AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.3.1

Detection and identification of plant diseases

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**5**
Available paper years	**2008–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.3.3.1 Detection and identification of plant diseases

Answer 01 · Mark scheme

June 2008 | BLY2H | Original Q6 | Legacy

question	answers	extra information	mark
6(a)	any **three** from: • ((mean) mass) increases up to 7 / 8 units (of light) then levels off • light limiting factor up to 7 / 8 units • for photosynthesis • other factor / temperature limiting above 7 / 8 units	must be in correct context	3
6(b)	any **two** from: • cost of providing conditions / heat / light / CO_2 • effect of treatment on profit • relevant use of data from graph eg limiting factors • named other factors eg fertiliser / pest control / weeds / density of planting	allow too much of factor is wasteful allow taste / appearance	2
6(c)	**nitrate function** produce amino acids / proteins / enzymes **nitrate deficiency** stunted growth **magnesium function** produce chlorophyll **magnesium deficiency** yellow leaves / plant	ignore DNA do **not** allow chlorophyll allow description ignore plant dies ignore chloroplasts ignore plant dies	1 1 1 1
Total			**9**

4.3.3.1 Detection and identification of plant diseases

Answer 02 · Mark scheme

January 2012 | BL1HP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	triangular pyramid with 3 layers	may be as blocks or as triangle ignore food chains and arrows	1
	layers appropriately labelled: bean / plant aphid, ladybird	labelled in food chain order must **not** contradict correct pyramid allow correctly labelled inverted pyramid for **2** marks	1
3(a)(ii)	any **two** from: (for aphid / ladybird) • not all digested / faeces • loss in urine • loss of CO_2 • not all eaten	ignore energy ignore loss of CO_2 from bean plant if none of first 3 points given then allow waste (materials) / excretion for **1** mark	2
3(b)	microorganisms / microbes / bacteria / fungi / decomposers / detritivores / named	do **not** accept germs allow mould ignore aphids	1
	decay / breakdown / digest / decompose / rot (bean plant)	ignore eat	1
	respiration (of microorganisms etc / aphids)	allow burning / combustion	1
	carbon dioxide released (from respiration of microorganisms etc / aphids)	allow carbon dioxide released / produced (from burning / combustion) ignore other parts of the carbon cycle ignore formation of fossil fuels	1
Total			**8**

4.3.3.1 Detection and identification of plant diseases

Answer 02 · Mark scheme

January 2012 | BL1HP | Original Q3 | Legacy

COMPONENT NUMBER: BL1HP

4.3.3.1 Detection and identification of plant diseases

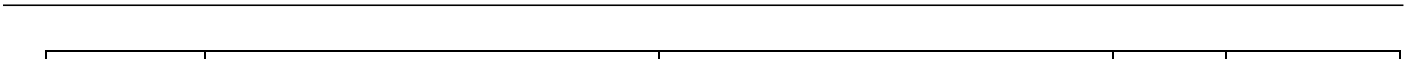
Answer 03 · Mark scheme June 2018 | 8461/1H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(mouthpiece) has pierced / entered the phloem **or** (the aphid) has been feeding from the phloem		1	AO2 4.2.3.2
05.2	yellow leaves due to lack of chlorophyll	ignore 'choroplasts' ignore magnesium is needed to make chorophyll	1	AO1
	(therefore) less / no light absorbed (by chlorophyll)		1	AO2
	(therefore) lower rate of / no photosynthesis	do **not** allow 'energy is produced by photosynthesis'	1	AO1
	(therefore) plant makes less / no sugar / glucose		1	AO1
	(therefore) plant converts less / no sugar / glucose into protein (for growth, so growth is stunted)	allow less glucose / sugar converted into cellulose (cell wall) allow less energy for protein synthesis	1	AO1 4.3.3.1 4.4.1.1 4.4.1.3
05.3	inject the protein / it into a mouse		1	AO1 4.3.2.1
	combine lymphocytes with tumour / cancer cells to make hybridoma (cells)	ignore white blood cells allow T or B lymphocytes ignore tumour unqualified	1	
	find a hybridoma which makes a monoclonal antibody specific to PVY		1	
	(the scientist) clones (the hybridoma) to produce many cells (to make the antibody)	do **not** allow cloning of original stem cells allow many rounds of cloning / mitosis	1	
Total			**10**	

