

Markscheme

November 2017

Biology

Standard level

Paper 3

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Section A

Question		Answers	Notes	Total
1.	a	<p><i>uncovered: 50 °C ✓</i></p> <p><i>covered with wet tissue paper: 55 °C ✓</i></p>	<p><i>Both needed</i></p> <p><i>Accept range 49 to 51 °C and 54 to 56 °C</i></p> <p><i>Units required</i></p> <p><i>Accept negative numbers (–50 °C and –55 °C)</i></p> <p><i>Working on its own without an answer is insufficient for the mark (eg: 80 – 30)</i></p>	1
1.	b	<p>a. volume/mass/amount of water they contain ✓</p> <p>b. temperature of <u>water</u> ✓</p> <p>c. placed in similar environment/on similar surface ✓</p> <p>d. «container must be» the same shape/size/volume/surface area ✓</p>	<p><i>Do not award “ambient room temperature” or “material of cups”</i></p> <p><i>Do not accept “type of water”</i></p> <p><i>OWTTE</i></p>	2 max
1.	c	<p>18 °C</p> <p>OR</p> <p>room temperature ✓</p>	<p><i>If the answer is given as a numerical value then units are required</i></p>	1
1.	d	<p>a. water has a high latent heat/high heat of vaporization ✓</p> <p>b. energy required to evaporate water «from the tissue paper» ✓</p> <p>c. evaporation of water leads to cooling ✓</p> <p>d. sweat produced by skin in response to heat ✓</p> <p>e. «evaporation of» sweat cools the body ✓</p>	<p><i>Do not accept specific heat</i></p>	3 max

Question		Answers	Notes	Total
2.	a	xanthophyll ✓		1
2.	b	acetone OR alcohol OR ether ✓	Accept other named organic solvent If there is more than one answer accept only the first one. (Note: "Water mixed with alcohol" would be correct as would "alcohol, water" but "water, alcohol" would be incorrect)	1
2.	c	a. they can be identified by their colour/analysis with spectrometer ✓ b. measure the distance travelled by the solvent front ✓ c. measure the distance travelled by the pigment ✓ d. calculate the R_f value ✓ e. they can be identified by comparing R_f values to known values ✓		3 max

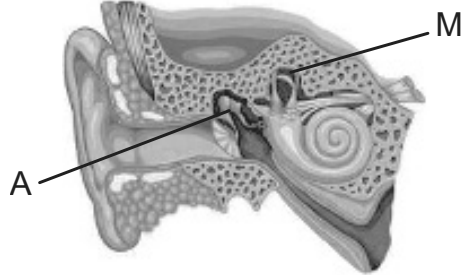
3.	a	label pointing to the upper of the two blood vessels in the micrograph ✓	Note: check the answer carefully as the scan of the diagram is not always clear for candidates writing in pencil	1
3.	b	a. vein has larger lumen ✓ b. vein has less elastic tissue ✓ c. vein has less muscular/thinner walls/tunica media OR ratio of wall thickness to lumen is less in the vein ✓ d. vein less rounded/squashed more easily ✓	Accept inverse for artery Do not accept non-visible differences such as valves No ECF	2 max

Section B

Option A — Neurobiology and behaviour

Question			Answers	Notes	Total
4.	a		fovea/yellow spot as there is the greatest quantity of cones ✓	<i>A reason is required</i>	1
4.	b		a. it is the blind spot ✓ b. where optic nerve passes out of the eye ✓		2
4.	c		left «side» ✓		1
4.	d	i	bipolar «cell» ✓		1
4.	d	ii	arrow pointing from right to left ✓		1

Question			Answers	Notes	Total
5.	a	i	medulla «oblongata» OR brain stem ✓		1
5.	a	ii	a. breathing «rate» ✓ b. heart function ✓ c. digestion/saliva production ✓ d. swallowing reflex ✓ e. coughing ✓ f. vomiting ✓ g. blood pressure ✓ h. state of consciousness/sleep ✓	<i>Allow any two functions. No ECF</i>	2 max
5.	b		«controls motor functions involved with speech and» speech is more developed in humans ✓		1
5.	c		observe any changes in the person ✓		1

Question			Answers	Notes	Total
6.	a	i	<p>Example of answer for part (a)(i) and (a)(ii)</p>  <p>M ✓</p>	<p>The candidate should label the semicircular canals</p> <p>Line with the letter M is expected but accept the letter M on diagram if clearly indicating the correct structure</p>	1
		ii	<p>A ✓</p>	<p>The candidate should label the bones/ossicles in middle ear</p> <p>Line with the letter A is expected but accept the letter A on diagram if clearly indicating the correct location</p>	
6.	b		<p>a. sound «waves» enters the ear causing fluid in the cochlea to move/vibrate ✓</p> <p>b. «movement of fluid in cochlea» causes the hair cells to move ✓</p> <p>c. «details of hair cell movement» is transmitted to brain via the auditory nerve ✓</p>		2 max
6.	c		<p>hearing aid/cochlear implant ✓</p>	<p>Answer must refer to ear, not for example just “operation”</p> <p>Accept other valid answers</p>	1

