Craving Control: How Food Messes with Your Mind (June 2018 Paper 3 Scientific Article): Edexcel SNAB A Level Bio

12 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 2018 · Q7(a) · 2 marks

7 The scientific article you have studied is adapted from several sources.

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

(a) 'The hunger system is mediated by hormones from the gut and from fat cells' (paragraph 6).

Describe how these fat cells could release hormones.

(2)

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Question 2 · A level Paper 3 · June 2018 · Q7(b) · 4 marks

(b) The reward system in humans involves the neurotransmitter dopamine pathway (paragraph 7).

Describe how dopamine acts as a neurotransmitter.

(4)

Question 3 · A level Paper 3 · June 2018 · Q7(c) · 2 marks

(c) The hormone ghrelin may cause epigenetic changes to the *FTO* gene leading to weight gain (paragraph 9).

Describe how ghrelin could cause epigenetic changes.

(2)

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Question 4 · A level Paper 3 · June 2018 · Q7(d) · 3 marks

(d) Probiotics include live bacteria that are ingested for health benefits.

Explain how probiotics may regulate food cravings (paragraphs 18, 19 and 20).

(3)

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Question 5 · A level Paper 3 · June 2018 · Q7(e) · 4 marks

(e) Tabor used enzymes to genetically modify a 'harmless species of *Escherichia coli*' (paragraph 26).

Describe the functions of the enzymes used to genetically modify bacteria.

(4)

Question 6 · A level Paper 3 · June 2018 · Q7(f) · 1 mark

(f) Give two reasons why doctors want to prevent people gaining excess weight (paragraph 28).

(1)

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Question 7 · A level Paper 3 · June 2018 · Q7(g) · 4 marks

(g) 'Bacterial molecules pass into the bloodstream where they do not belong, triggering an immune response' (paragraph 32).

Explain how the bacterial molecules could trigger a specific immune response.

(4)

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Question 8 · A level Paper 3 · June 2018 · Q7(h) · 2 marks

(h) Explain why genetically modified bacteria delivering drugs 'to the exact tissue in the body where they're needed and nowhere else' would decrease side effects (paragraph 34).

(2)

Question 9 · A level Paper 3 · June 2018 · Q7(i) · 2 marks

(i) There are 'trillions of microbes' found in the gut, 'as well as others living elsewhere in and on the body'.

Describe the role of the microbes that are normally found on the skin surface of humans (paragraph 40).

(2)

Question 10 · A level Paper 3 · June 2018 · Q7(j) · 2 marks

(j) The bacteria present in and on the body of a vertebrate 'can weigh as much as six pounds, and they make up a sort of organ' (paragraph 40).

State two properties of an organ.

(2)

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Question 11 · A level Paper 3 · June 2018 · Q7(k) · 3 marks

(k) Compare and contrast the structure of a bacterium, such as the one that causes neurological syphilis, with the Human Immunodeficiency Virus (HIV) (paragraph 49).

(3)

Question 12 · A level Paper 3 · June 2018 · Q7(l) · 1 mark

(l) Name one process that would have validated Pettersson's paper before it was published in the journal known as the Proceedings of the National Academy of Science (paragraph 58).

(1)

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Mark schemes

Question 1 · A level Paper 3 · June 2018 · Q7(a) · 2 marks

Question Number	Answer
7(a)	A description that makes reference to the following: • vesicles (containing hormone) (1) • fuse with the cell (surface) membrane (of fat cells) / by exocytosis (1)

Additional Guidance	Mark
	(2)

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Question Number	Answer
7(b)	A description that makes reference to the following: • (dopamine) released { from presynaptic membrane / from the synaptic knob / into the synaptic cleft } / diffuses across synaptic gap (1) • binds to receptors on post-synaptic membrane (1) • alters permeability of post-synaptic membrane / opens { sodium ion channels / channel proteins } (in the post synaptic membrane) (1) • initiating { depolarisation / action potential } in the post-synaptic neurone (1)

Additional Guidance	Mark
ALLOW dopamine diffuses across the synapse ALLOW influx of Na^+ ALLOW pd / voltage	**(4)**

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Question 3 · A level Paper 3 · June 2018 · Q7(c) · 2 marks

Question Number	Answer
7(c)	A description that makes reference to two of the following: • { methylation of / addition of methyl groups to } DNA (1) • modification of histones (1) • (therefore) affecting regulation (1)

Additional Guidance	Mark
ALLOW methylation of cytosine or gene ALLOW CpG for DNA ALLOW alters gene expression e.g. switching on or off of the gene ALLOW prevention of transcription of the gene (by methylation) ALLOW link to effect on promotor region	(2)

