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Pearson Edexcel

Mark Scheme (Provisional)

Summer 2021

Pearson Edexcel International GCSE
In Biology (4BI1) Paper 1B and Science (Double Award) (4SD0) Paper 1B

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<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>1(a)</td><td>
<table>
<tr><th>Value</th><th>Apparatus</th></tr>
<tr><td>magnification of a red blood cell</td><td>microscope</td></tr>
<tr><td>heat produced by germinating seeds</td><td>thermometer / temperature probe / data logger/eq (1)</td></tr>
<tr><td>surface area to volume ratio of a potato chip</td><td>ruler /eq (1)</td></tr>
<tr><td>breathing rate of a human</td><td>clock / watch / timer / spirometer /eq (1)</td></tr>
<tr><td>volume of gas produced by yeast in anaerobic respiration</td><td>syringe / measuring cylinder / respirometer/ eq (1)</td></tr>
</table>
</td><td>4</td></tr>
</table>

Question Number	Answer	additional guidance	Mark
1(b)	• width of cell = 5.3 cm • width of cell = in 53 000 µm ÷ 8 = 6625 6250 to 6750	**5.0 – 5.4 cm** **allow full marks for answer alone** allow 1 mark for dividing by 8	**2**

Total 6 marks

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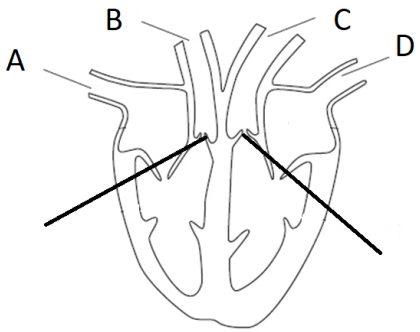
Question Number	Answer	Mark
2(a) (i)	**The only correct answer is D** A is not correct as it does not bring oxygenated blood to heart B is not correct as it does not bring oxygenated blood to heart C is not correct as it does not bring oxygenated blood to heart	**1**

Question Number	Answer	Mark
2(a) (ii)	**The only correct answer is C** A is not correct as it does not contain blood with the highest pressure B is not correct as it does not contain blood with the highest pressure D is not correct as it does not contain blood with the highest pressure	**1**

Question Number	Answer	additional guidance	Mark
2(b) (i)		allow other forms of indication of location	**1**

Question Number	Answer	additional guidance	Mark
2(b)(ii)	A description that makes reference to the following points: • prevent backflow of blood /one way flow /eq (1) • (from arteries) into <u>ventricle/ ventricles</u> (1)	back into heart =mp1	**2**

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Question Number	Answer	Mark
2(c)(i)	An explanation that makes reference to the following points: • so that oxygenated and deoxygenated blood do not mix / as left hand side now contains oxygenated blood from lungs / eq (1) • so that oxygenated blood can be pumped around body / so deoxygenated blood does not go round body / so oxygenated blood does not go to lungs / eq (1)	**2**

Question Number	Answer	Mark
2(c)(ii)	An explanation that makes reference to three of the following points: • may appear blue / lack colour / not survive / shortness of breath/ eq (1) • as less oxygen (transported from heart to body) / deoxygenated blood goes to body / eq (1) • less (aerobic) respiration (1) • less energy / less ATP/ eq (1)	**3**

Total = 10 marks

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Question Number	Answer	Mark
3(a)	A description that makes reference to four of the following points: • boil leaf in water / eq (1) • boil in <u>ethanol</u> (to remove chlorophyll) (1) • hot water bath / kettle / turn off Bunsen / eq (1) • soak in water (to rehydrate / allow diffusion) (1) • add iodine solution (1) • <u>blue black</u> / eq (leaf uncovered) <u>starch present</u> / <u>yellow / eq</u> <u>no starch</u> (leaf covered) (1)	**4**

Question Number	Answer	additional guidance	Mark
3(b)(i)	An answer that makes reference to four of the following points: • increasing carbon dioxide increases rate /eq (1) • CO_2 required / substrate (for photosynthesis)/ eq (1) • greater higher (in rate) at high light intensity / eq (1) • light required / provides energy for photosynthesis/ eq (1) • increase is same from 0.00 to 0.02 / first two readings / eq (in both light intensities) (1) • levelling at (high light intensity) due to temperature / number of chloroplasts / amount of chlorophyll/ eq (1)	correct ref to CO_2 limiting factor allow converse light limiting/ eq factor ref to temperature limiting factor	**4**

