The Big Sleep (June 2025 Paper 3 Scientific Article): Edexcel SNAB A Level Biology Exam Questions

11 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 2025 · Q8(a) · 2 marks

8 The scientific article you have studied is adapted from New Scientist.

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

(a) Explain why 'the distribution of hibernating species on the tree of mammals' suggests that the common ancestor of all mammals was a hibernator (paragraph 3).

(2)

Question 2 · A level Paper 3 · June 2025 · Q8(b) · 3 marks

(b) Explain how a reduction in physiological activity can result in a reduction in body temperature (paragraph 6).

(3)

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Question 3 · A level Paper 3 · June 2025 · Q8(c) · 5 marks

(c) Hibernating mammals, such as the black bear, can maintain a lower core temperature. 'The black bear (*Ursus americanus*), for example, lowers its core temperature by about 6 °C' (paragraph 8).

Describe the processes that would maintain the core body temperature of the black bear at a temperature 6 °C lower than normal.

(5)

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Question 4 · A level Paper 3 · June 2025 · Q8(d) · 3 marks

(d) Tissue samples were collected from different mammals during hibernation. These were analysed to identify which genes were controlling hibernation (paragraphs 10 and 11).

Explain how scientists could use tissue samples to find out which genes were activated.

(3)

Question 5 · A level Paper 3 · June 2025 · Q8(e) · 2 marks

(e) Explain why there will be changes in blood pressure when a mammal comes out of hibernation (paragraph 13).

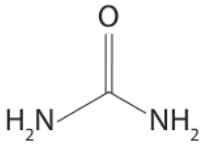
(2)

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Question 6 · A level Paper 3 · June 2025 · Q8(f) · 2 marks

(f) Urea is a waste product that is usually excreted in the urine of mammals.

The diagram shows a molecule of urea.



During hibernation 'the thirteen-lined ground squirrel recycles its urea' (paragraph 13).

Deduce why it is important for a hibernating mammal to recycle urea.

(2)

Question 7 · A level Paper 3 · June 2025 · Q8(g) · 2 marks

(g) Explain why the bones and muscles of astronauts on long missions will waste away (Box "To blearily go" paragraph B).

(2)

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Question 8 · A level Paper 3 · June 2025 · Q8(h) · 3 marks

(h) Explain why reducing body temperature from 37.5 °C to 32 °C would reduce metabolic activity (Box "To blearily go", paragraph C).

(3)

Question 9 · A level Paper 3 · June 2025 · Q8(i) · 2 marks

(i) Describe the role of a neurotransmitter (paragraph 15).

(2)

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Question 10 · A level Paper 3 · June 2025 · Q8(j) · 3 marks

(j) Explain how adenosine affects neural activity in the hippocampus (paragraph 15).

(3)

Question 11 · A level Paper 3 · June 2025 · Q8(k) · 3 marks

(k) Explain how boosting the uptake of adenosine in the brains of the rats could lower the core body temperature of rats without triggering shivering (paragraph 16).

(3)

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Mark schemes

Question 1 · A level Paper 3 · June 2025 · Q8(a) · 2 marks

Question number	Answer
8(a)	An explanation that makes reference to the following: • {several / many / most /different} mammals hibernate (1) • gene/alleles associated with hibernation passed down from (common) ancestor (1)

Additional guidance	Mark
ALLOW named examples from scientific article e.g. dormice, hedgehogs, bats, ground squirrel, black bears ALLOW adaptations (for hibernating) were present {when first mammals evolved / before different (taxonomic) groups evolved}	(2)

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Question 2 · A level Paper 3 · June 2025 · Q8(b) · 3 marks

Question number	Answer
8(b)	An explanation that makes reference to three of the following: • fewer metabolic reactions / lower metabolic rate / metabolism decreases (1) • reducing requirement for ATP (1) • therefore reduced respiration (1) • therefore less heat {released/generated} (1)

Additional guidance	Mark
ALLOW (reduced physiological activity) means reduced muscle activity ALLOW fewer exothermic reactions ALLOW 'produced' in place of {released/generated}	(3)

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Question 3 · A level Paper 3 · June 2025 · Q8(c) · 5 marks

Question number	Answer
8(c)	A description that makes reference to five of the following: • negative feedback / homeostasis / thermoregulation (1) • new (lower) set point (1) • thermoreceptors detect temperature (1) • hypothalamus receives impulses from thermoreceptors (1) • impulses from {hypothalamus / thermoregulatory centre} to effectors (involved in heat regulation) (1) • named mechanism leading to {heat loss / heat gain} (1)

Additional guidance	Mark
ALLOW hypothalamus {altering / changing} set point ALLOW hypothalamus detects changes away from set point ALLOW heat loss / heat gain centre ALLOW named effector e.g. vasodilation, shivering, sweating	(5)

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Question 4 · A level Paper 3 · June 2025 · Q8(d) · 3 marks

