A-level
BIOLOGY
7402/3

Paper 3

Mark scheme

June 2024

Version: 1.0 Final



Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from aqa.org.uk

Copyright information

AQA retains the copyright on all its publications. However, registered schools/colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools/colleges to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Copyright © 2024 AQA and its licensors. All rights reserved.

Mark scheme instructions to examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information in the 'Comments' column is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for the same mark are indicated by the use of **OR**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of errors / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (often prefaced by 'Ignore' in the 'Comments' column of the mark scheme) are not penalised.

3.2 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can usually be gained by correct substitution / working and this is shown in the 'Comments' column or by each stage of a longer calculation.

3.3 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.4 Errors carried forward, consequential marking and arithmetic errors

Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ECF or consequential in the mark scheme.

An arithmetic error should be penalised for one mark only unless otherwise amplified in the mark scheme. Arithmetic errors may arise from a slip in a calculation or from an incorrect transfer of a numerical value from data given in a question.

3.5 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.6 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.7 Ignore/Insufficient/Do not allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

Question	Marking Guidance	Mark	Comments
01.1	1. (Cell-surface) membrane 2. Protein 3. Antigen 4. Plasma 5. Active 6. Herd;;;	3 max (3 x AO1)	6 correct = **3 marks** 4–5 correct = **2 marks** 2–3 correct = **1 mark** 0–1 correct = **0 marks** 2. Accept immunoglobulin or glycoprotein 2. Ignore tertiary 2. Ignore polypeptide 3. Accept complementary/specific 3. Ignore identical 5. Ignore artificial 5. Ignore primary

Question	Marking Guidance	Mark	Comments
01.2	1. (High rate of) mutation; 2. (High) genetic diversity; 3. HIV in cells could (still) spread infection; 4. HIV (DNA) embeds/inserts itself in **host DNA**; 5. Lack of funding/money (for research/development); 6. HIV causes fewer T cells, **so** immune response (to the vaccine) does not happen;	1 max (1 x AO2)	1. Accept antigenic variability **OR** descriptions of antigenic variability 6. Accept 'HIV destroys/kills T cells' for 'HIV causes reduced T cells' 6. Accept 'so B cells not activated' for 'so immune response (to the vaccine) does not happen 6. Ignore immune cells destroyed

Question	Marking Guidance	Mark	Comments
01.3	**(Ciprofloxacin)** 1. (HIV) has RNA **OR** (HIV) does not have DNA; **(Penicillin)** 2. (HIV) has no cell wall **OR** (HIV) does not contain murein;	2 (2 x AO2)	1. Ignore any prefixes to RNA 1. Reject references to single stranded DNA 2. Reject any references to incorrect viral structures, eg viruses have a cell membrane **OR** a cell wall made of chitin

Question	Marking Guidance	Mark	Comments
02.1	Accept any **two** of the following for **1** mark; Volume/mass soda lime Concentration of soda lime Number/mass of woodlice Age of woodlice Same woodlice Species/type of woodlice Time for woodlice to acclimatise to (water bath) temperature (Starting) concentration of oxygen (inside the apparatus) Light intensity	1 (1 x AO3)	Accept weight/volume of woodlice for number/mass of woodlice Ignore 'amount' for concentration/volume/weight/mass

Question	Marking Guidance	Mark	Comments
02.2	1. Open the (3-way) tap; 2. Push/press the syringe (down);	2 (2 x AO3)	1. Accept descriptions of opening the tap, eg push/move/turn 2. Accept descriptions of the pushing the syringe down, eg apply pressure to the syringe

Question	Marking Guidance	Mark	Comments
02.3	1. No woodlice **and** all other conditions/apparatus/equipment the same; 2. To show that (respiring) woodlice are causing the drop to move **OR** To show that (respiring) woodlice are taking up the oxygen **OR** To show that (respiring) woodlice are causing the change in volume/pressure;	2 (2 x AO3)	1. Accept other inert objects instead of woodlice eg glass beads 1. Accept dead woodlice for no woodlice 1. Accept descriptions of 'all other conditions/apparatus/equipment the same' eg same investigation 2. Accept to show that (respiring) woodlice are affecting the results 2. Accept 'no other factor(s)' **OR** no other named factor **OR** 'nothing else' for woodlice

