PEARSON EDEXCEL IGCSE BIOLOGY · 4BI1

BIOLOGY



MARK SCHEME

SECTION 2: STRUCTURE AND FUNCTIONS IN LIVING ORGANISMS (PACK 5)

SCORE	PERCENTAGE
/210	%

STEMUP

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Mark Scheme

Q1.

Question Number	Answer	Additional guidance	Mark
(a)(i)	0.57 (3)	0.57 gains all **three marks** **Accept** 0.90 for **two marks** OR **Accept** 0.56 or 0.56(66666....7) or 0.56 recurring for **two marks** **Accept** 0.9 or 0.8975 or 1.7 or ÷3 for **one mark** *Example calculation (not mark points):* *(0.55 + 0.54 + 0.61) = 1.7* *÷ 3* *to two dp* Correct answer with no working gains all three marks.	**3**

Question Number	Answer	Additional guidance	Mark
(a)(ii)	• amino acids / peptides (1)	**Accept** polypeptide	**1**

Question Number	Answer	Additional guidance	Mark
(b)(i)	An answer that makes reference to two of the following. • temperature (1) • height / volume / mass / concentration of gelatine / protein/ eq (1) • volume / concentration, of, enzyme / bromelain / pineapple juice / eq (1) • volume of buffer (1) • time (in incubator) (1) • surface area of gelatine / SA:vol ratio / width of tube (1)	**Ignore** amount **Accept** gel for gelatine **Ignore** type / source of protein **Ignore** type / source of juice	**2**

Question Number	Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to three of the following. • volume digested increases up to (pH) 5 then decreases (above 5) / volume digested decreases above and below 5 / eq (1) • optimal pH / optimum pH (1) • (away from optimal pH / 5) enzyme denatures / (active site) shape changes / eq (1) • substrate no longer binds / fits / shape not complementary to substrate (1)	**Accept** rate increases up to 5 then decreases **Accept** denatures at high pH / low pH **Accept** E/S complexes do not form	**3**

Question Number	Answer	Additional guidance	Mark
(c)	A description that makes reference to the following. • add biuret (reagent) / add biuret A and biuret B / sodium hydroxide & copper sulfate (1) • turns lilac / purple / pink / mauve / eq (1)	**Accept** correct, alternative tests e.g. ninhydrin test goes red / brown xanthoproteic test goes yellow	**2**
			(Total for Question = 11 marks)

Q2.

Question Number	Answer	additional guidance	Mark
(a)(i)	producer to primary consumer = 132/ 703 x 100 = 19%	**allow 18.8 / 18.78 / 18.777 18.7767 / eq**	**1**

Question Number	Answer	Mark
(a)(ii)	primary consumer to secondary consumer = 1% of 1 = 0.01	**1**

Question Number	Answer	additional guidance	Mark
(a)(iii)	• more energy transferred / less energy lost / less heat loss / less movement in aquatic / more of producer eaten /eq (1)	**allow converse** not all crop eaten	**1**

Question Number	Answer	Additional Guidance	Mark
(b)	An explanation that makes reference to **two** the following points • less biomass in producers than consumers / consumers have more biomass / eq (1) • but producers have more energy /eq (1) • producers have low mass at any one point in time / are continually being consumed / replaced / high reproduction rate (1) • consumers feed in other areas/ eq (1)	ignore number	**2**

Question Number	Answer	Mark
(c)	An answer that makes reference to two of the following points • sampling using quadrats (1) • burn plants to release energy (1) • use of calorimeter / how heat energy released is measured when burning / heat volume of water and note temperature change/ eq (1)	**2**
	Total 7 marks	

Q3.

