Darwin's Cancer Fix (June 2022 Paper 3 Scientific Article): Edexcel SNAB A Level Biology Exam Questions

10 questions · 30 marks · about 36 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · A level Paper 3 · June 2022 · Q8(a) · 3 marks

8 The scientific article you have studied is adapted from *Scientific American*.

Use the information from the scientific article and your own knowledge to answer the following questions.

(a) Explain why natural selection took place in Darwin's Galapagos finches (paragraph 3).

(3)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 2 · A level Paper 3 · June 2022 · Q8(b) · 3 marks

(b) Explain how inflammation and the immune response can cause damage to tissues (paragraph 4).

(3)

Question 3 · A level Paper 3 · June 2022 · Q8(c) · 2 marks

(c) Describe how tumour shrinkage could be observed (paragraph 6).

(2)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 4 · A level Paper 3 · June 2022 · Q8(d) · 3 marks

(d) "Why is aging, smoking or radiation exposure associated with cancer?" (paragraph 8).

Explain why "These things cause mutations".

(3)

Question 5 · A level Paper 3 · June 2022 · Q8(e) · 2 marks

(e) Explain why a cancer cell needs to 'use the resources of the tissue immediately around it' (paragraph 12).

(2)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 6 · A level Paper 3 · June 2022 · Q8(f) · 3 marks

(f) Explain how 'a cancer-causing mutation' could increase the rate of division in stem cells (paragraph 14).

(3)

Question 7 · A level Paper 3 · June 2022 · Q8(g) · 4 marks

(g) Describe how a cell that is 'a key player in the body's immune system' differs from a stem cell (paragraph 14).

(4)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 8 · A level Paper 3 · June 2022 · Q8(h) · 4 marks

(h) Describe how the effects of 'competitive release' could be demonstrated (paragraphs 18 and 19).

(4)

Question 9 · A level Paper 3 · June 2022 · Q8(i) · 2 marks

(i) Describe how evasion mechanisms can enable pathogens to become drug-resistant (paragraph 20).

(2)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 10 · A level Paper 3 · June 2022 · Q8(j) · 4 marks

(j) Discuss the ethical issues relating to the use of mice in experiments such as those described in the article (paragraph 25).

(4)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Mark schemes

Question 1 · A level Paper 3 · June 2022 · Q8(a) · 3 marks

Question number	Answer
8(a)	An explanation that makes reference to three of the following: • there was isolation of (populations) of finches (1) • there were different selection pressures (at the different locations) (1) • (different / random) mutations in (different) populations of finches (1) • therefore allowing populations to adapt to different selection pressures (1)

Additional guidance	Mark
ALLOW finches in different locations ALLOW different food sources act as a selection pressure ALLOW different beak shapes due to mutations DO NOT ALLOW selection pressures caused mutations ALLOW finches with better adapted beaks passed on their (favourable) alleles resulting in a change in the {allele frequency / gene pool}	(3)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 2 · A level Paper 3 · June 2022 · Q8(b) · 3 marks

Question number	Answer
8(b)	An explanation that makes reference to three of the following: • {chemical mediators / histamine} released (1) • increasing blood flow / increasing capillary permeability / causing oedema (1) • {increasing number of / activating / recruiting} white blood cells (in the area of inflammation) (1) • (stimulating) the release of (catabolic) enzymes / increasing phagocytosis (of damaged tissue) (1)

Additional guidance	Mark
ALLOW activating T killer cells / activating phagocytes / activating macrophages ALLOW tissues destroyed by {macrophages / phagocytes / T killer cells}	(3)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 3 · A level Paper 3 · June 2022 · Q8(c) · 2 marks

Question number	Answer
8(c)	A description that makes reference to the following: • use of {MRI / CT / PET} scans (1) • before treatment and after treatment (1)

Additional guidance	Mark
ALLOW ultrasound scans / clinical investigation ALLOW regular scans / scans at stated frequency / over course of treatment	(2)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 4 · A level Paper 3 · June 2022 · Q8(d) · 3 marks

Question number	Answer
8(d)	An explanation that makes reference to three of the following: • {chemicals in smoke / carcinogens / radiation} can damage DNA (1) • by changing the {DNA base sequence / chromosome number} (1) • with age there have been a greater number of cell divisions (1) • therefore a greater chance of an error (being introduced) in the base sequence of the DNA (during replication) (1)