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Question Number	Answer	Mark
3(b)(ii)	An answer that makes reference to one of the following points: • use more bulbs / change bulb / wattage / use dimmer / filters / eq (1) • change distance (1)	**1**

Question Number	Answer	Mark
3(b)(iii)	• (number of) bubbles (per minute) / rate of photosynthesis / rate of oxygen production / eq	**1**

Question Number	Answer	Mark
3(b)(iv)	• same type / species / mass / number of leaves / length / size same piece of plant / eq	**1** **Grad**

Total = 11 marks

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Question Number	Answer	Mark
4(a)(i)	**The only correct answer is C chitin glycogen** A is not correct as it is not cellulose and glycogen B is not correct as it is not cellulose and starch D is not correct as it is not chitin and starch	**1**

Question Number	Answer	Mark
4(a)(ii)	**The only correct answer is B fungus** A is not correct as it is not a bacterium C is not correct as it is not a plant D is not correct as it is not a protoctist	**1**

Question Number	Answer	Mark
4(b)(i)	**Only correct answer is B glucose → ethanol + carbon dioxide** A is not correct as it is not the correct equation C is not correct as it is not the correct equation D is not correct as it is not the correct equation	**1**

Question Number	Answer	additional guidance	Mark
4(b)(ii)	• restriction / endonuclease / ligase (1)	allow correctly named endonuclease	**1**

Question Number	Answer		Mark
4(b)(iii)	• contains new DNA / new gene / foreign DNA / foreign gene / altered genes / DNA from other organism/ DNA from other species / gene from other organism / gene form other species / contains gene for digesting cell walls / contains gene for digesting cellulose / gene for cellulase / eq /		**1**

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Question Number	Answer		Mark
4(b)(iv)	An answer that makes reference to two of the following points: • less burning of fossil fuels / eq (1) • less carbon dioxide in air / carbon neutral / plants use CO_2 (in photosynthesis) / eq (1) • less trapping of heat / less greenhouse effect / eq (1) • uses renewable resource (1)	allow named fossil fuel	**2**

Question Number	Answer	Additional guidance	Mark
4(c)(i)	• 2.2 – 1.25 = • 0.95 ÷ 1.25 = 0.76 • × 100 = 76% (2)	award full marks for correct numerical answer without working allow 2.2 -1.3 =0.9 0.9÷1.3 = 0.69 ×100 = 69% allow 2.2 – 1.2 =1 1÷ 1.2= 0.8 0.8×100 = 80% allow 1 mark for dividing by mass of normal yeast / 1.2 to 1.3 percentage between 69 and 80 (2)	**2**

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Question Number	Answer	additional guidance	Mark
4(c)(ii)	An answer that makes reference to two of the following points: • running out of glucose / food / eq (1) • (build-up of) ethanol (1) • yeast cells die (1)	allow one mark for oxygen becomes available ethanol kills the yeast = mp2 and mp3	**2**

Total 11 marks

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Question Number	Answer	additional guidance	Mark
5(a)	An answer that makes reference to three of the following points: • quadrat (1) • repeat (1) • random / using coordinates / eq (1) • count / how many / amount / number /eq (1) • divide total /eq (count) by (area / number of) quadrats /eq (1)	use quadrat**s** scores mp1 and mp 2	**3**

Question Number	Answer	additional guidance	Mark
5(b)	An answer that makes reference to five of the following points: • BC numbers decline slower / CC numbers lower at start / February / eq (1) • CC numbers lower in some / April/ June / August / stated months /eq (1) • BC numbers are (overall) lower / eq (1) • BC stays low / less variable / CC go up and down / eq (1) • BC no need to reapply / insects reproduce / eq (1) • BC less risk of pollution / eq (1) • BC less risk of resistance /eq (1) • BC is specific / not affect (other) food chains /eq (1) • BC no bioaccumulation / eq (1) • BC could become pest /eq(1)	allow converse allow biomagnification	**5**