Question	Marking Guidance	Mark	Comments
02.4	Correct answer of 0.11 = **3 marks**;;; 0.10816247795/0.1082600897/0.1082173395 = **2 marks** (answer not to 2 dp) Evidence of $\frac{3.14 \times 1.25^2 \times 25}{(5 \times 60) \times 3.78}$ and incorrect answer to 2 dp = **2 marks** (for input error into calculator) 0.41 = **2 marks** (mean rate in $mm^3\ s^{-1}$ for 3.78 g of woodlice) 32.45/32.48/32.47 = **2 marks** (mean rate in $mm^3\ g^{-1}$ in 5 minutes) 0.43 = **2 marks** (used diameter instead of radius in calculation) Evidence of $\frac{3.14 \times 1.25^2 \times 25}{(5 \times 60) \times 3.78}$ and incorrect answer to **not** to 2 dp = **1 mark** (for input error into calculator) 122.65625/122.767857142/122.718463 = **1 mark** (volume of oxygen taken up in 5 minutes) 0.40885416/0.40922619047/0.4090615434 = **1 mark** (mean rate in $mm^3\ s^{-1}$ for 3.78 g of woodlice and not to 2 dp) 32.44874339/32.47826909/32.46520186 = **1 mark** (mean rate in $mm^3\ g^{-1}$ in 5 minutes and not to 2 dp) 0.4326499118/0.43286935813/0.43304358780 = **1 mark** (used diameter instead of radius in calculation and not to 2 dp) 0.08 = **1 mark** (distance travelled by the drop per second) 0.02 = **1 mark** (just used 25 mm distance travelled by the drop and not worked out volume)	3 (3 x AO2)	For **3 marks** accept 1.08×10^{-1}

Question	Marking Guidance	Mark	Comments
03.1	1. As surface area to volume ratio increases, metabolic rate increases **OR** (Humans with) a large surface area to volume ratio have a high/fast metabolic rate; 2. (A large(r) surface area to volume ratio will) lose **more** heat; 3. (A high(er) rate of metabolism/respiration) releases/provides/replaces heat **OR** (A high(er) rate of metabolism/respiration) maintains body temperature;	3 (3 x AO1)	Accept the converse for all marking points 1. Accept the relationship is proportional 1. Ignore 'directly' if prefixing proportional 1. Accept the relationship is **positively** correlated 2. Accept lose heat faster/**more** easily 3. Accept (a higher rate of metabolism/ respiration) releases energy **OR** produces /generates heat 3. Reject produces energy/ heat energy

Question	Marking Guidance	Mark	Comments
03.2	Person **A and** correct ratio of 23.7:1 **OR** 23.8:1 = **3 marks**;;; Person **A and** correct ratio (23.75349227:1) not to 3 sf = **2 marks** Person **A and** correct answer not expressed as a ratio = **2 marks** Person **A and** 2.14:0.09 = **2 marks** Person **B and** correct ratio of 23.7 **OR** 23.8:1 = **2 marks** Person **B and** 26.0:1 = **2 marks** (correct calculations, wrong person) Person **A and** answer not expressed as a ratio (23.75349227) **and** not to 3 sf = **1 mark** Evidence of 2.14 **and** 1.61 in working = **1 mark** Evidence of 0.09 **and** 0.06(2) in working = **1 mark** 1.61:0.06(2) = **1 mark**	3 (2 x AO1, 1 x AO3)	Ignore named person alone If no person remove 1 mark

Question	Marking Guidance	Mark	Comments
03.3	Due to a typographical error, this question has been discounted and all candidates will receive 1 mark, even the non-attempts.	1 (1 x AO1)	

Question	Marking Guidance	Mark	Comments
03.4	(Gill) lamella(e) **and** (gill) filament(s);	1 (1x AO1)	Accept primary **and** secondary lamellae Ignore (gill) arch **and** (gill) rakers

Question	Marking Guidance	Mark	Comments
04.1	Put the (stiffness) scores (for each concentration) in (value/rank) order **and** found middle value;	1 (1 x AO1)	Accept descriptions of (rank/value) order, eg smallest to largest Accept find the $(\frac{n+1}{2})^{th}$ term/value

