALLOW** '*9.3 1000 deaths per year*' for mp3 (but gets mp 4)
1(b)(v)	*(answers must relate to **data** on graph)* **1** decrease in new diagnoses, from 1992 / already / began before 1995 ✓ **2** peak / plateau, in deaths, from 1994 / already / began before 1995 ✓ **3** no change in / same, (rate of) increase in people living with AIDS, before / after, 1995 ✓	2 max	**ALLOW** when, saquinavir / drug / medicine, was introduced for '1995' in mps **1**, **2** and **3** **ALLOW** new diagnoses decrease at same time as deaths **ALLOW** from / since / after, 1993 (instead of 1992)

Question	Answer	Mark	Guidance
1(c)(i)	*(suggestion(**S**) PLUS reason (**R**) needed)* **1 S** put pencil line / origin / amino acids, higher (than the solvent / 1cm) **+** **1 R** to stop, spots / samples / amino acids, dissolving into / mixing with / touching, <u>solvent</u> ✓ **2 S** put, amino acids / spots / them, further apart / on separate plates **+** **2 R** to stop them, merging / touching / clashing / AW ✓ **3 S** touch plate edges / wear gloves / use forceps / don't touch middle, **+** **3 R** to prevent, contamination / transfer of substances from hands ✓ **4 S** place, lid / cover, over beaker **+** **4 R** to prevent evaporation (of solvent) ✓ **5 S** support the plate / attach plate to beaker **+** **5 R** to keep plate, vertical / still / at constant height ✓ **6 S** use ninhydrin **+** **6 R** to, see / visualise, amino acids ✓ **7 S** repeat and find, mean / average (Rf value) **+** **7 R** to improve, accuracy / check for repeatability / exclude anomalies ✓ **8 S** label, amino acids / spots / samples (in pencil / on beaker) **+** **8 R** to know which is which / avoid confusion ✓	4 max	**Read all and mark as prose**. **ALLOW** paper / chromatogram / gel, for 'plate' **IGNORE** measure in mm instead of cm **ALLOW** 'or otherwise x would happen' in place of the reason 'to stop x' throughout **ALLOW 1S** ORA less solvent / make solvent lower **OR** make plate / paper, higher **DO NOT ALLOW 1S** pen / permanent marker, line **ALLOW 1R** so only bottom of plate touches solvent **ALLOW 2S** put same distance apart / spread them apart **ALLOW 2R** ORA so they are, distinguishable / clear **ALLOW 3R** amino acids / oils for 'substances' **ALLOW 3R** *idea of* not damaging, stationary phase / silica gel / alumina / AW **ALLOW 4S** close beaker / line beaker with filter paper soaked in solvent **ALLOW 5S** description e.g. use clips / pencil / clamp / rod **ALLOW 5R** ORA to stop plate, tilting / trembling / moving **IGNORE 6S** UV / iodine / permanganate **ALLOW** '*no need, to stain / for ninhydrin, as spots shown up already*' (on Fig. 1.4) **= 1 mark**

Question	Answer	Mark	Guidance
1(c)(ii)	**1** *answer must lie within this range:* 0.1(0) to 0.15 **AND** *supporting calculation must be shown, e.g:* $\frac{0.65}{4.95}$ (= 0.13) ✓ **2** glutamine ✓		**No mark** for figure in correct range unless it also shows the working out of this calculation: $\frac{\text{distance from origin to spot}}{\text{distance from origin to solvent front.}}$ **ALLOW** figures given in **mm** **ALLOW** figures with no unit shown **ALLOW** variation in measurements taken **so long as** the final answer falls within the allowed range. **ALLOW** mp2 even if no attempt is made at working stage