Additional guidance	Mark
IGNORE they cause mutations ALLOW 'they damage DNA' ALLOW causing {epigenetic changes / methylation of DNA / acetylation of histones} ALLOW longer period of exposure (to mutagens) ALLOW (with age) there is a greater chance of change in chromosome number	(3)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 5 · A level Paper 3 · June 2022 · Q8(e) · 2 marks

Question number	Answer
8(e)	An explanation that makes reference to two of the following: • cancer cells {grow / divide} (1) • therefore they need {oxygen / glucose} for respiration (1) • therefore they need {amino acids / nucleotides / lipids} for {growth / cell division} (1)

Additional guidance	Mark
ALLOW for production of a named cell component or process e.g. DNA / proteins cell membranes, protein synthesis	(2)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 6 · A level Paper 3 · June 2022 · Q8(f) · 3 marks

Question number	Answer
8(f)	An explanation that makes reference to three of the following: • {mutation / change in base sequence} of a gene for {check point protein / cell cycle (control) protein} (1) • no check point (1) • activating oncogenes / deactivating tumour suppressor genes (1) • cell {cycle / division} is no longer inhibited / shortening the cell cycle (1)

Additional guidance	Mark
IGNORE mitosis ALLOW 'mutation in gene involved in controlling the cell cycle' IGNORE rate of division increases ALLOW shorter S / G stage ALLOW uncontrolled cell division	(3)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 7 · A level Paper 3 · June 2022 · Q8(g) · 4 marks

Question number	Answer
8(g)	A description that makes reference to four of the following: • stem cell is undifferentiated whereas a 'key player' is differentiated (to undertake a specific function) (1) • example of a 'key player' (1) • example of specific function of a named 'key player' cell (1) • number of divisions of a stem cell is unlimited whereas for a 'key player' the number of cell divisions is limited (1) • 'key player' has undergone differential gene expression (1)

Additional guidance	Mark
ALLOW unspecialised and specialised e.g. B cells / plasma cells / phagocytes / lymphocytes e.g. (B cells) produce antibodies ALLOW Hayflick limit for 'key players' but not for stem cells	(4)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 8 · A level Paper 3 · June 2022 · Q8(h) · 4 marks

Question number	Answer
8(h)	A description that makes reference to four of the following: • suitable study group selected (1) • treat one group with high dose and a second group with {minimum / lower} dose (1) • suitable sampling method (1) • repeat sampling over a period of time (1) • description of how results would demonstrate competitive release (1)

Additional guidance	Mark
e.g. (two) groups of patients with same cancer (two) similar fields (two) flasks of bacteria e.g. chemotherapy agent pesticide antibiotic e.g. scanning random quadrats zones of inhibition e.g. (demonstrates competitive release if eventually) the cancer responds better to low dose of drugs than high dose only the low dose treated group remain sensitive to the antibiotic number of pests in field sprayed with high concentration of pesticide greater than number in field sprayed with lower concentration	(4)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 9 · A level Paper 3 · June 2022 · Q8(i) · 2 marks

Question number	Answer
8(i)	A description that makes reference to two of the following: • (accumulation of) mutations resulting in change in target recognised by host (1) • transfer of genetic material coding for resistance genes (1) • example of a resistance mechanism (1)

Additional guidance	Mark
ALLOW mutations result in change in shape of antigens ALLOW transfer of plasmids between bacteria e.g. enzyme / change in shape of receptor binding protein / TB mechanisms, waxy coat / virus using host cell membrane	(2)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 10 · A level Paper 3 · June 2022 · Q8(j) · 4 marks

Question number	Answer
8(j)	An answer that makes reference to four of the following: Argument in favour • a utilitarianism – the overall benefits of the experiments are greater than any harm done (1) • welfare argument - animals can be used if they are treated well as far as possible (1) Argument against • rights argument - all animals have rights (not just humans) (1) • results may not be applicable to humans (1) • consent argument - animals are unable to give consent (as is required for human trials) (1)

Additional guidance	Mark
e.g. animals can be used if their use is regulated e.g. it is not acceptable to keep animals in laboratory cages / not acceptable to cause pain suffering to mice	(4)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.