Question	Marking Guidance	Mark	Comments
04.2	**Max 4 for mark points 3 to 9** **For** 1. (All concentrations) reduced stiffness (compared with 0 mg kg^{-1}); 2. (Reduced stiffness) could mean less damage/pain **OR** (Reduced stiffness) could improve movement/mobility **Against** 3. No idea of range/SD **OR** No statistical tests, **so** do not know if differences are due to chance/significant; 4. No result for 37.5 **OR** No data between 25.0 and 50.0; 5. Not clear if enzyme/damage is the same (as OA); 6. All mice had stiffness, **so** not (completely) effective/cured **OR** Only reduced the amount of stiffness; 7. (Investigation) carried out in mice **OR** (Investigation) not carried out in humans; 8. (Investigation) only six weeks **OR** Do not know long-term effect; 9. Small sample/20 (mice) in each group **OR** 20 (mice) is a small sample size;	5 max (5 x AO3)	3. Do not accept results unqualified

Question	Marking Guidance	Mark	Comments
05.1	**Mark as pairs: 1 and 2 OR 3 and 4** 1. Deletion/translocation; 2. Could mean triplet(s)/codon(s) missing **OR** Could mean amino acid(s) missing (from the polypeptide/SURF1); 3. Substitution/inversion/addition/duplication/ deletion/translocation; 4. Could result in a (premature) stop triplet/codon;	2 max (2 x AO2)	2. Reject could mean an amino acid is not produced

Question	Marking Guidance	Mark	Comments
05.2	Correct answer of 3 (people) = **3 marks**;;; 3.462564706/3.48/3.45 (or any correct rounding down to 1dp) = **2 marks** (answer not to the nearest whole number) 23 = **2 marks** (number of Faroe Islanders with nuclear mutations) 4 = **2 marks** (not factored in that only 80% of mutations are in nuclear DNA) 29 = **1 mark** (number of Faroe Islanders with LS)	3 (3 x AO2)	

Question	Marking Guidance	Mark	Comments
05.3	**Mark as pairs: 1 and 2 OR 3 and 4** 1. Genetic drift; 2. Frequency is higher by chance **OR** High frequency is not due to natural selection; 3. (Only) inbreeding/interbreeding (within a population) **OR** No (inter)breeding with other populations **OR** (Inherited from) common ancestor; 4. Low genetic diversity **OR** Small gene pool **OR** Little gene flow **OR** Higher chance of inheriting <u>allele</u> **OR** Frequency of <u>allele</u> higher (in offspring);	2 max (2 x AO2)	3. Accept descriptions of inbreeding **OR** no interbreeding 3. Accept reproductively isolated 3. Accept genetic bottleneck **OR** founder effect

Question	Marking Guidance	Mark	Comments
05.4	**2 max for mark point 1 to 4 OR 5 to 7** **Yes (no mark)** 1. Some people could be heterozygous/carriers; 2. Could prevent (human) suffering/death **OR** Could allow for (informed) decisions about having children; 3. (But only) in families/people with a history of LS **OR** (only) in families/people in the Faroe Islands (where high frequency/1: 1700); 4. Cost of screening might be cheaper than cost of treating LS; **No (no mark)** 5. It is rare (globally) **OR** (Only) 1 in 40 000 (globally); 6. Caused by (too) many genes/one of 75 genes **OR** Would need (too) many probes/75 probes; 7. (Too) expensive to produce tests/probes (for more than 75 different genes) **OR** (Too) expensive to screen **all**;	3 max (3 x AO3)	

Question	Marking Guidance	Mark	Comments
06.1	1. A group (of organisms) of the same species in a (particular) space at a (particular) time; 2. That can (potentially) interbreed;	2 (2 x AO1)	1. Accept descriptions of 'space' eg area, part of the world, habitat, ecosystem 2. Accept that can produce fertile offspring

Question	Marking Guidance	Mark	Comments
06.2	The number of all species present in the woodland	1 (1 x AO1)	

Question	Marking Guidance	Mark	Comments
06.3	**Max 3 for mark points 3 to 10** **Reason for** 1. The number of (bird) species increased (over 30 years); 2. Long-term study; **Reasons against** 3. (Bird) species did not increase every year; 4. Don't know if the protection was for birds **OR** Don't know if the aim of the protection was to increase biodiversity **OR** Don't know when the protection started; 5. No data from/comparison with a woodland without protection; 6. Only breeding birds recorded **OR** Non-breeding birds may be present, but not recorded **OR** Not all bird species were recorded; 7. Only one woodland **OR** Protection might not be the same in other/all woodlands; 8. Only one day each year **OR** Birds breed at different times **OR** Birds migrate **OR** Birds might not be present/seen on the day (of recording); 9. Number of each species not known; 10. The data is old/out of date;	4 max (4 x AO3)	3. Accept some years the (bird) species decreased 3. Accept (bird) species fluctuated 5. Accept no control (woodland) 6. and 7. Ignore unqualified references to sample size 9. Accept did not calculate index of diversity