Question	Answer	Mark	Guidance
2(a)(i)	(supraventricular) tachycardia ✓	1	**ALLOW** tachyarrhythmia **ALLOW** spelling variants: tachycardic / tacchycardia / tackycardia (to sound same, not 'tr' at start) **DO NOT ALLOW** trachecardia / tracardia / tracycardia / tracchycardia / trachycardia
2(a)(ii)	*calculated cardiac output (in cm^3):* figure in range from 5333 to 5520 ✓ *presentation in standard form:* figure in range from 5.3(33) x 10^3 to 5.5(20) x 10^3 ✓ *units:* cm^3 min^{-1} **OR** cm^3 / min(ute) OR cm^3 per min(ute) ✓	3	**Correct answer in standard form** gets 2 marks automatically if working not shown for mp 1. **ALLOW** calculated figure within this range **ALLOW** up to 3 extra decimal places within this range **DO NOT ALLOW** rounding error when reducing no. of s.f. **ALLOW** up to 3 extra significant figures e.g. 5.48571 x 10^3 **ALLOW** ECF for any calculated figure outside the allowed range presented in standard form: e.g. 4800 shown as 4.8 x 10^3 gets mp2 **ALLOW** ECF if >3 extra d.p. already penalised for mp 1 **ALLOW** conversion from cm^3 to **dm^3** so for example: 5.333 / 5.434 / 5.463 / 5.485, **x 10^0 dm^3 minute^{-1}** and 5.3 / 5.4 / 5.5, **x 10^0 dm^3 min^{-1}** gets 3 marks **DO NOT ALLOW** beats or letter 'b' in unit
2(a)(iii)	**1** impulse **OR** (wave of) depolarisation **OR** wave of excitation ✓ **2** correct ref. atrioventricular node / AV node / AVN ✓ **3** (through / along) bundle of His / Purkyne fibres, to (cause contraction of) ventricles ✓	2 max	**IGNORE** signals / messages / electrical waves **IGNORE** SAN

Question	Answer	Mark	Guidance
2(b)(i)	*assume answer refers to heart **2** unless stated otherwise:* can see / it has, aorta / (pulmonary) artery / (pulmonary) vein / vena cava / <u>blood</u> vessel(s) ✓	1	**DO NOT ALLOW** coronary artery **ALLOW** ORA that aorta / (pulmonary) artery / (pulmonary) vein / vena cava / <u>blood</u> vessel(s), not present on heart **1**
2(b)(ii)	**Z** = <u>left ventricle</u> ✓	1	**IGNORE** cardiac muscle
2(c)	For answers marked by levels of response: Read through the whole answer from start to finish, concentrating on features that make it a stronger or weaker answer using the indicative scientific content as guidance. The indicative scientific content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the science content of the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, **best** describes the overall quality of the answer using the guidelines described in the level descriptors in the mark scheme. Once the level is located, award the higher or lower mark. **The higher mark** should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met. **The lower mark** should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing. **In summary:** • **The science content determines the level.** • **The communication statement determines the mark within a level.**	6 max	

Question	Answer	Mark	Guidance
	Level 3 (5–6 marks) A detailed description of the cardiac cycle with references to B, C, and D in Fig. 2.3. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated*. **Level 2 (3–4 marks)** A description of the cardiac cycle with some references to B, C and/or D in Fig. 2.3. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.* **Level 1 (1–2 marks)** A basic description of the cardiac cycle with limited reference to B, C and/or D in Fig. 2.3. *A basic structure and some relevant information is provided, although a clear line of reasoning may not be present. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.		Indicative scientific points may include the following: (answers may start at any point in the cycle. IGNORE box A description) B • atrial diastole • ventricular diastole • atria relax • ventricles relax • blood flows through, atrioventricular / AV / bicuspid / tricuspid, valve(s) OR ref. to their opening (more) • blood enters atria (passively) • blood enters ventricles (passively) C • atrial systole • atria contract • pressure (on blood) in atria increases • blood flows through, atrioventricular / AV / bicuspid / tricuspid, valve(s) OR ref. to their being open • ventricles fill / more blood enters ventricles • volume (of ventricles) increases • pressure (of blood against ventricles) increases • pressure in arteries is, low / at a minimum D • ventricular systole • ventricles contact • volume (of ventricles) decreases • pressure (on blood in ventricles) increases • atrioventricular / bicuspid / tricuspid, valves close • semi-lunar valves open • blood flows into aorta • blood flows into pulmonary arteries

Question	Answer	Mark	Guidance
3(a)	(using) microtubules / tubulin / motor proteins ✓	1	**ALLOW** kinesins / dyneins / 'moto' proteins **IGNORE** spindle fibres, centrioles
3(b)	**1** goblet cells, secrete / release / make / produce / form, mucus ✓ **2** mucus traps, pathogens / microorganisms / bacteria ✓ **3** ref. phagocytes / neutrophils / macrophages / lysozyme ✓ **4** cilia / ciliated cells / ciliated epithelium, sweep / brush / waft / move / AW, mucus ✓ **5** cytoskeleton / microtubules / tubulin, move(s) / make(s) up, the cilia ✓	4 max	**IGNORE** excrete **ALLOW** named example of a lung pathogen **IGNORE** cilia trap, pathogens / microorganisms **ALLOW** 'cillia' / other spelling that looks and sounds same **DO NOT ALLOW** cilia cells