Question Number	Answer	Mark
(a)	An explanation that makes reference to two of the following points: • less oxygen (1) • (less) respiration (1) • (less) energy / ATP (1)	**2**

Question Number	Answer	Mark
(b)	An explanation that makes reference to three of the following points: • DNA unzips / separates / one strand copied / eq (1) • complementary / base pairing /eq (1) • template (1) • mRNA produced / eq (1) • transcription (1)	**3**

Question Number	Answer	additional guidance	Mark
(c)	• no nucleus / DNA / no ribosomes/ mitochondria /eq	ign amino acids / genetic material	**1**

Question Number	Answer	Mark
(d)	• can pass across placenta (1)	**1**

Question Number	Answer		Mark
(e)(i)	An answer that makes reference to the following points: • parent genotype dd x Dd (1) • gamete d (and d) and D or d (1) • offspring genotype Dd and dd (1)	allow Punnett square any letter TE max 2	**3**

Question Number	Answer	Mark
(e)(ii)	• 50% / 0.5 / half / 50:50 **not if contradicts ei**	**1**

Question Number	Answer	Mark
(f)	An explanation that makes reference to three of the following points: • memory cells (1) • remain in mother's blood (1) • recognise / identify antigen / binds with antigen (1) • more antibodies produced/ produced faster / sooner (1) • secondary immune response (1)	**3**

Question Number	Answer	Mark
(g)	• **in** the uterus / womb	**1**

Question Number	Answer	Mark
(h)	• (adult) (rhesus) positive / positive / eq	**1**
	Total 16 marks	

Q4.

Question Number	Answer	Mark
(a)	• no GH / water / saline / eq	**1 grad**

Question Number	Answer	Additional guidance	Mark
(b)	increase in mass between 100 and 500 days divide by 400 = g per day 485-230 = 255 ÷ 400 = 0.6375 / 0.638 / 0.64 **allow any answer between 0.6375 and 0.65**	award full marks for correct numerical answer allow 1 mark for ÷ 400	**2 grad**

Question Number	Answer	Mark
(c)	An answer that makes reference to two of the following points: • temperature (1) • (mass of) food / diet / type of food /eq (1) • water (1) • size of cage (1) • time (1) • volume of solution/eq (1)	**2 exp**

Question Number	Answer	Mark
(d)	An explanation that makes reference to two of the following points: • avoids making wrong conclusion based on one / few result(s) / conclusion is valid / eq(1) • can calculate mean / average (1) • results are <u>reliable</u> / increase <u>reliability</u> (1) • anomalous results recognised / eq(1)	**2 exp**

Question Number	Answer	additional guidance	Mark
(e)	An answer that makes reference to three of the following points: • (more) mRNA made (1) • (more) translation (1) • (more) proteins / polypeptides made (1) • enzymes / muscle / tissue (1)	**ignore more cells**	**3 exp**
		Total 10 marks	

Q5.

Question Number	Answer	Additional guidance	Mark
(a)	A description that makes reference to three of the following: • enzymes (1) • (feed on) dead / decaying organisms (1) • for <u>extracellular digestion</u> (1) • absorb the digested food / nutrients (1)	**Accept** named nutrients **Accept** broken down food	**3**

Question Number	Answer	Additional guidance	Mark
(b)(i)	A description that makes reference to one of the following: • judgement of cloudiness is subjective / is qualitative / not quantitative / cloudiness cannot be accurately measured / cannot be repeated by other people / eq (1)	**Accept** cloudiness is judged by eye **Accept** cannot see small differences / it is imprecise **Accept** cannot measure difference in cloudiness	**1**

Question Number	Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to two of: • less kinetic energy / lower collision frequency / not at optimal temperature for enzymes / eq (1) • less fungal growth / less mould / only slight fungal growth (1) • less respiration (1)	**Accept** fewer E-S complexes formed **Accept** microbes / bacteria for fungi **Accept** less decay / less spoilage / less digestion	**2**

Question Number	Answer	Additional guidance	Mark
(b)(iii)	An explanation that makes reference to two of: • enzymes denature (in acid / low pH / vinegar) (1) • active site shape changes / enzymes do not bind with substrate / eq (1) • fungal growth decreases (1)	**Reject** enzymes denature due to **high temperature** **Accept** fungi killed / less spoilage / less decomposition / less respiration **Accept** bacteria / microbes for fungi	**2**

Q6.

