AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.2.2.7

Cancer

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**5**
Available paper years	**2018–2024**

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.

4.2.2.7 Cancer

Answer 01 · Mark scheme

June 2018 | 8464/B/1H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	is not caused by a pathogen / infective organism	allow not caused by a microorganism / microbe ignore not caused by infection ignore named pathogen unless bacteria, virus and fungus all mentioned	1	AO1 4.2.2.4 4.2.2.5 4.3.1.1 4.3
	(so) is not passed / spread (from person to person)	allow cannot be spread / caught allow is not infectious / contagious	1	AO2 4.2.2.4 4.2.2.5 4.3.1.1 4.3
02.2		allow 'it' for heart		AO1 4.2.2.4
	reduced / restricted / stopped blood flow	it does not matter where blood flow is restricted to – heart / body	1	
	(so) less oxygen reaches heart (muscle / cells)	must reference heart / it allow no oxygen reaches the heart (muscle / cells)	1	
	(so heart muscle / cells) cannot respire (enough) **or** (so heart muscle / cells) do not release (enough) energy	do **not** accept do not make / produce / create energy ignore references to breathing / suffocation ignore blood clots / blockages	1	

4.2.2.7 Cancer

Answer 01 · Mark scheme

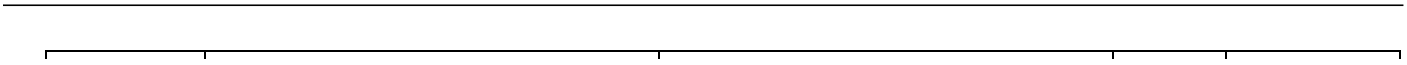
June 2018 | 8464/B/1H | Original Q2

Question	Answers	Mark	AO / Spec. Ref.
02.3	**Level 3:** Relevant points (factors / effects) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	Level 2: Relevant points (factors / effects) are identified and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2 AO1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	
	Indicative content **medical risk factors:** • high blood pressure • high cholesterol • diabetes • genetic factors • medications **lifestyle risk factors:** • smoking • obesity • lack of exercise • high fat / energy diet • eating insufficient fruit / vegetables • alcohol • high salt intake • exposure to air pollution • certain drugs / correct named drug **examples of links:** • smoking – high bp / cholesterol / fatty deposition • obesity – lack of exercise / high bp / cholesterol / fatty deposition / diabetes • exercise – obesity / bp /diabetes • diet – obesity / cholesterol / diabetes • alcohol – bp / cholesterol • high salt intake - high blood pressure • genetic factors – bp / cholesterol / diabetes / obesity • medication – can affect blood / blood vessels / metabolism the main discriminator is the quality of linking both lifestyle and medical factors are required for **level 3**		4.2.2.2 4.2.2.4 4.2.2.5 4.2.2.6
Total			**11**

4.2.2.7 Cancer

Answer 01 · Mark scheme

June 2018 | 8464/B/1H | Original Q2



4.2.2.7 Cancer

Answer 02 · Mark scheme

June 2018 | 8464/B/2H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	one X and one Y chromosome and 9 pairs of other chromosomes		1	AO2 4.6.1.6
07.2	any **three** from: • (called) meiosis • DNA / chromosomes replicate **or** DNA makes a copy • two divisions to form 4 cells • so only 1 set of chromosomes per cell • (daughter cells / gametes) are all genetically different	correct spelling only allow cells are haploid ignore half the DNA if no other mark awarded allow **1** mark for forms gametes / cells which are all different **or** only happens in testes and (embryonic) ovaries	3	AO1 4.6.1.2
07.3	(meiosis will not work because) number of chromosomes cannot halve	allow chromosomes cannot form pairs allow chromosomes cannot split up evenly	1	AO2 4.6.1.2
07.4	do not use energy in reproduction so more (energy) available to synthesise proteins	allow converse if clearly describing diploid oysters allow other correct molecules or cell components	1 1	AO2 4.6.1.3 4.4.2.1