Question	Answer	Mark	Guidance
3(c)(i)	(stage) **2** (should say), non-self / not self / foreign ✓ (stage) **5** (should be) before **4 / 4** (should be) **after 5** ✓	2	**ALLOW** quote to replace stage number **2**, e.g. *'phagocytes recognise pathogens as non-self'* *'phagocytes do **not** recognise pathogens as **self*** **IGNORE** non-body **ALLOW 4** and **5** are in wrong order / should be reversed / need swapping / should be the other way round / AW **ALLOW** quote to replace stage numbers, e.g. *'phagosome combines with a lysosome **before** stage 4'* *'enzymes from lysosomes digest pathogens **after** stage 5'* *'forms a phagolysosome and THEN destroys the pathogen'* *'phagosome and lysosome do not combine AFTER the pathogen is destroyed'*
3(c)(ii)	minimum of one light chain drawn on outside of heavy chain **and** label to, light (polypeptide) chain / variable region / antigen-binding site ✓	1	**GUIDELINES for drawing:** Light chain should start at tip of arm of Y and be 25–50% the length of the heavy chain. **ALLOW** label line not touching if label written near correct region

<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>4(a)(i)</td><td>
<table>
<tr><th>Important role</th><th>Ion</th></tr>
<tr><td>Production of nitrate ions by bacteria</td><td>NH_4^+</td></tr>
<tr><td>Loading of phloem</td><td>H^+</td></tr>
<tr><td>DNA structure</td><td>PO_4^{3-}</td></tr>
<tr><td>Cofactor for amylase</td><td>Cl^-</td></tr>
</table>
✓✓</td><td>2</td><td>Additional incorrect answer in a cell = 0 marks

Symbols must be fully correct

all three correct = 2 marks

one or two correct = 1 mark

none correct = 0 marks</td></tr>
<tr><td>4(a)(ii)</td><td>at arterial end
AND
hydrostatic / 4.6, is greater than, oncotic / –3
AND
(fluid / plasma) moves, out / from, (capillary) ✓

at venous end
AND
hydrostatic / 2.3, is lower than, oncotic / –3
AND
(tissue fluid) moves into (capillary) ✓</td><td>2</td><td>Statements must:
• name the end of the capillary
• make a comparative statement about the two pressures in the capillary (using name or number)
• state the direction of movement of fluid.

ALLOW bigger / higher / more, for ‘greater’
ALLOW ORA oncotic / –3, less than hydrostatic / 4.6

ALLOW ORA fluid moves into tissues
IGNORE osmosis

ALLOW smaller / less, for ‘lower’
ALLOW ORA oncotic / –3, more than hydrostatic / 2.3

ALLOW ORA fluid moves, out of / from, tissues
IGNORE osmosis</td></tr>
</table>

Question	Answer	Mark	Guidance
4(b)(i)	**1** inhibitor binds to, allosteric site / enzyme away from active site ✓ **2** changes, tertiary / 3D, structure of, enzyme / active site / protein **OR** active site no longer complementary to substrate **OR** substrate and, enzyme / active site, cannot, bind / fit (together) **OR** E-S compex cannot form ✓	2	**ALLOW** catalase for 'enzyme' throughout **ALLOW** hydrogen peroxide / H_20_2, for 'substrate' throughout **ALLOW** joins / fits into, for 'binds' **ALLOW** shown on diagram **ALLOW** conformation / shape for 'structure' **IGNORE** denatures
4(b)(ii)	**1** downward-sweeping curve showing negative correlation drawn ✓ ***2*** x axis label = conc(entration) of copper sulfate in moles dm^{-3} **AND** y axis label = vol(ume) of oxygen (gas produced) in cm^3 ✓	2	**DO NOT ALLOW** straight line or plotted points that are not joined. Curve may level off at end. Allow 'dot-to-dot' curve. **ALLOW** $CuSO_4$ / copper sulphate, for 'copper sulfate' **ALLOW** slash before unit / slash or 'per' in the unit / brackets round unit **ALLOW** variant symbols: M **OR** moles L^{-1} **OR** moles / L **OR** mol dm^{-3} **ALLOW** O_2 for 'oxygen'