Question Number	Answer	Mark
(a)(i)	The only correct answer is **D** S glomerulus **A** is not the answer as P is the distil convoluted tubule **B** is not the answer as Q is the collecting duct **C** is not the answer as R is the loop of Henle	**1**

Question Number	Answer	Mark
(a)(ii)	The only correct answer is **D U** the PCT **A** as Q is the collecting duct **B** is not the answer as R is the loop of Henle **C** is not the answer as S is the glomerulus	**1**

Question Number	Answer	Mark
(a)(iii)	The only correct answer is **B** structure R is the loop of Henle **A** is not the answer as P is the distil convoluted tubule **C** is not the answer as S is the glomerulus **D** is not the answer as U is the proximal convolute tubule	**1**

Question Number	Answer	additional guidance	Mark
(b)(i)	An answer that makes reference to the following: • substances / chemicals present / in solution/ dissolved / carried in the liquid part of the blood / substances / chemicals / present / in solution/ dissolved / carried in the plasma / eq (1)	no credit for components	**1**

Question Number	Answer	additional guidance	Mark
(b)(ii)	56 / 100 x 54 = 30 (2)	allow 30.2 / 30.24 (2) allow full marks for correct answer alone allow 1 mark for 56 or 1 mark for 54 – (54 x 44 / 100)	**2**

Question Number	Answer	Mark
(b)(iii)	An explanation that makes reference to two the following: • (so that) glucose not excreted / lost from body / eq (1) • maintain blood glucose / eq (1) • (required for) respiration / (release of) energy / eq (1)	**2**

Question Number	Answer	Mark
(b)(iv)	An answer that makes reference to five of the following: • 1 as water potential of blood decreases / (solute / solution) concentration increases /eq(1) • 2 osmoreceptors / hypothalamus /pituitary glands (1) • 3 (more) ADH secreted (1) • 4 increase permeability of collecting duct / eq (1) • 5 more water (re)absorbed / less excreted / less urine /more concentrated urine / eq(1) • 6 more urea produced / concentration increases /eq (1) • 7 less urea reabsorbed / more urea excreted / more in urine / eq (1) • 8 more sodium / salts in plasma /eq (1) • 9 so more salt / sodium excreted / less reabsorbed / more in urine / eq(1) • 10 more glucose in blood/ filtered but no change as all reabsorbed / none excreted / eq (1)	**5**

Q7.

Question Number	Answer	Mark
(a)(i)	A collecting duct *B is not correct because it is not the collecting duct* *C is not correct because it is not the collecting duct* *D is not correct because it is not the collecting duct*	**1**

Question Number	Answer	Mark
(a)(ii)	D T *A is not correct because ultrafiltration does not occur here* *B is not correct because ultrafiltration does not occur here* *C is not correct because ultrafiltration does not occur here*	**1**

Question Number	Answer	Mark
(a)(iii)	A P *B is not correct because not affected by ADH* *C is not correct because not affected by ADH* *D is not correct because not affected by ADH*	**1**

Question Number	Answer	Mark
(a)(iv)	B R *A is not correct because glucose not absorbed* *C is not correct because glucose not absorbed* *D is not correct because glucose not absorbed*	**1**

Question Number	Answer	Mark
(b)(i)	An answer that makes reference to the following points: • increasing birth mass associated with more nephrons / eq (1) • a positive correlation / linear / straight line / (directly) proportional (1)	**2**

Question Number	Answer	Mark
(b)(ii)	An explanation that makes reference to four of the following points: • proteins are big / large / only small molecules (1) • normally will not pass out of glomerulus / through basement membrane / into Bowman's capsule / not present in glomerular filtrate (1) • (high blood pressure) forces / squeezes / pushes protein molecules out (1) • damage to glomerulus / Bowman's capsule / basement membrane / nephron (1)	**4**

Question Number	Answer	Additional guidance	Mark
(b)(iii)	An answer that makes reference to the following points: • add Biuret (1) • (changes to) purple/ lilac / mauve (1)	**Allow** NaOH and $CuSO_4$ / use urine testing strips e.g uristix / eq **Allow** green colour for urine testing strip	**2**

Q8.