4.2.2.7 Cancer

Answer 02 · Mark scheme

June 2018 | 8464/B/2H | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	any **two** from: • global warming may be raising temperature of water and killing oysters • pollutants in the water may be toxic and kill the oysters **or** increased acidity of the oceans is killing oysters • new competitors / triploid oysters are using up the normal food source • new pathogens may be causing diseases • new predators eating oysters	allow correctly named pollutant with reason ignore over harvesting	2	AO2 4.7.3.5 4.7.3.2 4.7.1.2 4.7.1.3

4.2.2.7 Cancer

Answer 02 · Mark scheme

June 2018 | 8464/B/2H | Original Q7

Question	Answers	Mark	AO / Spec. Ref.
07.6	**Level 3:** A judgement strongly linked and logically supported by a sufficient range of correct reasons is given.	5–6	AO3
	Level 2: Some logically linked reasons are given. There also may be a simple judgement.	3–4	AO3 AO2
	Level 1: Relevant points are made. They are not logically linked.	1–2	AO2
	No relevant content	0	
	Indicative content **for:** • oysters are available to eat all year **so** eating oysters has become very popular • cheaper to produce **so** more food for expanding population • oysters grow faster **so** more oysters for supermarkets / restaurants or more profit for farmers • stocks are replenished each year **so** more sustainable fishing • they can harvest / sell all year **so** more stable and profitable for oyster farmers **against:** • carcinogen put into environment / oysters **so** may enter the food chain or cause cancer in humans • bigger triploid oysters may outcompete the smaller native diploid oysters **so** upset balance of the ecosystem / cause extinction • people may not buy / eat them because they have used a carcinogenic chemical **so** reduced profit for farmers / suppliers / supermarkets / restaurants • farmers have to buy new seed oysters every time **so** more expensive **other content:** • shouldn't be eating the oysters until they are thoroughly tested • should be looking for alternative ways to get triploid oysters • should stop using triploid oysters until the effect on the (marine) environment is known • would replace lost oyster beds **but** could change the ecosystem • oysters available to eat all year **but** probably do not taste the same or have the same flavour		4.7.3.2 4.7.3.6 4.7.2.1 4.7.1.3 4.7.1.1
Total		**15**	

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Answer 03 · Mark scheme

November 2020 | 8464/B/1H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	3 years		1	AO2 4.3.1.9
06.2	any **one** from: • to reduce any risk	allow idea (if it is unsafe) less harm will be caused with a lower dose ignore that it may be unsafe / dangerous unqualified	1	AO1 4.3.1.9
	• to look for side effects	ignore unknown side effects unqualified		
06.3	too great a risk for ill person / patient	allow may make their condition worse allow less risk to healthy person ignore references to immune system	1	AO2 4.3.1.9
	patient might be taking another drug **or** side effects of drug are easier to identify	allow unhealthy person might be taking another drug ignore to see side effects unqualified	1	
06.4	any **one** from: • to prevent false claims • to make sure the results / conclusions are correct / valid • to avoid bias	ignore references to accuracy, reliability or precision	1	AO2 4.3.1.9

Question	Answers	Mark	AO / Spec.
06.5	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.3.1.9
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content **arguments for use:** • will save the NHS money • (approximately) 20 times as many people or 19 more people can be treated compared to Drug A • (approximately) 29 times as many people can be treated compared to Drug B (allow 28 times **or** 28 / 27 more people) • more people can be treated for the same cost • patients will be treated sooner • improves patient choice • used in other countries so likely to be effective • used in other countries so likely to be safe • likely to have been tested in other countries **arguments against use:** • injections of drug not tested (in UK) • cannot be sure it is as effective as Drug A / Drug B • cannot be sure if it is safe to use • may have unknown side effects • doctors cannot be confident in prescribing Drug C • goes against regulations / laws regulating drug development / use • might set a precedent for other drugs not to be fully tested • might set a precedent for other non- approved / unlicensed drugs to be used Need advantages and disadvantages for Level 2		