Question	Answer	Mark	Guidance
4(b)(iii)	*(trend described)* **1** as (concentration of) copper, sulphate / ions, **increases**, (volume of) oxygen / H_2O_2 breakdown, **decreases** ✓	2 max	**ALLOW** AW for 'decrease' e.g.reduce / decline / drop / fall **ALLOW** AW for 'increase' e.g. go up / rise / climb **ALLOW** AW so long as inverse trend is still made clear by use of comparative terms such as: increases / decreases, higher / lower, more / less E.g. *'when there is more $CuSO_4$, less oxygen is produced'* **ALLOW** ORA, e.g. '*the lower the concentration of Cu^{2+} the higher the volume of oxygen produced'*
	(conclusion / inference, about activity of enzyme) **2** copper, sulphate / ions, inhibit(s) / decrease(s), <u>catalase</u> activity ✓		**IGNORE** '*disturbs the action of catalase*'
	(detail) **3** at high concentrations / 0.15 / 0.20 **EITHER** most enzymes, (irreversibly / already) damaged / inhibited **OR** adding more copper (sulphate / ions) has little effect ✓		

Question	Answer	Mark	Guidance
4(b)(iv)	**1** compare / measure / test, catalase activity / oxygen produced ✓ **2** experimental detail ✓ **3** further experimental detail ✓ **4** less, oxygen / catalase (activity), means more, copper / pollution ✓ **5** use, Table 4 / graph, to estimate copper (ion) concentration ✓	3 max	**IGNORE** how much oxygen is in each fish **IGNORE** how much catalase is in each fish *experimental detail points:* **ALLOW** AW throughout **IGNORE** amount throughout **i** prepare a , catalase / fish / tissue, extract / sample (e.g. ref. pestle and mortar / chopping / liquidiser) **ii** equal / known / controlled, volume / sized samples (of fish / tissue / extract) **iii** equal / known / controlled, concentration / volume, of hydrogen peroxide **iv** measure, volume of, oxygen / gas, in a given time **v** use gas syringe / collect gas under water **ALLOW** correct statement of relationship between copper or pollution **and** oxygen **or** amount of catalase present **or** catalase activity **even if wrong experiment is done** (e.g. adding catalase or copper sulphate to fish) or measuring 'how much oxygen is in fish'

Question	Answer	Mark	Guidance
5(a)(i)	to, protect / conserve, species endangered by trading activities **OR** to, prevent / restrict, trade in endangered species ✓ to, regulate / restrict / reduce , international / cross-border, wildlife trade ✓	1 max	**ALLOW** for 'trading activities' and 'trade' the **buying** or **selling** of, live animals / body parts such as tusks or ivory / plant bulbs / etc. **ALLOW** for 'endangered' - threatened / rare / vulnerable **ALLOW** an example of an endangered species, e.g. *'stop people from selling elephant tusks'* gets mp 1 **ALLOW** for 'wildlife trade' the buying or selling of, live animals / body parts such as tusks or ivory / plant bulbs. **ALLOW** for 'international' and 'cross-border' a description such as import from Africa to Europe, etc.
5(a)(ii)	**1** ref. 95% (decrease) **OR** 5% (remain) **OR** 25 000 (in 2113) ✓ **2** 1250 (in 2213) **OR** 4 (orders of magnitude) ✓	2	**Look for two correct stages of working corresponding to mps 1 and 2, irrespective of final answer.** *Exemplar working:* There is a 95% decrease in 100 years from 1913 to 2013, so: 2113: 500 000 x 0.05 = 25 000 left 2213: 25 000 x 0.05 = 1250 left 1.25×10^3 compared to 1×10^7 is 4 orders of magnitude smaller.

Question	Answer	Mark	Guidance
5(b)	*General statement identifying place and y axis variable **plus** two of options below:* in Eastern Africa, poaching / number of illegally killed elephants / percentage of elephants killed illegally, is *comment or comparison about absolute number* **1** (kept) below 60 / low**est** / low**er** (than C/W. Africa) ✓ *identify most recent sustained trend as far as 2015* **2** decreasing / less, since 2011 / from 60 to 40 ✓ *figures quote to show trend* **3** quote any two figures **and** years **and** ref. decrease ✓	2 max	**Mark evidence 1 and 2 together as prose** **ALLOW** AW for 'decrease' e.g.reduce / decline / drop / fall **ALLOW** AW for 'increase' e.g. goes up / rise / climb **ALLOW** ORA, e.g: in, Central / Western, Africa, poaching / number of illegally killed elephants / percentage of elephants killed illegally, is **1** (mostly) over 60 (or quote of figure over 60) / high**er** (than E. Africa) **2** increasing / more, since 2013 / from, 60 to 82 (W) / 70 to 75 (C) **3** quote any two figures **and** years **and** ref. increase **IGNORE** calculated 'by x %' figures