Question Number	Answer	Mark
(a)	W nucleus / eq (1) X cell sap / vacuole / eq (1) Y cellulose cell wall / cell wall / eq (1) Z cytoplasm (1)	**4**

Question Number	Answer	Additional guidance	Mark
(b)	An answer that makes reference to two the following: measure distance A-B 80 **mm** 8.0 **cm** = 80 000 μm magn = 80 000 ÷ 1000 80 or 79 or 81 or 82 (2) or A-B 8 cm = 8 × 10000	allow full marks for correct answer alone allow 1 mark for ×1000÷1000 if mm or ×10000÷1000 if cm or for correct length of AB from diagram **with units** range 79-82 mm 7.9-8.2 cm	**2**

Question Number	Answer	Mark
(c) (i)	An explanation that makes reference to three of the following: • increases surface area (1) • osmosis (1) • (water in) root hair cell has lower water potential (than water in soil) / from high to low water potential from dilute to more concentrated solution / eq (1) allow correctly expressed idea of conc gradient • as water is lost from leaves/ stomata reducing / setting up osmotic gradient/ water potential gradient in plant /eq (1) • for photosynthesis / turgor/ eq (1) • to transport / absorb mineral ions / eq (1)	**3**

Question Number	Answer	Mark
(c) (ii)	An explanation that makes reference to three of the following: • (no / less) oxygen / eq (1) • (no / less) respiration / eq (1) • (no / less) active transport / eq (1) • (no / less) absorption of minerals /named mineral /eq (1) • (no / less) nitrates for amino acids / for protein synthesis / no magnesium for chlorophyll synthesis / eq (1)	**3**

Q9.

Question Number	**Answer**	**Mark 2**

(a)(i)

Cube side in cm	Surface area of one cube in cm^2	Total Surface area in cm^2	Volume of one cube in cm^3	Total volume in cm^3
20	2400	2400	8000	8000
1	**6**	**48 000**	1	8000

- 6 (1)
- (6 x 8000 =) 48 000 (1) Allow if not in table but in working

Question Number	Answer	Additional guidance	**Mark**
(a)(ii)	20 : 1	award the mark for error carried forward from table Allow their number for total surface area : 2400 eg: 48 000 : 2400 / 6 : 2400 / 1 : 400	**1**

Question Number	Answer	Additional guidance	**Mark**
(b)	An answer that makes reference to two of the following points: **One from:** • (number) reference to many cubes / many alveoli / (alveoli) not one large cube • (surface) reference to SA:Vol / surface area (1) **One from:** • (shape) <u>alveoli</u> are not cubes / <u>alveoli</u> are round/spherical / <u>alveoli</u> have different shape / <u>lungs</u> are not cubes / eq (1) • <u>alveoli</u> surfaces touch / not all surfaces of <u>alveoli</u> are exposed (1) • reference to <u>bronchioles</u> (1)	Eg: alveoli have large SA:Vol / alveoli have large SA	**2**

Question Number	Answer	Additional guidance	Mark
(c)	An explanation that makes reference to the following points: • thin (walls) / one cell thick / close to capillaries **and** short diffusion distance / not far to diffuse (1) • wet / water / moist **and** gases dissolve / in solution (1) • capillaries / blood supply / blood flow **and** concentration/diffusion gradient (1)	Mp1 Ignore faster diffusion Mp2 Ignore liquid	3

Q10.

Question Number	Answer		Mark
(a)	An answer that makes reference to two of the following points: • increasing enzyme concentration increases the rate of oxygen production / eq (2) **one mark** for naming the enzyme concentration / number of potato discs as independent variable and the oxygen production as the dependent variable (1)	**Allow** increasing catalase concentration / number of potato discs increases the amount of oxygen produced / eq (2) **Max one** for correct relationship but variables named wrongly e.g. increasing potato disc number (dependent variable) increases the volume of oxygen produced (independent variable)	2

Question Number	Answer	Mark
(b)	An answer that makes reference to two of the following points: • pH / volume of buffer (1) • volume of hydrogen peroxide / substrate (1) • time / duration of reaction (1) • size / volume / mass / shape / surface area of each disc (1) • temperature (1)	**2**

Question Number	Answer	Additional guidance	Mark
(c) (i)	• 4.2÷3 • 1.4 (2)	Allow **one mark** for mean using all values e.g. 4.2 ÷ 4 = 1.05 or 1.1 or 1.0	**2**