4.3.3.1 Detection and identification of plant diseases

Answer 03 · Mark scheme

June 2018 | 8461/1H | Original Q5



4.3.3.1 Detection and identification of plant diseases

Answer 04 · Mark scheme

June 2023 | 8461/1H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.1	a group of the same / similar cells **or** a group of cells with a (similar / specific) function	ignore a group of cells unqualified ignore examples of tissue functions	1	AO1 4.2.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.2	meristem (tissue)		1	AO1 4.1.1.4 4.1.2.3 4.2.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.3	willow	ignore named parts of willow	1	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.4	any **one** from: • (berries are) easy to access / pick • easier to extract chemical • taking berries will not harm the plant	ignore berries are not underground allow taking leaves / roots might damage / kill the plant (so it cannot produce more chemical) allow idea that the lower mass / amount (of chemical) will be less toxic / harmful allow greater mass of berries than of leaves / roots	1	AO3 4.2.3.1

4.3.3.1 Detection and identification of plant diseases

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.5	(0.6 × 1.2 =) 0.72	allow conversion to mg at any point in calculation	1	AO2 4.3.3.1
	(0.72 × 2 =) 1.44		1	
	1.44 × 1000	allow conversion of a correct mass calculated for berries / roots	1	
	1440 (mg)	allow a correct answer using an incorrect conversion factor of a multiple of 10	1	
	alternative route (2 × 1.2 =) 2.4 (1) (2.4 × 0.6 =) 1.44 (1) 1.44 × 1000 (1) 1440 (mg) (1)			

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.6	any **one** from: • lack of chlorophyll • lack of magnesium (ions)	allow lack of chloroplasts allow lack of mineral (ions) **or** named example such as iron / nitrate / potassium / zinc (ions) ignore lack of nutrients / nitrogen allow lack of water allow incorrect pH of soil allow acidic / alkaline soil allow (named) infection allow lack of light allow other correct suggestions	1	AO1 4.3.3.1 4.3.1.2 4.3.1.4

4.3.3.1 Detection and identification of plant diseases

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.7	any **two** from: • to check toxicity • to check dosage • to check its efficacy	allow to check it is safe allow to check for side effects allow to check it is not poisonous / dangerous / harmful allow to check how much is needed allow to check it works allow to check it does not interact with other drugs	2	AO1 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.8	(writers / companies may get) financial gain **or** (competitor may suffer) financial loss	ignore because the report has not been peer reviewed ignore have not used a double-blind trial	1	AO3 4.3.1.9

Question	Answers	Extra information	Mark	AO / Spec Ref.
01.9	have the claims peer reviewed		1	AO1 4.3.1.9

Total Question 1	13

4.3.3.1 Detection and identification of plant diseases

Answer 05 · Mark scheme

June 2025 | 8461/1H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.1	temperature		1	AO2 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2		allow correct calculation in other units eg bubbles per minute / hour		AO1 4.4.1.2 RPA6
	$\frac{10}{43}$ **or** $\frac{1}{43} \times 10$		1	
	0.23255…		1	
	0.233	allow student's incorrectly calculated value to 3 significant figures allow use of other values for time from **Table 4**	1	
	(unit) bubbles per second	unit must be consistent with student's answer for MP3	1	

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3		allow converse for 10 °C if clearly stated		
	rate / photosynthesis is faster / higher (at 40 °C)	allow as the temperature increases, the rate (of photosynthesis) increases	1	AO3
	reactants / particles / molecules / enzymes have greater (kinetic) energy	allow reactants / particles / molecules / enzymes move faster	1	AO2
	(so) collide more frequently	allow (so) more collisions in a given time allow more successful collisions	1	AO2 4.4.1.2 4.2.2.1