<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>6(a)(i)</td><td>
<table>
<tr><td>Species</td><td>n</td><td>n/N</td><td>$(n/N)^2$</td></tr>
<tr><td>Meadow buttercup</td><td>6</td><td>6/24 = 0.250</td><td>0.063</td></tr>
<tr><td>Common daisy</td><td>7</td><td>7/24 = 0.292</td><td>0.085</td></tr>
<tr><td>Red clover</td><td>3</td><td>3/24 = 0.125</td><td>0.016</td></tr>
<tr><td>Ribwort plantain</td><td>8</td><td>8/24 = 0.333</td><td>0.111</td></tr>
<tr><td></td><td></td><td>∑ =</td><td>0.275 ✓</td></tr>
</table>
1 – 0.275 = <u>0.725</u> ✓

final answer to 2 s.f:
0.73 ✓
</td><td>3</td><td>
Correct final answer of 0.73 = 3 marks, even if working (and intermediate figures 0.275 and 0.725) not shown

CALCULATIONS TO MORE OR FEWER D.P
ALLOW any figure within each range:

∑ = from 0.271 to 0.276 to more or less d.p.

1 - ∑ = from 0.724 to 0.729 to more or less d.p

final answer = 0.72 OR 0.73

CALCULATIONS USING FRACTIONS
ALLOW these options for first 2 mps:

∑ = 158/576 OR 79/288

1 - ∑ = 418/576 OR 209/288

WORKING ERRORS
ECF to max 2 for a final answer to 2 s.f. after one class of error in working somewhere, e.g.
in the n/N stage
or the $(n/N)^2$ stage
or in adding up the ∑ sum
or in subtracting the answer from 1.

If final answer is not given to 2 s.f. after one class of error in working, then ECF as above to max 1.

ALLOW a final answer slightly below or above correct answer (0.71 – 0.79) 2 marks ECF by assuming 1 error at one stage.
</td></tr>
</table>

Question	Answer	Mark	Guidance
6(a)(ii)	(point / frame) quadrat(s) ✓	1	**Additional incorrect answer = 0 marks** **IGNORE** random number, generator / calculator
6(b)	*YES reasons why it **would**, work / be successful:* **2 max** **Y1** detergent, breaks / disrupts, (cell) membrane(s) / nuclear envelope OR detergent, releases contents of, cell / nucleus ✓ **Y2** salt, helps DNA, shed water / precipitate ✓ **Y3** protease breaks down, histones / proteins around DNA / proteins attached to DNA ✓ *NO reasons why it would **not**, work / be successful:* **2 max** **N1** cell walls not broken by, abrasion / grinding / blender ✓ **N2** no RNAase added to remove RNA (from DNA / chromatin) ✓ **N3** no, alcohol / ethanol, added to, precipitate DNA ✓ **N4** temperature not low to reduce, enzyme activity / DNA break down ✓	3 max	**IGNORE** additional unlikely ideas throughout e.g. detergent breaks cell wall, salt disrupts membranes. **ALLOW** protease separates DNA from, protein / chromatin **ALLOW** ORA for N1-N4, e.g. action, should be / ought to be / needs to be, done to... e.g. **N1** '*plant should be crushed to break cell walls*' **N3 ALLOW** as reason '*to separate DNA from, solution / water / aqueous phase*'
6(c)	(species evenness is) low / uneven / not even / poor / not high **AND** many / large, number OR abundance OR population of, leather jackets / meadow ants / two species / some species, but, not many / only a few / small number of / hardly any / small population of, click beetles / wireworms / two species / other species ✓	1	**ALLOW** comparatives e.g. a lot more ants than wireworms, ants much more common than click beetles **ALLOW** dominated by (mostly) leatherjackets and ants / 2 species **IGNORE** comparative pairs of figures that lack a qualification like 'only' to show which figure is small(er) **IGNORE** percentage figures unqualified by description

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