Question Number	Answer	Additional guidance	Mark
(c) (ii)	• 8.3 - 7.3 ÷ 7.3 x 100 • = 13.7 (2)	**Allow one mark** for 1(.0) or (8.3 – 7.3) **Allow one mark** for ÷ by 7.3 **Allow one mark** for 0.137 **Allow** 13.6986 / 14 for 2 marks **Allow one mark** for 13.69	**2**

Question Number	Answer	Additional guidance	Mark
(c) (iii)	An explanation that makes reference to two of the following points: • increasing enzyme concentration /number of discs increases volume of oxygen produced (1) • more active sites (1) • (increase in enzyme concentration) means more collisions / more enzyme substrate complexes / more enzymes combine with substrates / eq (1)		**2**

Question Number	Answer	Additional guidance	Mark
(d)	An explanation that makes reference to the following two points • to measure initial / fastest rate (1) • (as time increases) hydrogen peroxide / substrate concentration falls / hydrogen peroxide breaks down / is used up (1) • valid (comparison) (1)	**Allow** converse for mp1 and mp2 **Allow** reaction will slow down **Allow** the rate of oxygen production / bubbles produced will slow **Allow** reaction is not limited by substrate concentration **Allow** reaction may have finished by 10 min	**2**
			Total 12 marks

Q11.

Question Number	Answer	Mark
(a)(i)	The only correct answer is A *B is incorrect because ultrafiltration does not take place at the proximal convoluted tubule* *C is incorrect because ultrafiltration does not take place at the loop of Henle* *D is incorrect because ultrafiltration does not take place at the collecting duct*	**1**

Question Number	Answer	Mark
(a)(ii)	The only correct answer is B *A is incorrect because reabsorption of glucose does not take place at the glomerulus* *C is incorrect because reabsorption of glucose does not take place at the loop of Henle* *D is incorrect because reabsorption of glucose does not take place at the collecting duct*	**1**

Question Number	Answer	Mark
(a)(iii)	The only correct answer is D *A is incorrect because the proximal convoluted tubule does not respond to ADH* *B is incorrect because ultrafiltration does not respond to ADH* *C is incorrect because ultrafiltration does not respond to ADH*	**1**

Question Number	Answer	Mark
(b)(i)	An explanation that makes reference to the three of following points: • water reabsorbed / water into blood (1) • osmosis (1) • concentrated urine / less water in urine / less urine (1)	**3**

Question Number	Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to the following points: • hot/higher temperature during day / cool(er)/lower temperature at night / cool(er)/lower temperature underground (1) • less water loss / less dehydration (1) • hide from predators / less visible to predators / less chance of being hunted (1)	Mp2 Allow less sweating Allow converse for Mps 2 and 3	**2**

Question Number	Answer	Additional guidance	**Mark**
(b)(iii)	An answer that makes reference to one of the following: • respiration (1) • food / cacti / plants / seeds (1) • condensation (1)	Ignore rain / other water source	**1**

Q12.

Question Number	Answer	additional guidance	Mark
(a)	• 600 / 1400 • 0.43 dm^3 = • 430	one mark for 600 /1400 or one mark for 0.43/ eq **full marks for correct answer with no working** allow 429 / 428.57 or 428.6 / eq	**2**

Question Number	Answer	additional guidance	Mark
(b)	• lungs / skin (1)	allow liver if two answers and one incorrect = 0 skin anus =0	**1**

Question Number	Answer	additional guidance	Mark
(c)	An answer that makes reference to five of the following points • as blood concentration increases osmoreceptors / hypothalamus detects change (1) • pituitary gland release ADH (1) • increase permeability of collecting duct (1) • reabsorbed from collecting duct / into blood (1) • less urine /more concentrated urine (1) • increases water level / reduces blood concentration (1) • (so that) hypothalamus not stimulated / pituitary releases less ADH / negative feedback idea (1)	**allow converse if blood water content increases**	**5**
			Total 8 marks

Q13.