Total			11

4.2.2.7 Cancer

Answer 04 · Mark scheme

June 2022 | 8464/B/1H | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	any **four** from: **Similarities:** • result from changes in the cell / DNA / genes • uncontrolled cell growth / division • can form a lump of cells • made up of abnormal cells **Differences:** Malignant tumours: • are made of cancer cells, benign tumours are not **or** benign tumours are made up of cells that are more similar to normal cells • (usually) grow faster than benign tumours • invade neighbouring tissues, but benign tumours do not • can spread (to other parts of the body) but benign tumours stay in one place **or** cells can travel in the blood, but benign tumours do not • can form secondary tumours, benign tumours do not	max **three** marks if only similarities or differences given allow result from mutations allow benign tumours (often) have a layer of covering cells, malignant tumours (usually) do not ignore references to level of harm	4	AO1 4.2.2.7

4.2.2.7 Cancer

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	little exposure to ionising radiation **or** little exposure to carcinogens	allow little exposure to UV (light) allow little exposure to sunlight ignore little exposure Sun unqualified allow use sunscreen allow do not use sunbeds allow named carcinogen e.g. smoking	1	AO3
	(so) less cell / DNA / gene damage	allow (so) fewer mutations allow older people's (skin) cells are more susceptible to DNA damage if no other marks awarded allow **1** mark for skin cancer takes a long time to develop	1	AO2 4.2.2.6 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	any **two** from: • more females than males diagnosed each year up to age 59 (years) • more new cases in males than in females from 60 (years) • greatest number of people / males / females diagnosed in age group 65-69 (years) • number of new cases increases in **males** up to age group 65−69 (years) after which they decrease / fall	ignore the number of cases of skin cancer increases with age	2	AO3 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	to account for the different group sizes	allow there are different numbers of people / males / females of different ages allow so the different group sizes can be compared allow so it can be compared to populations in other countries ignore to compare unqualified	1	AO3 4.2.2.7

Answer 04 · Mark scheme

June 2022 | 8464/B/1H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	any **two** from: • number (of males / female per 100 000 population) increases with age • in females the number (per 100 000 population) increases at a steady rate • number (per 100 000 population) in males increases at a similar **or** at a slightly lower rate as in females up to age 55 • number (per 100 000 population) increases at a much higher rate in males than females above age 59	do **not** accept if referring to number of new cases allow number (per 100 000 population) in males increases at a steady rate up to 55−59 (years) allow number (per 100 000 population) in males increases more rapidly above age 59	2	AO2 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	$\frac{116 \times 694\,000}{100\,000}$ = 805.04 = 805	allow values in the range 114 to 118 allow an incorrectly calculated number of males correctly rounded to 3 significant figures if no other marks awarded allow **1** mark only for an answer of 5270	1 1 1	AO2 4.2.2.7

Total Question 5		14

4.2.2.7 Cancer

Answer 05 · Mark scheme

June 2024 | 8464/B/1H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1		allow a maximum of **3** marks if the stages are out of order		AO2 4.1.2.2
	DNA replicates **or** two copies of each chromosome form	allow DNA duplicates / doubles allow genetic material doubles ignore genetic information replicates do **not** accept DNA reproduces	1	
	one set of chromosomes is pulled to each end of the cell	allow one set of chromosomes is moved to each end of the cell ignore half the chromosomes are moved to each end of the cell	1	
	nucleus divides	allow two (new) nuclei form	1	
	cytoplasm **or** cell membrane divides **and** two genetically identical cells form	allow cytokinesis **and** two genetically identical cells form ignore names of phases of mitosis if no other mark awarded allow **1** mark for mitosis	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	uncontrolled cell division / growth		1	AO1 4.2.2.7
	invade neighbouring tissues		1	
	(tumour) cells spread to different parts of the body / tissues in the blood / lymph	allow tumour metastasises	1	

4.2.2.7 Cancer

Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	(need to breathe faster / deeper) to get more oxygen	allow the converse if clearly stated	1	AO2 4.2.2.6 4.2.2.2 4.4.2.1 4.4.2.2
	(because) smaller surface area		1	
	(so) less oxygen in the blood	allow (so) less oxygenation of haemoglobin	1	
	(so) less (oxygen for) respiration	allow (so) anaerobic respiration increases allow (so) lactic acid is produced allow (so) an oxygen debt is created do **not** accept energy produced / made / created	1	

Total Question 6	11

4.2.2.7 Cancer

Answer 01 · Examiner comments

June 2018 | 8464/B/1H | Original Q2

Question 2 (standard demand)

02.1 Few students scored the first marking point for saying that a non-communicable disease is not caused by a pathogen. Some students gave examples of non-communicable diseases, such as CHD, diabetes and cancer. Others gave a cause, such as genetics, lifestyle or diet. These were ignored.