Question	Marking Guidance	Mark	Comments
06.4	Not a linear relationship;	1 (1 x AO3)	Accept descriptions of a linear relationship Accept not a proportional relationship Accept no correlation Accept data fluctuates

Question	Marking Guidance	Mark	Comments
06.5	1. (The bird community) becomes less similar (to the first year) **OR** (The bird community) becomes more dissimilar (to the first year); 2. (Suggesting) biodiversity has changed/ increased; 3. Due to changes/increases in the species/birds (present) **OR** Due to changes in the woodland/abiotic/biotic factors;	2 max (2 x AO3)	1. Accept the index (of similarity) decreases 1. Accept there is a negative correlation 3. Accept **named** examples that would cause change eg change in environment/ habitat/ competition/ predation/food sources

Question	Marking Guidance	Mark	Comments
06.6	1. Climax community; 2. (Even in a climax community,) number of birds/species will change;	2 (2 x AO2)	2. Accept suitable suggestions that describe the species/bird composition changing, eg migration of birds

Question	Marking Guidance	Mark	Comments
06.7	1. No significant decrease/difference as shown by SD; 2. No idea if due to human activity **OR** No data/measurement/evidence of human activity **OR** Changes could be due to natural variation; 3. LPI/index above 1970/1.0/baseline **OR** LPI/index increased (overall) 4. (Vertical) scale has been altered to make (changes in) LPI/index look worse;	3 max (3 x AO3)	2. Accept **named** examples of factors that could cause change, eg disease, natural disasters 3. and 4. Accept 'biodiversity' for LPI

Question 7 Level of response marking guidance

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity, you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level, you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive, and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

21–25	Extended Abstract Generalised beyond specific context	Response shows holistic approach to the question with a fully integrated answer which makes clear links between several different topics and the theme of the question. Biology is detailed and comprehensive A-level content, uses appropriate terminology, and is very well written and always clearly explained. No significant errors or irrelevant material. For top marks in the band, the answer shows evidence of reading beyond specification requirements.
16–20	Relational Integrated into a whole	Response links several topics to the main theme of the question, to form a series of interrelated points which are clearly explained. Biology is fundamentally correct A-level content and contains some points which are detailed, though there may be some which are less well developed, with appropriate use of terminology. Perhaps one significant error and/or, one irrelevant topic which detracts from the overall quality of the answer.
11–15	Multistructural Several aspects covered but they are unrelated	Response mostly deals with suitable topics but they are not interrelated and links are not made to the theme of the question. Biology is usually correct A-level content, though it lacks detail. It is usually clearly explained and generally uses appropriate terminology. Some significant errors and/or, more than one irrelevant topic.
6–10	Unistructural Only one or few aspects covered	Response predominantly deals with only one or two topics that relate to the question. Biology presented shows some superficial A-level content that may be poorly explained, lacking in detail, or show limited use of appropriate terminology. May contain a number of significant errors and/or, irrelevant topics.
1–5	Unfocused	Response only indirectly addresses the theme of the question and merely presents a series of biological facts which are usually descriptive in nature or poorly explained and at times may be factually incorrect. Content and terminology is generally below A-level. May contain a large number of errors and/or, irrelevant topics.
0		Nothing of relevance or no response.

Commentary on terms and statements in the levels mark scheme

The levels mark scheme for the essay contains a number of words and statements that are open to different interpretations. This commentary defines the meanings of these words and statements in the context of marking the essay. Many words and statements are used in the descriptions of more than one level of response. The definitions of these remain the same throughout.