Question	Answers	Notes	Total
7.	<p>a. at birth neurons are mainly unconnected ✓</p> <p>b. after birth «up to 2 years» neurons start to make synapses/connections with other neurons OR up to 2 years the number of synapses/connections increases ✓</p> <p>c. «increase in synapses» occurs rapidly due to learning/new experiences ✓</p> <p>d. each neuron can make multiple synapses ✓</p> <p>e. brain makes many more connections than are required ✓</p> <p>f. «after 2 years/in adults» neural pruning causes the loss of unused neurons/synapses/connections ✓</p>	<p><i>Do not accept more neurons are made</i></p>	<p>4 max</p>

Option B — Biotechnology and bioinformatics

Question		Answers	Notes	Total
8.	a	a. pH ✓ b. temperature ✓ c. oxygen levels ✓ d. viscosity ✓ e. foam ✓ f. carbon dioxide ✓	<i>Accept any two conditions for the mark</i>	1 max
8.	b	a. maintain constant temperature/insulation ✓ b. cooling ✓		1 max
8.	c	carbon dioxide/CO ₂ ✓		1
8.	d	a. inside of fermenter is sterilized «to prevent growth of other organisms» ✓ b. «penicillin» fungus/ <i>Penicillium</i> added to fermenter ✓ c. nutrients are provided to allow the fungus to grow ✓ d. when nutrients are used up, penicillin is produced ✓ e. penicillin extracted from mixture in fermenter ✓ f. penicillin purified ready for medical use ✓	<i>Accept named nutrient eg: glucose</i>	3 max

Question		Answers	Notes	Total
9.	a	carries/transfers genetic material into a cell ✓		1
9.	b	a. TMV contains RNA/is a retrovirus ✓ b. gene of hepatitis B «virus» codes for antigen OR hepatitis B «virus» has a gene that induces an immune response ✓ c. «antigen» fuses to capsid gene for TMV ✓ d. two fused genes enter/infect the plant cells «using the virus as a vector» ✓ e. mice fed with infected plants produce antibodies against hepatitis B ✓ f. antibodies are extracted from mouse serum/blood ✓	<i>Allow other mammal</i>	3 max
9.	c	marker genes show the «target» gene has been inserted ✓		1

10.	a	reduces «the accumulation of biofilm» ✓		1
10.	b	a. does not affect taste of water/no chemicals added ✓ b. lower biofilm accumulation over time ✓		1 max
10.	c	A and B ✓	<i>Both required</i>	1
10.	d	a. quorum sensing is a means of communication between bacteria ✓ b. allows the bacteria to synchronize their activities/work together ✓ c. they can change according to the environment/conditions in the pipe ✓ d. control cell density/gene expression ✓		2 max

Question	Answers	Notes	Total
11.	a. bioremediation is the use of organisms to remove «or neutralize» pollutants ✓ b. <i>Pseudomonas</i> species used in bioremediation of oil ✓ c. oil biodegrades naturally at a very slow rate ✓ d. bioremediation increases the rate that the oil breaks down ✓ e. microorganisms feed/get energy from the oil ✓ f. break the oil down into smaller nontoxic molecules ✓	Accept other valid microorganism	4 max

Option C – Ecology and conservation

Question		Answers	Notes	Total
12.	a	190 ✓		1
12.	b	accounts for different productivity at different times of year/seasonal variations OR more data collected OR to increase reliability OR trends over time more easily detected ✓		1
12.	c	a. the increase in concentration of the pesticide at higher trophic levels ✓ b. taken in by organisms low in the food chain ✓ c. cannot be excreted so remains in tissues OR accumulates as more organisms from lower levels are eaten ✓ d. pesticides do not degrade/degrade very slowly ✓		2 max