4.3.3.1 Detection and identification of plant diseases

Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	any **two** from: • light intensity / level • colour / wavelength of light • carbon dioxide (concentration) • (mass of) chlorophyll	if neither point awarded allow **1** mark for light unqualified allow number of chloroplasts ignore water / humidity do **not** accept wind	2	AO1 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	collect gas / oxygen in a (gas) syringe **or** collect gas / oxygen in an inverted measuring cylinder	allow bubbles for gas / oxygen do **not** accept incorrect gas allow measure the volume of gas / oxygen in a (gas) syringe ignore use a gas syringe allow measure the volume of gas / oxygen in an inverted measuring cylinder ignore collect gas / oxygen in a measuring cylinder ignore use an inverted measuring cylinder allow other correct methods	1	AO3 4.4.1.2 RPA6

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	any **two** from: • reference to a gardening manual / website / app • take (infected plants) to a laboratory / scientist / expert • use testing kits that contain monoclonal antibodies	ignore use / search the internet unqualified	2	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7	(rose) black spot	allow other correct diseases such as rust do **not** accept nitrate / magnesium deficiency do **not** accept tobacco mosaic virus **or** TMV	1	AO1 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.8	a shortage of magnesium (ions)	allow a shortage of nitrate / iron (ions)	1	AO1 4.3.1.4 4.3.3.1
	which causes chlorosis **or** (so) less chlorophyll **or** (magnesium is needed) to make chlorophyll **OR** lack of light (1) causes chlorosis **or** causes chlorophyll to break down (1)	ignore chlorosis unqualified ignore fewer chloroplasts allow (nitrate / iron is needed) to make chlorophyll	1	

Total Question 4	16

4.3.3.1 Detection and identification of plant diseases

Answer 03 · Examiner comments

June 2018 | 8461/1H | Original Q5

Question 5 (standard, standard / high & high demand)

05.1 Many students recognised the relevance of the phloem, although some of these simply stated that the phloem carries sugars, without linking this to feeding by the aphid.

Some students continued the theme from the previous question and linked 'high concentration' in the question to diffusion, osmosis or active transport.

05.2 Although many students showed some understanding of the reason for stunted growth, most did not go on to achieve three or four marks.

The lack of magnesium was often linked to chlorophyll deficiency, causing yellow leaves, although chloroplasts were sometimes confused with chlorophyll. The fact that reduced chlorophyll would lead to a reduction in light absorption was frequently omitted as students moved directly to a reduction in photosynthesis and in turn, reduced glucose production.

However a lack of glucose was only rarely linked to a shortage of protein or cellulose, but more commonly to a lack of energy which was insufficient. Many students were able to describe much of the process that happens when magnesium is not deficient but did not answer the question by stating that none of this would happen in the case of magnesium deficiency.

05.3 This was a new area of the specification and although many students knew that something had to be injected, most were confused either as to the organism receiving the injection or to the contents of the syringe.

At the next step the need for lymphocytes, cancer cells and the production of a hybridoma was not understood by many. Although many knew the term 'hybridoma' most answers described the wrong components. Specificity was only mentioned on very rare occasions, as was the need for the scientists to clone the hybridoma. Many students did know some details, but clarity of detail and explanation was frequently lacking.

4.3.3.1 Detection and identification of plant diseases

Answer 04 · Examiner comments

June 2023 | 8461/1H | Original Q1

Question 1 (Standard demand)

01.1 Whilst a large majority of students knew that a tissue consists of 'a group of cells', often adding 'working together'; these were insufficient to gain the mark. In order to be credited, students also needed to qualify this answer in terms of structure or appearance (ie 'being similar') or their functions being similar, and around 67% of students successfully gained the mark. As the question was asked in general terms, answers which gave the roles of specific tissues were not credited.

01.2 67% of students knew the name of this tissue. Common answers that failed to gain the mark included other cells or tissues that might be found in roots, such as 'root hairs' and 'xylem'.

01.3 63% of students were able to name 'willow' as the plant from which aspirin originates. Many students qualified their answers with specific parts of the willow, such as 'bark' or 'leaves' or just added 'tree' These details were ignored as being beyond expected knowledge. Incorrect answers included 'foxgloves' and 'fungus' as students mixed up the original sources of traditional drugs. Those who appeared not to have revised this area of the specification could only come up with improbable guesses such as 'the aspirin tree'.