89% of students achieved one mark, usually for saying a non-communicable disease cannot be caught or is not infectious. 5% of students achieved full marks.

02.2 The majority of students gained the first marking point for stating that blood flow is reduced in people with CHD.

For the second marking point it had to be clear that this would result in less oxygen reaching the cells of the heart, as the question asked how CHD can cause a heart attack. Many students wrote about less oxygen reaching other parts of the body.

The last marking point needed a link to less respiration or insufficient energy release. Students often incorrectly referred to less energy being made, created or produced.

There were very few three-mark answers seen (2%). Of these, some gave a complete story linking reduced respiration to there being insufficient energy released for the heart muscle to contract.

4.2.2.7 Cancer

Answer 01 · Examiner comments

June 2018 | 8464/B/1H | Original Q2

02.3 This was a 'level marked', 'extended response question'. The command word was 'Explain', so the main discriminator between the three different levels was the quality of linking ideas. Students were asked to explain how lifestyle and medical risk factors increase the chance of developing CHD. Therefore examples of both types of factor had to be included, with several examples of logical linking of ideas, in order to enter level 3. 77% of students achieved a minimum of three marks. 41% of students gave a level 3 response.

Many students phrased their response in terms of how to reduce the chance of developing CHD, which could achieve full credit if explanations were included. References to doing exercise and not eating too many fatty foods were often seen, but if these were not linked to explanations the answer was limited to level 1. References to bad or unhealthy diets were too vague without going on to mention high levels of fat, sugar or salt.

An answer such as a fatty diet and not enough exercise can lead to obesity, which increases the chance of CHD, gained 3 marks as there is an attempt to link ideas. To be awarded 4 marks better links had to be made, or more factors referred to. Smoking and alcohol consumption were sometimes mentioned. With reference to smoking, a number of students were under the impression that smoking leads to the build-up of tar in the coronary arteries.

Many responses were limited to level 2 because there was no reference to any medical risk factors. Where medical factors were included it was often in relation to diabetes or genetic factors. A family history of heart problems was sufficient for this idea. High blood cholesterol was sometimes given as a medical risk factor.

Answer 02 · Examiner comments

Question 7 (standard, standard / high & high demand)

As expected with this question being higher demand, students generally achieved lower marks. Some excellent answers were seen where students were able to access knowledge from different parts of the specification as well as use information from the question stem and their own wider reading to express complex concepts.

07.1 This was not a straightforward knowledge question as students needed to use logical thinking as well as knowledge of chromosomes to work out the correct alternative. 50% of students arrived at the correct response. Many realised that there would be one X and one Y chromosome but their maths let them down when they computed that only eight more pairs would be needed.

07.2 A large number of students understood meiosis was the type of cell division and many students could not spell it correctly. Being able to understand the differences in mitosis and meiosis is crucial as is being able to correctly spell all keywords. 28% of students achieved two or three marks.

07.3 Students seemed to struggle with the idea that meiosis created four daughter cells from the two divisions, although they did tend to identify that the cells would be haploid. Many just stated the cells would be not identical rather than being genetically different.

The majority of students found it difficult to transfer their knowledge of humans and their 23 pairs of chromosomes to oysters with ten pairs and so their answers were confused. 19% of students achieved the mark here.

07.4 While students were able to note that triploid oysters didn't spend time reproducing, very few related this to energy. Many went down the route of not needing time to look for a mate. The few that did identify energy and reproduction (6% of students) rarely linked the energy available to synthesising proteins, and instead going with vague references to 'growth' which is insufficient at this level.

07.5 Students had the idea that global warming, pollutants, competition or predators could be involved, but rarely gained credit as they did not express this with the necessary high demand biological detail required to explain how it would lead to a reduction in population.