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Question 4 · A level Paper 3 · June 2018 · Q7(d) · 3 marks

Question Number	Answer
7(d)	An explanation that makes reference to three of the following: • (addition of bacteria) changes the { gut flora / gut microbes / microbiome } (1) • resulting in a change in taste perception (1) • resulting in a change to { cravings / food preferences } (1) • preventing one type of bacterium controlling { food preferences / taste perception / cravings } (1)

Additional Guidance	Mark
ALLOW (probiotics) outcompete other gut microbes ALLOW affects taste receptors	(3)

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Question 5 · A level Paper 3 · June 2018 · Q7(e) · 4 marks

Question Number	Answer
7(e)	A description that makes reference to four of the following: • restriction endonuclease used to { cut plasmid / isolate gene } (1) • forming sticky ends (1) • ligase enzymes used to add isolated gene to plasmid (1) • (ligase) forms phosphodiester bonds (between nucleotides) (1) • recombinant { DNA / plasmid } produced (1)

Additional Guidance	Mark
ALLOW 'endonuclease' or 'restriction enzyme' ALLOW 'sticky ends' in context of the DNA or plasmid being cut by enzymes if restriction enzymes not specified ALLOW integrase for ligase	**(4)**

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Question 6 · A level Paper 3 · June 2018 · Q7(f) · 1 mark

Question Number	Answer
7(f)	• two obesity-related conditions given (1)

Additional Guidance	Mark
e.g. diabetes / wear and tear on joints / sleep apnoea / increased risk of cancer / {increased blood pressure /hypertension} / {CVD / CHD} / atherosclerosis / stroke / {heart attack / myocardial infarction } ALLOW one obesity-related condition and a relevant idea of a negative effect on the NHS	**(1)**

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Question 7 · A level Paper 3 · June 2018 · Q7(g) · 4 marks

Question Number	Answer
7(g)	An answer that makes reference to four of the following: • bacterial molecules are engulfed by { macrophages / phagocytes / B cell } (1) • antigen presented on the surface of cell / antigen presenting cell produced (1) • T (helper) cells with complementary { CD4 / receptor } bind to APCs (1) • cytokine released causes { cloning of B cells / formation of B effector cells } (1) • plasma cells { produce / release } antibodies (1)

Additional Guidance	Mark
ALLOW reference to antigens on MHCs ALLOW APC	**(4)**

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Question 8 · A level Paper 3 · June 2018 · Q7(h) · 2 marks

Question Number	Answer
7(h)	An explanation that makes reference to the following: • drugs not delivered to { other / healthy} tissues (1) • overall dosage needed is less (1)

Additional Guidance	Mark
ALLOW drug does not {affect / reach} other tissues, drug not delivered to the whole body ALLOW converse ALLOW {higher concentration / more of the drug} delivered to area where needed	(2)

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Question 9 · A level Paper 3 · June 2018 · Q7(i) · 2 marks

Question Number	Answer
7(i)	A description that makes reference to two of the following: • (skin flora) {prevents /reduces } colonisation by other microbes (1) • make environment hostile for other microbes (1) • outcompetes other microbes (1)

Additional Guidance	Mark
ALLOW {bacteria / pathogenic bacteria / pathogens} for other microbes e.g. produce { lactic acid / lactate }	(2)

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Question 10 · A level Paper 3 · June 2018 · Q7(j) · 2 marks

Question Number	Answer
7(j)	An answer that makes reference to the following: • made up of { many different types of cell / more than one type of tissue } (1) • (tissues) working together { for various functions / to carry out an overall function } (1)

Additional Guidance	Mark
ALLOW 'tissues' plural	(2)

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Question 11 · A level Paper 3 · June 2018 · Q7(k) · 3 marks

Question Number	Answer
7(k)	An answer that makes reference to three of the following: Similarities • both contain { genetic material / RNA } (1) • both have a phospholipid bilayer (1) Differences • (only) bacteria have { cytoplasm / ribosomes / pili / slime capsule / flagellum /cell wall / cell membrane / plasmid } (1) • (only) HIV has { capsid / protein coat / GP 120 } (1)

Additional Guidance	Mark
IGNORE both have DNA ALLOW lipid bilayer ALLOW converse i.e. HIV does not have… ALLOW converse i.e. bacterium does not have…	(3)

Question 12 · A level Paper 3 · June 2018 · Q7(l) · 1 mark

Question Number	Answer	Additional Guidance	Mark
7(l)	• peer review (1)	ALLOW reviewed by other scientists IGNORE peer assessment	(1)

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