Levels mark scheme word/statement	Definition
Holistic	Synoptic, drawing from different topics (usually sections of the specification).
A fully integrated answer which makes clear links between several different topics and the theme of the question.	All topics relate to the title and theme of the essay; for example, explaining the biological importance of a process. When considering, for example, the importance of a process, the explanation must be at A-level standard. 'Several' here is defined as at least four topic areas from the specification covered. This means some sentences, not just a word or two. It does not mean using many examples from one topic area.
Biology is detailed and comprehensive A-level content, uses appropriate terminology, and is very well written and always clearly explained.	Detailed and comprehensive A-level content is the specification content. Terminology is that used in the specification. Well written and clearly explained refers mainly to biological content and use of terminology. Prose, handwriting and spelling are secondary considerations. Phonetic spelling is accepted, unless examiners are instructed not to do so for particular words; for example, glucagon, glucose and glycogen.
No significant errors or irrelevant material.	A significant error is one which significantly detracts from the biological accuracy or correctness of a described example. This will usually involve more than one word. Irrelevant material is several lines (or more) that clearly fails to address the title, or the theme of the title.
For top marks in the band, the answer shows evidence of reading beyond specification requirements.	An example that is relevant to the title and is not required in the specification content. The example must be used at A-level standard.
Response mostly deals with suitable topics but they are not interrelated and links are not made to the theme of the question.	Not addressing the biological theme of the essay (eg importance) at A-level standard.

Question	Marking Guidance	Mark	
07.1	**Phosphorus-containing substances and their importance in biological systems.** • 3.1.3 Lipids • 3.1.5.1 Structure of DNA and RNA • 3.1.5.2 DNA replication • 3.1.6 ATP • 3.1.8 Inorganic ions • 3.2.1.1 Structure of eukaryotic cells • 3.2.2 All cells arise from other cells • 3.2.3 Transport across cell membranes • 3.3.3 Digestion and absorption • 3.4.1 DNA, genes and chromosomes • 3.4.2 DNA and protein synthesis • 3.4.3 Genetic diversity can arise as a result of mutation or during meiosis • 3.4.4 Genetic diversity and adaptation • 3.4.7 Investigating diversity • 3.5.1 Photosynthesis • 3.5.2 Respiration • 3.5.4 Nutrient cycles • 3.6.2.1 Nerve impulses • 3.6.2.2 Synaptic transmission • 3.6.3 Skeletal muscles • 3.6.4.2 Control of blood glucose concentration (cyclic AMP) • 3.6.4.3 Control of blood water potential • 3.8.1 Alteration of the sequence of bases in DNA can alter the structure of proteins • 3.8.2.1 Most of a cell's DNA is not translated • 3.8.2.2 Regulation of transcription and translation • 3.8.3 Using genome projects • 3.8.4.1 Recombinant DNA technology	**[25 marks]** (13 x AO1, 12 x AO2)	

In order to fully address the question and reach the highest mark bands students must also include at least four topics in their answer, to demonstrate a synoptic approach to the essay.

Students may be able to show the relevance of other topics from the specification.

Note, other topics from beyond the specification can be used, providing they relate to the title and contain factually correct material of at least an A-level standard. Credit should not be given for topics beyond the specification which are below A-level standard.

Question	Marking Guidance	Mark	
07.2	**The mechanisms and importance of transport within organisms.** • 3.1.3 Phospholipids • 3.1.4 Proteins • 3.1.6 ATP • 3.1.7 Water • 3.2.1.1 Structure of eukaryotic cells • 3.2.2 All cells arise from other cells • 3.2.3 Transport across cell membranes • 3.2.4 Cell recognition and the immune system • 3.3.1 Surface area to volume ratio • 3.3.2 Gas exchange • 3.3.3 Digestion and absorption • 3.3.4.1 Mass transport in animals • 3.3.4.2 Mass transport in plants • 3.4.2 DNA and protein synthesis • 3.4.3 Genetic diversity can arise as a result of mutation or during meiosis • 3.5.1 Photosynthesis • 3.5.2 Respiration • 3.6.1.1 Survival and response (IAA) • 3.6.1.2 Receptors • 3.6.1.3 Control of heart rate • 3.6.2.1 Nerve impulses • 3.6.2.2 Synaptic transmission • 3.6.3 Skeletal muscles • 3.6.4.1 Principles of homeostasis and negative feedback • 3.6.4.2 Control of blood glucose concentration • 3.6.4.3 Control of blood water potential • 3.8.1 Alteration of the sequence of bases in DNA can alter the structure of proteins • 3.8.2.2 Regulation of transcription and translation • 3.8.2.3 Gene expression and cancer	**[25 marks]** (13 x AO1, 12 x AO2)	

In order to fully address the question and reach the highest mark bands students must also include at least four topics in their answer, to demonstrate a synoptic approach to the essay.

Students may be able to show the relevance of other topics from the specification.

Note, other topics from beyond the specification can be used, providing they relate to the title and contain factually correct material of at least an A-level standard. Credit should not be given for topics beyond the specification which are below A-level standard.