Key points were generally missing such as toxic pollutants and new predators or pathogens. Some students mentioned disease but did not relate it to pathogens. 3% of students achieved full marks.

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Answer 02 · Examiner comments

07.6 This 'extended response' question was targeted at grades 6–9. Many students were able to access level 1 (43%) and level 2 (27%). It served its purpose of allowing the higher-attaining students to perform well, while not discouraging lower-attaining students from answering, and very few students made no attempt.

It was felt that students engaged with the opportunity to have an opinion about ideas on whether supermarkets and restaurants should be allowed to stock a product which may have a link to a carcinogen.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.2.2.7 Cancer

Answer 04 · Examiner comments

June 2022 | 8464/B/1H | Original Q5

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

05.1 This question was set at a high level of demand. Two-thirds of students scored one or more marks, with 41% of all students achieving two or more marks. Similarities and differences between benign and malignant tumours were needed for full marks. Where differences were given the statements had to be comparative. Many students compared how harmful the tumours are, or how they can be treated, neither of which was creditworthy.

05.2 39% of students scored one mark, usually for saying younger people wear sunscreen, or have had little exposure to sunlight. Little exposure to the Sun was ignored. Few referred to ionising radiation, and just said radiation, which was insufficient. The second marking point, about less cell or DNA damage in younger people, was rarely seen.

05.3 Two conclusions about the number of new cases were needed. Many students made conclusions from the lines on the graph, rather than from the bars. A common error was to say the number of cases increases with age, but this is not true above age 69. Students often referred to the wrong age ranges. For example, saying that there were more new cases in males than females above age 55 was incorrect, it was above age 60. The most common correct answer was that most people were diagnosed between the ages of 65 and 69.

Answer 04 · Examiner comments

June 2022 | 8464/B/1H | Original Q5

05.4 The question was set at the highest level of demand with 3% of students achieving the mark. Incorrect responses included ideas about accuracy and that there would be too many people to count, or too much data to plot.

05.5 Two trends in the number of people with skin cancer were needed. Many students did not describe trends, but instead gave information using the bars on the graph about the number of new cases. The simplest trend to identify was that the number of people with skin cancer increases with age. Half the students scored at least one mark.

05.6 18% of students scored three marks, and 10% scored one mark. This was usually for the compensation mark using a reading from the bar at age 80 to 84, rather than from the line.

Answer 05 · Examiner comments

Question 6 (standard/high & high demand)

06.1 Many students were only able to gain the single fall-back mark of 'mitosis' for this high-demand question: 62% were only awarded 1 mark, and less than 1% gained all 4 marks.

Use of appropriate terminology proved challenging. It was common to see references to:

- DNA being copied
- genetic information duplicating
- chromosomes duplicating
- 'everything' replicating
- chromosomes doubling
- nucleus replicating.

None of these were sufficient for the first marking point.

Students rarely made any reference to one *set* of chromosomes in their answers, so this mark was rarely awarded.

There were some good descriptions beyond the specification of spindle fibre formation, although it was also common for any description attempted to infer that the chromosomes moved themselves to the poles rather than being pulled.

Students often referred to the nucleus being split, rather than using the term 'divide'; this was not enough to gain the third mark.

Although some good descriptions of cytokinesis were seen, as well as the term itself, marking point 4 was often not credited due to lack of reference to the cells being 'genetically' identical.