01.4 Just over half of students gave correct responses in this question, with the most common correct responses referring to not causing damage or harm to the plant, or the idea that berries are easier to access. A number of students suggested that the berries would be 'easier to extract', which fell between the ideas of the berries being easier to access and the chemical being easier to extract; this idea was considered to be just sufficient to gain the mark. Suggestions that berries would 'grow back' after picking were insufficient as this would also be true of leaves and to some extent, of roots.

4.3.3.1 Detection and identification of plant diseases

Answer 04 · Examiner comments June 2023 | 8461/1H | Original Q1

01.5 The most problematic part of this calculation was the conversion of grams to milligrams. Many students made no attempt at the conversion, stopping at '1.44', gaining 2 marks or alternatively '0.72' or '2.4', either of which gained just the first mark.
Students who attempted a conversion, using factors such as 100, 10 or even 0.001, were able to gain the fourth mark, provided their answers matched this conversion factor.
Unlike for more complicated calculations, most students laid out their calculations in a way that made interpretation fairly straightforward. Only a small minority of students appeared to have no idea of how to go about the calculation.

01.6 Many students were able to quote from their revision, that a 'lack of magnesium' would cause chlorosis. Whether this was expressed as a small deficiency or the plant getting no magnesium was not critical in gaining the mark. Other students were likely to offer ideas such as a 'lack of chlorophyll' or a 'lack of sunlight'. Only 17% of students failed to give a correct response with some suggesting that chlorosis might have been 'caught' or passed on' from other plants, without reference to a pathogen or infection.

01.7 Students were generally well-versed in the need for drug tests or trials, and 82% of students gained full marks. The most common error was to offer both the idea of checking toxicity and checking for side effects, as these amount to the same thing so could only be credited once. For many students the technical term 'efficacy' was well used, although some offered the idea of 'checking for efficiency', for which a mark was not awarded.

01.8 Although there may be many possible subordinate reasons for the writing of a biased report, all of these come down to one party or another being affected financially. Thus, only this idea was credited and the various reasons for this, such as 'disagreeing with the ethics' of the company were ignored.

01.9 A pleasing 90% of students correctly identified the need to have the claims peer reviewed.

Question 4 (standard, standard/high demand and high demand)

04.1 89% of students were able to identify the independent variable in the investigation. The most common incorrect answer was 'time taken to release 10 bubbles', which was the dependent variable. Other incorrect answers seen included the type or length of pondweed. A small minority of students had misunderstood the practical or seemed to have seen pondweed and assumed it was an investigation into the effect of light intensity and therefore gave answers such as the 'distance of the pondweed' or 'the number of bubbles produced'.

04.2 In this question students were asked to calculate the rate of photosynthesis to 3 significant figures and to include the correct units. 30% of students achieved full marks, with 39% not scoring any marks at all. Many students identified the correct value of 43 seconds from the table and those who had read the information carefully realised that this was the time for 10 bubbles to be produced and continued to correctly complete the calculation. However, a frequently seen mistake was to use the value of 20 (°C) from the table in a calculation, and this was not worthy of any credit. Some students converted their answer to bubbles per minute and as long as this was given to 3 significant figures (14.0) and the units were correct, could achieve full marks. Also seen, although rarely, was a conversion to bubbles per hour and again, this could be credited with all available marks. Most students were correctly able to round their answer to 3 significant figures. However, many students struggled to identify the correct units, with common incorrect answers including cm^3/s, O_2/s or b/s (presumably trying to abbreviate bubbles to b, which was not worthy of credit). Students should be encouraged to work out units from the calculation they have completed.

04.3 The majority of students (59%) were able to gain the first marking point and state that the rate was higher at 40 °C than at 10 °C. The converse was also accepted. Few were able to explain why this was the case, although the majority of those that did, provided a good explanation in terms of increased energy of particles and more frequent collisions, and achieved the other two marks on offer (24%). Most students, however, went on to quote data to support their statement and this did not gain credit as it did not explain why the rate was higher. There were also some students that seemed to go on to make up their own question and explain what would happen if the temperature continued to increase, describing denaturation of enzymes. Some students attempted the correct explanation, however missed key details for the marking points, for example, stating that there is 'more energy' but not identifying that the energy is of the particles or reactants, whilst some stated that the pondweed as a whole had more energy. Others knew there were more collisions but missed that these are more frequent or more successful. Of the misconceptions seen, cells having more energy and chlorophyll being an enzyme were the most common. It was not uncommon to see confused accounts about the effect of temperature on the opening of stomata and a number of students confused photosynthesis with respiration.