Question		Answers	Notes	Total
13.	a	<p>a. both cause the frequency of the mussel to decrease ✓</p> <p>b. sea star affects the mussel population more than the sea snail ✓</p> <p>c. when both are together the effect of the sea snail is low ✓</p>	<p>Accept binomial names</p> <p>Allow numerical answers if expressed as comparisons and the candidates are not simply stating numbers</p>	2 max
13.	b	<pre> graph LR phytoplankton --> zooplankton phytoplankton --> mussel zooplankton --> mussel mussel --> sea_snail[sea snail] mussel --> sea_star[sea star] sea_snail --> sea_star </pre>	<p>Award [2] for a correct food web</p> <p>Award [1] for phytoplankton, zooplankton and mussel with correct arrows</p> <p>Award [1] for mussel, sea snail and sea star with correct arrows</p> <p>Award [0] if arrows are in wrong direction</p> <p>Accept binomial or scientific names</p>	2
13.	c	<p>a. keystone species have a significant/disproportionate effect on the ecosystem «relative to their quantity» ✓</p> <p>b. sea stars reduce the number of mussels ✓</p> <p>c. sea stars increase the total number of species in the ecosystem ✓</p> <p>d. reduction of the number of mussels allows other species to flourish ✓</p>	<p>Accept binomial names</p> <p>Accept numerical responses</p> <p>Accept inverse response</p>	2 max
13.	d	<p>number of species/biodiversity will go down ✓</p>		1

Question		Answers	Notes	Total
14.	a	14/15/16;	<i>Do not accept intermediate values eg: 14.5</i>	1
14.	b	zoos/nature reserves/captive breeding/ <i>ex situ</i> conservation/farming/husbandry/pets ✓		1
14.	c	deforestation reduces richness by destroying habitat/loss of food/shelter/nesting sites ✓		1
14.	d	a. adults/young ingest plastic «which is indigestible» ✓ b. plastic damages/fills stomach «can lead to starvation and death» ✓ c. plastic blocks intestine so food cannot be digested «can lead to starvation and death» ✓ d. adults/young can become entangled in plastic and so they drown/choke/suffocate ✓	Allow other verifiable effect of plastic “Can kill the birds” is too vague and worth [0]	2 max

Option D — Human physiology

Question		Answers	Notes	Total
16.	a	as pressure increases volume decreases OR inverse correlation ✓	<i>Accept reverse argument</i> <i>Do not accept “inversely proportional”</i>	1
16.	b	a. when the ventricle contracts blood presses/pressure acts on the AV valve ✓ b. this closes the AV valve «which causes the sound» ✓	<i>The valve must be identified as the AV or atrioventricular valve</i>	2
16.	c	a. required when rate of heartbeat/heart contraction is too slow/irregular ✓ b. produces electrical impulse that stimulates heartbeat/heart contraction ✓ c. needed when SA node is defective ✓	<i>Accept “regulate the heartbeat” for marking point a</i>	2 max
17.	a	probability of GI damage increases with increased «gastric» acidity OR positive correlation ✓	<i>OWTTE</i> <i>Do not accept “directly proportional”</i>	1
17.	b	a. proton pump inhibitors reduce stomach acid «production» ✓ b. antacid/medication to neutralize/decrease acidity ✓ c. «lower acidity» allow GI damage/ulcers to heal ✓ d. antibiotics for <i>H. pylori</i> /bacterial infection ✓ e. diet/lifestyle changes/eliminate smoking/alcohol ✓ f. surgery needed with extensive gastric damage ✓	<i>Accept “cauterization” for marking point f</i>	3 max
17.	c	a. <i>Helicobacter pylori</i> / <i>H. pylori</i> «infection» ✓ b. use of non-steroidal anti-inflammatory drugs/NSAID/aspirin/ibuprofen ✓	<i>Accept valid examples of NSAID but do not accept trade names</i>	1 max

Question			Answers	Notes	Total
18.	a	i	«hepatic» <u>portal vein</u> ✓		1
		ii	a. takes blood from intestine/spleen/pancreas/stomach to liver ✓ b. carries digested food/nutrients/glucose ✓ c. prevents glucose entering the general circulation ✓ d. helps maintain osmotic potential of blood ✓ e. allows toxins to be removed ✓		3 max
18.	b		a. sinusoids have open pores/fenestrations/discontinuous endothelium and capillary endothelium is continuous/does not contain fenestrations ✓ b. Kupffer cells are located inside sinusoids but not in capillaries ✓ c. sinusoids larger in diameter than capillaries ✓	<i>Accept labelled diagrams</i>	2 max
19.			a. increased risk of hypertension/high blood pressure ✓ b. high cholesterol/LDL ✓ c. «circulatory problems such as» atherosclerosis/plaque/thrombosis/stroke/heart disease ✓ d. increased chance of <u>type II</u> diabetes OR unable to control blood sugar level ✓ e. possibly develop osteoarthritis/trouble with joints ✓ f. higher risks of cancers ✓ g. overconsumption of fats/sugars leads to the under consumption of essential nutrients ✓ h. gallstones/gall bladder disease ✓		4 max