Question Number	Answer	Mark
(a)(i)	The only correct answer is C *A is not correct as ultrafiltration does not take place in A* *B is not correct as ultrafiltration does not take place in B* *D is not correct as ultrafiltration does not take place in D*	**1**

Question Number	Answer	Mark
(a)(ii)	The only correct answer is D *A is not correct as reabsorption does not take place in A* *B is not correct as reabsorption does not take place in B* *C is not correct as reabsorption does not take place in C*	**1**

Question Number	Answer	Mark
(b)(i)	• osmoregulation (1)	**1**

Question Number	Answer	additional guidance	Mark
(b)(ii)	• removal of metabolic waste / waste from chemical reactions (from cells) (1)	Ignore waste removal	**1**

Question Number	Answer	Mark
(c)	An explanation that makes reference to the following points: • collecting duct (1) • impermeable / less permeable / no change in permeability / eq (1) • less water reabsorbed / water is not reabsorbed / less water back into blood / eq (1) • more urine produced / dilute urine produced / more water lost / dehydration / eq (1) • blood concentration increases / eq (1)	**4**

Question Number	Answer	Mark
(d)(i)	• increases permeability of collecting duct (wall) / becomes permeable / will now be permeable / eq (1)	**1**

Question Number	Answer	Mark
(d)(ii)	An answer that makes reference to the following points: • decrease (volume) / less urine / eq (1) • increase concentration / eq (1)	**2**
		Total = 11 marks

Q14.

Question Number	Answer	Mark
(a)(i)	The only correct answer is A B is not correct as B is not Nitrogen fixation C is not correct as C is not Nitrogen fixation D is not correct as D is not Nitrogen fixation	**1**

Question Number	Answer	Mark
(a)(ii)	The only correct answer is D A is not correct as A is not decomposition B is not correct as B is not decomposition C is not correct as C is not decomposition	**1**

Question Number	Answer	Mark
(a)(iii)	The only correct answer is C A is not correct as A is not nitrification B is not correct as B is not nitrification D is not correct as D is not nitrification	**1**

Question Number	Answer	additional guidance	Mark
(a)(iv)	• (nitrifying) bacteria / fungi allow correctly named genus / species (1)	ign denitrifying / nitrogen fixing bacteria / microorganisms	**1**

Question Number	Answer	Mark
(b)(i)	An explanation that makes reference to two of the following points • compare / (look at growth in) test solution / without **nitrate** / eq (1) • compare with (growth of) control / shows normal growth /eq(1) • if control had no minerals / other minerals absent would not show normal growth (1)	**2**

Question Number	Answer	Mark
(b)(ii)	• remove nitrates / all minerals /eq (1)	**1**

Question Number	Answer	Mark
(b)(iii)	An explanation that makes reference to two of the following points • block out light (from roots) /eq (1) • prevent photosynthesis (1) • prevent algal growth (1)	**2**

Question Number	Answer	Mark
(b)(iv)	An explanation that makes reference to two of the following points • measure height / length / leaf area / mass of plants (1) • using ruler / balance / scales / eq (1) • of both solutions / seedlings complete with minus nitrates (1)	**2**
	Total 11 marks	

Q15.

Question number	Answer	Mark
(a)(i)	B	**1**

Question number	Answer	Mark
(a)(ii)	A	**1**

Question number	Answer	Additional guidance	Mark
(b)(i)	An explanation that makes reference to the following points: • less dry mass (with herbicide) so less growth (1) • less carbon dioxide absorbed (1) • less photosynthesis (1) • less carbohydrate synthesised/equivalent (1) • less water loss/transpiration (1) • stomata close (1) • less supply of mineral ions/named mineral ion (1) • nitrate needed for amino acids/protein; phosphate needed for ATP/DNA; magnesium needed for chlorophyll/ chloroplasts (1)	ignore nutrients	**6**

Question number	Answer	Additional guidance	Mark
(b)(ii)	Subtraction • 0.97 − 0.85 = 0.12 (1) Multiplication • 60 × 24 × 7 = • 10080 × 1209.6 = 1200 to two sig fig (1)	award full marks for correct numerical answer without working allow 1209.6	2

Question number	Answer	Additional guidance	Mark
(b)(iii)	Subtraction • 33.3 – 19.5 = 13.8 (1) Percentage • (13.8 ÷ 33.3) × 100 = 41.4% to three significant figures (1)	award full marks for correct numerical answer without working allow 41%	2

Question number	Answer	Additional guidance	Mark
(c)	A description that makes reference to five of the following points: • potometer (1) • stopwatch/reference to time (1) • measure distance moved by bubble/measure mass loss/equivalent (1) • repeat readings/find mean (1) • control of named environmental factor (1) • same size plant/divide by leaf surface area/equivalent (1)	allow credit for description of weight or mass potometer	5

(Total for question = 17 marks)

Q16.