4.3.3.1 Detection and identification of plant diseases

Answer 05 · Examiner comments

04.4 79% of students scored full marks in this question. The full range of answers on the mark scheme were seen, with the most common being carbon dioxide and light intensity. Carbon dioxide was often given as CO_2. Students need to take care when giving the chemical formula for carbon dioxide as the 2 was occasionally seen superscript or the same size as the C and the O, which are both incorrect.
Other common incorrect answers were pH, surface area, concentration of solution or amount of oxygen. Answers affecting the rate of transpiration, e.g. humidity, were ignored and any suggestion that wind was a factor was not accepted. It was surprising to see a number of students giving temperature as an answer, despite being specifically told not to.

04.5 In this question, students were asked to give one way the method could be changed to obtain more accurate results. 18% of students were able to give a correct response to this question by identifying the equipment that could be used and how it could be used to collect the oxygen or measure its volume. Some got close to gaining the mark, however, only gave part of the answer required e.g. identifying that the volume needed to be measured but not stating which piece of equipment to use or using a measuring cylinder to collect the gas but forgetting that it needed to be inverted to do so. Another common omission was volume as 'amount' or 'how much' were too vague for the mark to be awarded. Occasionally, students did not achieve the mark due to reference to the incorrect gas (carbon dioxide), There were many others who purely gave general improvements to the practical, the most common being to carry out repeats and calculate a mean or suggesting variables that should be controlled and ensuring that no other factor was limiting. Another common suggestion was to use smaller intervals of temperature. A few even suggested a completely different investigation, changing the independent variable to the more familiar light intensity investigation and therefore changing the distance of the light. These ideas were not creditworthy.

04.6 Students were asked to describe two ways a gardener could identify a plant disease. This question discriminated well and all options on the mark scheme were seen. Only 27% of students scored full marks with 57% scoring zero. Commonly, students merely gave symptoms to look out for e.g. colour of leaves or drooping, but such answers were not creditworthy. The most common correct response was reference to a gardening manual or gardening website. A number of students gave both of these options but as they were the same marking point (involving the same idea of using a source), could only be credited once. Others were too vague to achieve this point with statements such as 'look it up', or Google it', without giving an idea of where or what was to be looked up. MP2 was also frequently seen, with students suggesting a sample of the plant could be taken to a lab for testing. MP3 was less frequently seen and often when students attempted this marking point, they just stated that a 'test kit' should be used and missed the idea of the kit containing monoclonal antibodies.

04.7 80% of students were able to identify rose black spot as the disease in this question. Some added the name of the pathogen to the end of their answer, which was still creditworthy, however, an incorrect pathogen such as a virus, was incorrect. Some students omitted the words 'black' or 'spot' from their answer and therefore did not gain the mark, but answers that omitted 'rose' were still considered creditworthy. The most common incorrect answer was Tobacco Mosaic Virus / TMV.

4.3.3.1 Detection and identification of plant diseases

Answer 05 · Examiner comments June 2025 | 8461/1H | Original Q4

04.8 59% of students were able to gain full credit in this question by explaining why the plant developed yellow leaves. All options on the mark scheme were seen and the majority of students were able to gain a mark by identifying a shortage of magnesium ions and / or less chlorophyll. Simply stating that the plant has chlorosis was not sufficient for the mark; this needed to be linked to a shortage of one of the ions or a lack of light. Other students confused chloroplasts for chlorophyll or stated that chlorophyll was affected, but did not say how. It was not uncommon to see the idea of chlorophyll 'fading' or 'discolouring', neither of which was creditworthy. Those that started down the second route on the mark scheme often linked this to less chlorophyll, but this was insufficient – instead, students needed to state that the chlorophyll was being broken down. Another common incorrect answer was reference to TMV.