Total = 8 marks

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Question Number	Answer	Mark
6(a)	The only correct answer is C the organisms of all species in a habitat A is not correct as is not a community B is not correct as is not a community D is not correct as is not a community	**1**

Question Number	Answer	Additional guidance	Mark
6(b)(i)	• $1.5 \times 10^4 = 15\,000$ • $2.5 \div 15\,000 =$ • 1.7×10^{-4} (3)	award full marks for correct numerical answer without working 1 mark for $2.5 \div 15000$ or $2.5 \div 1.5 \times 10^4$ 2 marks for 0.00017 2 marks for 17×10^{-5} allow $1.67 \times 10^{-4} = 3$ allow 1.66 recurring $\times 10^{-4} = 3$	**3**

Question Number	Answer	additional guidance	Mark
6(b)(ii)	• correct order / names (1) • correct pyramid / shape / eq (1)	ignore shape ignore names	**2**

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Question Number	Answer	additional guidance	Mark
6(c)(i)	An explanation that makes reference to the following points: • undigested / not absorbed / waste / faeces / not assimilated / eq (1) • contains energy / cellulose (1)	cellulose not digested = 2 marks energy trapped in faeces = 2 marks	**2**

Question Number	Answer	Mark
6(c)(ii)	An answer that makes reference to two of the following points: • respiration / heat loss (1) • movement / eq (1) • uneaten / die / not consumed /eq (1) • excretion (1)	**2**

Total 10 marks

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Question Number	Answer	Mark
7(a)	• <table><tr><th>Individual</th><th>Genotype</th></tr><tr><td>P</td><td>Dd (1)</td></tr><tr><td>Q</td><td>Dd (1)</td></tr><tr><td>R</td><td>Dd</td></tr><tr><td>S</td><td>dd (1)</td></tr></table>	**3**

Question Number	Answer	Mark
7(b)	1/8 / 0.125 / 12.5%	**1**

Question Number	Answer	Mark
7(c)	An answer that makes reference to four of the following points: • greater increase in testosterone in R / smaller increase in S /eq (1) • R male / S female / eq (1) • greater increase in oestrogen in S / less increase in R / eq (1) • more muscle / deeper voice / beard in R/ eq (1) • wider hips / breasts / in S (1) • body hair / growth spurt / eq (1) • gamete / sperm / egg production / start to menstruate (1) • <u>secondary sexual characteristics</u> (1)	**4**

Total 8 marks

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Question Number	Answer	additional guidance	Mark
8(a)	• Fat more in cow's / eq (1) • Fat could lead to obesity / too many kJ calories / eq (1) • Protein more in in cow's / eq (1) • Minerals more in cow's / eq (1) • Carbohydrate less in cow's / eq (1) • (too little carbohydrate in cow's) so not enough (quick) energy (1) • Vitamins similar / same (1) • Water the similar / same (1) • Antibodies no (human antibodies) in cow's (1) • Antibiotics in cow's (1)	allow converse for mp 1,3,4, 5, 9 and 10 allow 'too much' allow 'too much' allow 'too much' allow 'too little in cows '	**6**

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Question Number	Answer	additional guidance	Mark
8(b)	An answer that makes reference to two of the following points: • (exposure to) sun(light) (1) • named source of vitamin D such as cod-liver oil / oily fish – such as salmon, sardines, herring and mackerel / red meat /liver /eggs / fortified foods – such as most fat spreads and some breakfast cereals (1) • add drops / use supplement / eq (1)	give cod-liver oil (tablets) = mp 2 and 3	**2**

Question Number	Answer	additional guidance	Mark
8(c)	An answer that makes reference to the following points: • Add biuret (1) • If protein present turns purple / lilac (1)	allow / uristix / clinistix /protein test sticks mp 1 and stated colour change mp 2	**2**