Question Number	Answer	Mark
(a)	The only correct answer is **D** osmosis *A is not correct as it is not how plants absorb water* *B is not correct as it is not how plants absorb water* *C is not correct as it is not how plants absorb water*	**1 comp**

Question Number	Answer	Mark
(b)	• xylem / xylem vessels	**1 cler**

Question Number	Answer	Mark
(c)	• transpiration / evaporation / diffusion / evapotranspiration	**1 cler**

Question Number	Answer	Mark
(d)	**C** low air temperature *A is not correct as it does not reduce the movement of water from the leaves into the air* *B is not correct as it does not reduce the movement of water from the leaves into the air* *D is not correct as it does not reduce the movement of water from the leaves into the air*	**1 comp**

Question Number	Answer	additional guidance	Mark
(e)	An answer that makes reference to two of the following points: • support / turgor / eq (1) • photosynthesis / eq (1) • cooling (1) • reactions / solvent / transport of mineral ions /named/mineral ion /eq (1)	**ignore** transpiration for enzymes to work eq reactions	**2 grad**
			Total 6 marks

Q17.

Question Number	Answer	additional guidance	Mark
(a)	A description that makes reference to six of the following points: • **virus** non-living organisms / small particles / protein coat / capsid / relies on other organisms for reproduction/ eq (1) • AIDS / eq (1) • **bacteria** microscopic single-celled / prokaryotic / no nucleus / have nucleoid / plasmids (1) • pneumonia / eq (1) • **fungus** not able to carry out photosynthesis / saprotrophic / single-celled / hyphae / cell wall chitin/eq (1) • athlete's foot / eq (1) • **protoctist / protozoa** *Plasmodium* / microscopic single-celled (1) • malaria / eq (1)	pathogen **and** description for first mark disease mark must **match pathogen** type allow plant disease eg TMV HIV / AIDS scores disease mark but not pathogen description mark Virus non-living causing cholera scores pathogen description but not disease mark	**6 exp**

Question Number	Answer	additional guidance	Mark
(b)	An explanation that makes reference to three of the following points: • dead / weakened / harmless / attenuated pathogen / eq (1) • produce memory cells / lymphocytes (1) • (secondary) immune response (1) • **<u>faster / more</u>** antibodies production (1)	allow weakened strain	**3 exp**
			Total 9 marks

Q18.

Question Number	Answer	Additional guidance	Mark
(a)(i)	An answer that makes reference to one of the following: • bleach / hypochlorite / disinfectant / antiseptic / chlorine (1) • alcohol / ethanol (1) • radiation / uv / gamma rays / X-rays (1)	Reject boil / steam or any method that kills cells Reject acid / alkali / anti-bacterial wash / antibiotic / sterilising solution Boiling in ethanol = 0	**1**

Question Number	Answer	Additional guidance	Mark
(a)(ii)	An answer that makes reference to one of the following: • nitrate / ammonium / magnesium / calcium / sulphate / potassium / phosphate / iron (1) • amino acids (1) • sucrose / glucose / fructose / sugar / starch (1)	Ignore water / phosphorus / nitrogen / mineral ions	**1**

Question Number	Answer	Additional guidance	Mark
(b)	An explanation answer that makes reference to two of the following points: • cells are differentiated / specialised / can only form one cell type / cells unable to differentiate / specialise / form other cell types (1) • no / fewer stem cells (1) • stem cells found in embryo / bone marrow / umbilical cord (1)	Ignore references to plant tissue	**2**

Q19.