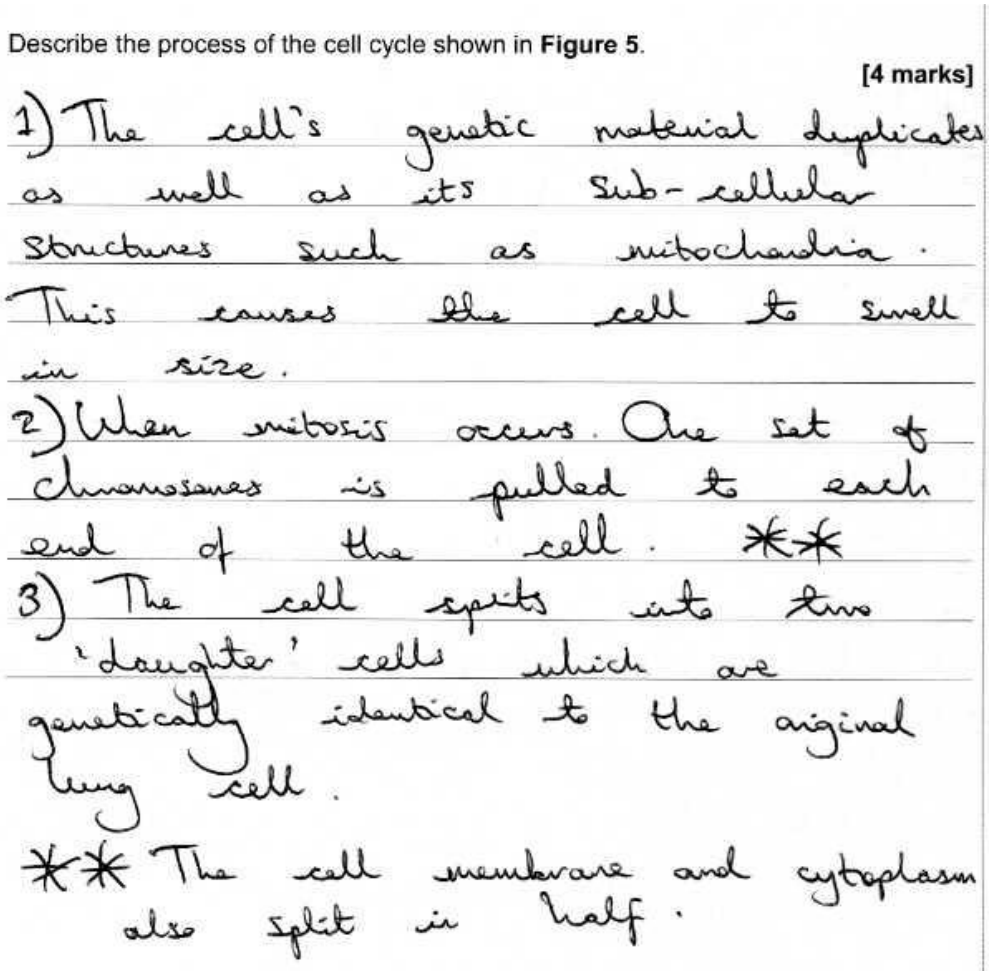
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4.2.2.7 Cancer

Answer 05 · Examiner comments June 2024 | 8464/B/1H | Original Q6

Describe the process of the cell cycle shown in **Figure 5**.

[4 marks]



This response gained 3 marks: 1 mark for 'genetic material duplicates' ('genetic information' would not have gained credit), 1 mark for the set of chromosomes being pulled to each end of the cell, and 1 mark for cytoplasm splitting in half (synonymous with dividing) and forming two genetically identical cells. There is no mention of the nucleus dividing.

06.2 Students occasionally referred to uncontrolled division or growth in their answer, which gained them 1 mark. However, many students simply repeated the stem of the question, talking about cancer being malignant, which gained no credit. Many responses stated that the tumour itself spreads through the blood rather than the *cells* spreading or did not make a reference to how the cells were spreading (ie through the blood). It was common to see responses stating that the tumour invades cells rather than tissues. It was rare to see students using the term metastasise. 67% gained no credit on this question.

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06.3 28% of students were not able to access this question, often giving simple statements rather than being comparative. Some responses did not relate to the question at all: they simply referred to the adaptations of the alveoli for efficient gas exchange.

Marks were most commonly awarded for comparison of surface area, and why the person breathes faster to gain more oxygen.

A very common misconception was that B had a larger surface area than A. Although the general idea of the smaller surface area allowing less oxygen was often seen, many students did not qualify this with there being less oxygen in the blood so could not gain the mark.

Where students correctly identified B as having a smaller surface area, accurate descriptions of how this affected breathing in terms of lactic acid production and oxygen debt were more commonly seen than less respiration.

Many responses still refer to the ‘production of’ energy.