Question number	Answer
8(d)	An explanation that makes reference to three of the following: • tissue samples from hibernating and non-hibernating animals compared (1) • (identify which) genes are {active / transcribed} from the {mRNA / proteins} present (1) • description of how mRNA can be used to produce copies of active genes (1) • analyse {amino acid sequence of proteins/base sequence of mRNA} to identify active gene

Additional guidance	Mark
ALLOW tissue samples from mammals at different stages of hibernation ALLOW 'switched on' for active e.g. use of reverse transcriptase or {production / use} of cDNA IGNORE references to DNA methylation / histones	(3)

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Question 5 · A level Paper 3 · June 2025 · Q8(e) · 2 marks

Question number	Answer
8(e)	An explanation that makes reference to two of the following: • to increase {blood flow / delivery of oxygen} to cells (1) • for {respiration} / for generation of {ATP / energy} (1) • for muscle contraction / movement (1)

Additional guidance	Mark
ALLOW faster blood flow to tissues/organs, such as muscles and brain	(2)

Question 6 · A level Paper 3 · June 2025 · Q8(f) · 2 marks

Question number	Answer
8(f)	An explanation that makes reference to two of the following: • amine group from urea (1) • used to synthesise {amino acids / nucleotides} (1) • to synthesise {DNA / proteins} (1)

Additional guidance	Mark
IGNORE nitrogen ALLOW nucleic acids ALLOW reference to (ground squirrels) not eating during hibernation	(2)

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Question 7 · A level Paper 3 · June 2025 · Q8(g) · 2 marks

Question number	Answer
8(g)	A description that makes reference to two of the following: • physical activities are less demanding / muscles do not work as hard (1) • (and) bones are no longer weight-bearing (1) • {cosmic radiation / lack of nutrients in diet} leads to {bone loss / muscle atrophy} (1)

Additional guidance	Mark
ALLOW less force needed to move {muscles/limbs}/ less movement ALLOW fewer contractions / less intense contraction / decreased contraction force ALLOW bones under less stress / fewer microbreaks ALLOW muscles 'waste away' for 'atrophy' ALLOW lack of calcium in diet leading to bone loss	(2)

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Question 8 · A level Paper 3 · June 2025 · Q8(h) · 3 marks

Question number	Answer
8(h)	An explanation that makes reference to the following: • (lowering body temperature leads to) less kinetic energy (1) • (resulting in) {fewer enzyme-substrate collisions / fewer enzyme substrate complexes / reduced enzyme activity} (1) • metabolic activities depend on enzymes / lower enzyme activity reduces metabolic activity (1)

Additional guidance	Mark
ALLOW a named/described example of a metabolic reaction ALLOW role of enzymes in metabolic reactions	(3)

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Question 9 · A level Paper 3 · June 2025 · Q8(i) · 2 marks

Question number	Answer
8(i)	An answer that makes reference to two of the following: • (neurotransmitters are released) {into a synapse / from presynaptic membrane} (1) • (neurotransmitters) bind to postsynaptic membrane / transmit nerve impulses from one neurone to another (1) • to {stimulate / inhibit} formation of an action potential (1)

Additional guidance	Mark
ALLOW bind to post-synaptic receptors IGNORE if there is reference to post synaptic knob ALLOW {depolarisation / movement of sodium ions in} / {hyperpolarisation / movement of chloride ions in} DO NOT ALLOW references to neurotransmitter causing voltage gated channels to open	(2)

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Question 10 · A level Paper 3 · June 2025 · Q8(j) · 3 marks

Question number	Answer
8(j)	An explanation that makes reference to three of the following: • (adenosine) can be an inhibitory neurotransmitter / reduces neural activity in the hippocampus (1) • binding to receptors in the hippocampus / binds to receptors in synapse (1) • inhibits {release of neurotransmitters / depolarisation of neurones / binding of neurotransmitters to post-synaptic neurone} (1) • results in {reduced generation of action potentials in / hyperpolarisation of} the post-synaptic neurone (1)

Additional guidance	Mark
ALLOW blocks calcium channels on presynaptic membrane ALLOW {no /less} sodium ions enter, fewer sodium channels open ALLOW {chloride ions / Cl^-} move in / {potassium ions / K^+} move out ALLOW reduced transmission of impulses in the hippocampus ALLOW threshold potential not reached	(3)

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Question 11 · A level Paper 3 · June 2025 · Q8(k) · 3 marks

Question number	Answer
8(k)	An explanation that makes reference to three of the following: • adenosine binds to receptors in the hypothalamus (1) • reduces neural activity (in hypothalamus) (1) • so fewer impulses sent to (skeletal) muscles (1) • {less/no} contraction of (skeletal) muscle (1)

Additional guidance	Mark
ALLOW adenosine binds to thermoreceptors ALLOW thermoregulatory centre not activated	(3)

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