Question Number	Answer	Mark
(a)	The only correct answer is A *B is not correct because it does not contain nephrons* *C is not correct because it does not contain nephrons* *D is not correct because it does not contain nephrons*	**1**

Question Number	Answer	Mark
(b)	An answer that makes reference to one of the following points: • water (1) • urea (1) • ions / named ion / salts (1)	**1**

Question Number	Answer	Additional Guidance	Mark
(c)(i)	An explanation that makes reference to five of the following points: • more urine produced when drinking water / less urine when drinking salt solution (1) • lower blood concentration (when drinking water) / higher blood concentration (when drinking salt solution) (1) • detected by hypothalamus / osmoreceptors (1) • less / no ADH released by (pituitary) (with water) / (more) ADH released (with salt) (1) • collecting ducts are less permeable (with water) / collecting ducts are more permeable (with salt) (1) • less water reabsorbed / absorbed into blood (with water) / (more) water reabsorbed / absorbed into blood (with salt) (1)	**Allow** converse for salt **Allow** correct water potentials **Allow** blood is more dilute / higher water levels	**5**

Question Number	Answer	Mark
(c)(ii)	An answer that makes reference to two of the following points: • exercise / sweating / activity (1) • volume of fluid consumed before investigation / what they drank (1) • temperature / eq (1) • food eaten / diet (1)	**2**

Q20.

Question Number	Answer	Mark
(a)	C ultrafiltration *A is incorrect because digestion is not a process in the kidneys* *B is incorrect because mutation is not a process in the kidneys* *D is incorrect because vaccination is not a process in the kidneys*	**1 comp**

Question Number	Answer	Additional guidance	Mark
(b)	An answer that makes reference to three of the following points: • stay out of water / wear waterproof clothes / eq (1) • treat drinking water / boil water (before drinking) / do not drink water / drink bottled water / eq (1) • sanitation / no faeces in water / no urine in water /eq (1) • remove snails /eq (1) • vaccination (1)	**Allow** do not go in infected rivers or lakes / cover skin when in water / avoid contact with affected water / only wash in clean water **Allow** filter water / do not drink river water / lake water **Allow** use sewage treatment system / use toilet with septic tank **Allow** don't touch snails	**3 exp**

Question Number	Answer	Mark
(c)	An answer that makes reference to two of the following points: • red blood cells / rbc (1) • white blood cells / wbc (1) • lymphocytes (1) • phagocytes / macrophages (1)	**2 grad**

Question Number	Answer	Mark
(d)	D 4 800 *A is incorrect because it is the wrong value* *B is incorrect because it is the wrong value* *C is incorrect because it is the wrong value*	**1 comp**

Question Number	Answer	Additional guidance	Mark
(e)	• $8 \times 10^{-4} = 0.0008$ • x 240 million = 192 000 ÷ 100 = 1920 (2)	**Allow** 1 mark for: 19200000 / 1920000 / 192000 / 19200 / 192 / 19.2 / 1.92 / 0.192 / 0.0192 Award full marks for correct numerical answer without working	**2 grad**

Question Number	Answer	Mark
(f)	A a circle of DNA *B is incorrect because it is not RNA* *C is incorrect because it is not a protein* *D is incorrect because it is not RNA*	**1 comp**

Question Number	Answer	Mark
(g)	An explanation that makes reference to three of the following points: • antigen (1) • memory cells / lymphocytes (1) • (secondary) immune response (1) • more antibodies / antibodies made sooner / faster / faster immune response / eq (1)	**3 exp**

Question Number	Answer		Mark
(h)(i)	• (a treatment with) no plasmid / no protein / only water / saline / eq (1)	**Allow** placebo vaccine / a placebo / plasmid with no gene / plasmid with no DNA / different DNA	**1 exp**

Question Number	Answer	Additional Guidance	Mark
(h)(ii)	An answer that makes reference to three of the following points:		**3 exp**
	• reduced numbers / eq (1)	**Allow** reduces numbers of worms / worms decrease / lower number of worms after vaccine **Allow** more worms in control group	
	• by 19 or by 47% / about 50%		
	• schistosomes / worms, still present in body (1)	**Allow** does not completely get rid of them	
	• no idea of group size / needs to be repeated (1)	**Allow** more testing / more people tested	
	• no idea of age / sex / health (1)		
			Total = 17 marks