Total = 10

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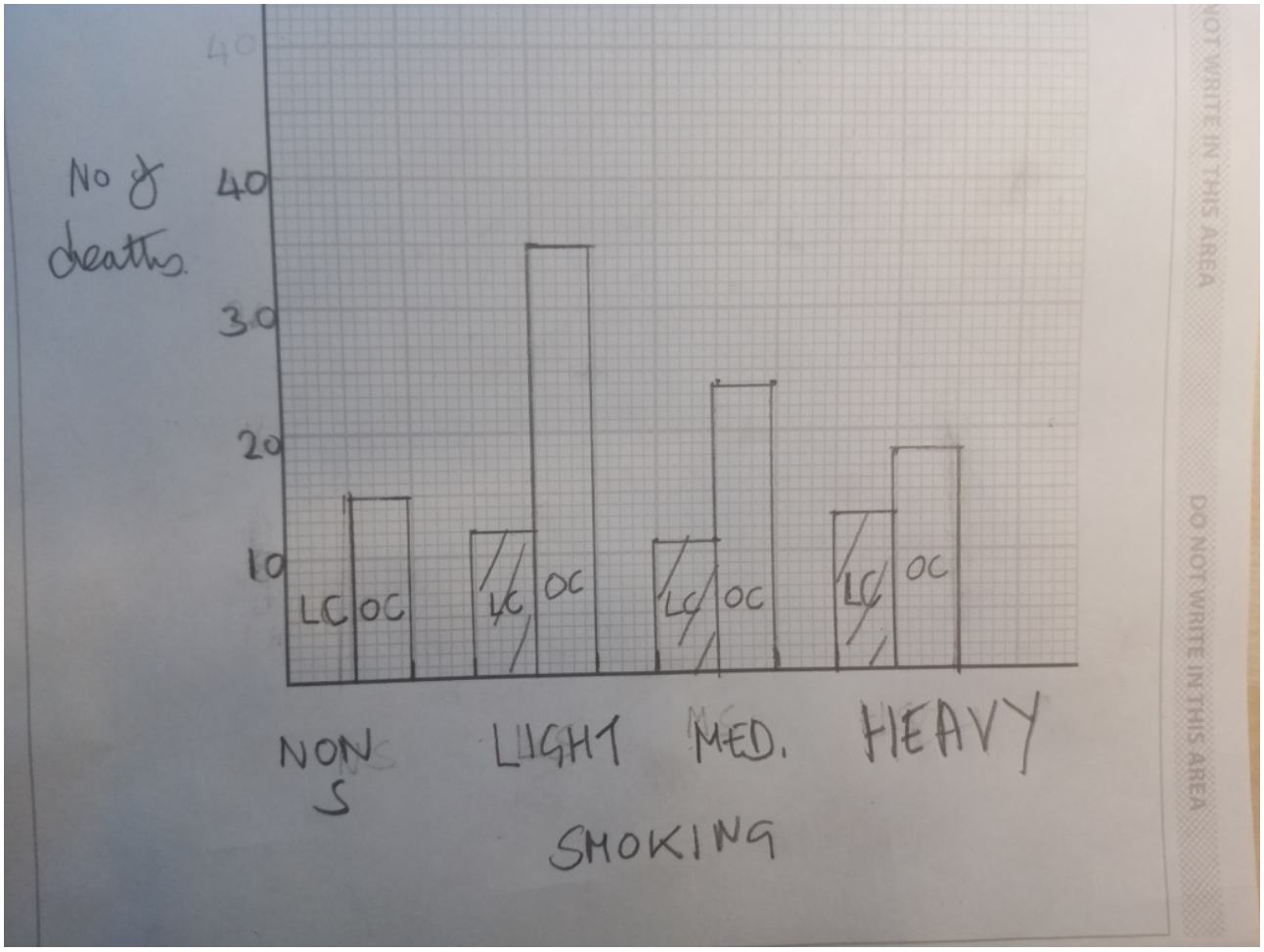
Question Number	Answer	Additional guidance	Mark
9(a)(i)	An answer that makes reference to 5 of the following points: • S y axis scale linear and half the grid (1) • A 2 y axis labelled (number of) deaths (1) • P bars plotted correctly within one (1) • K 1 non- smoker / light/ medium /heavy labelled key shown (1) • K2 labelled lung / other cancer (1)	allow stacked bar chart for LC and OC or LC OC and All line graph scores 4 max	**5**



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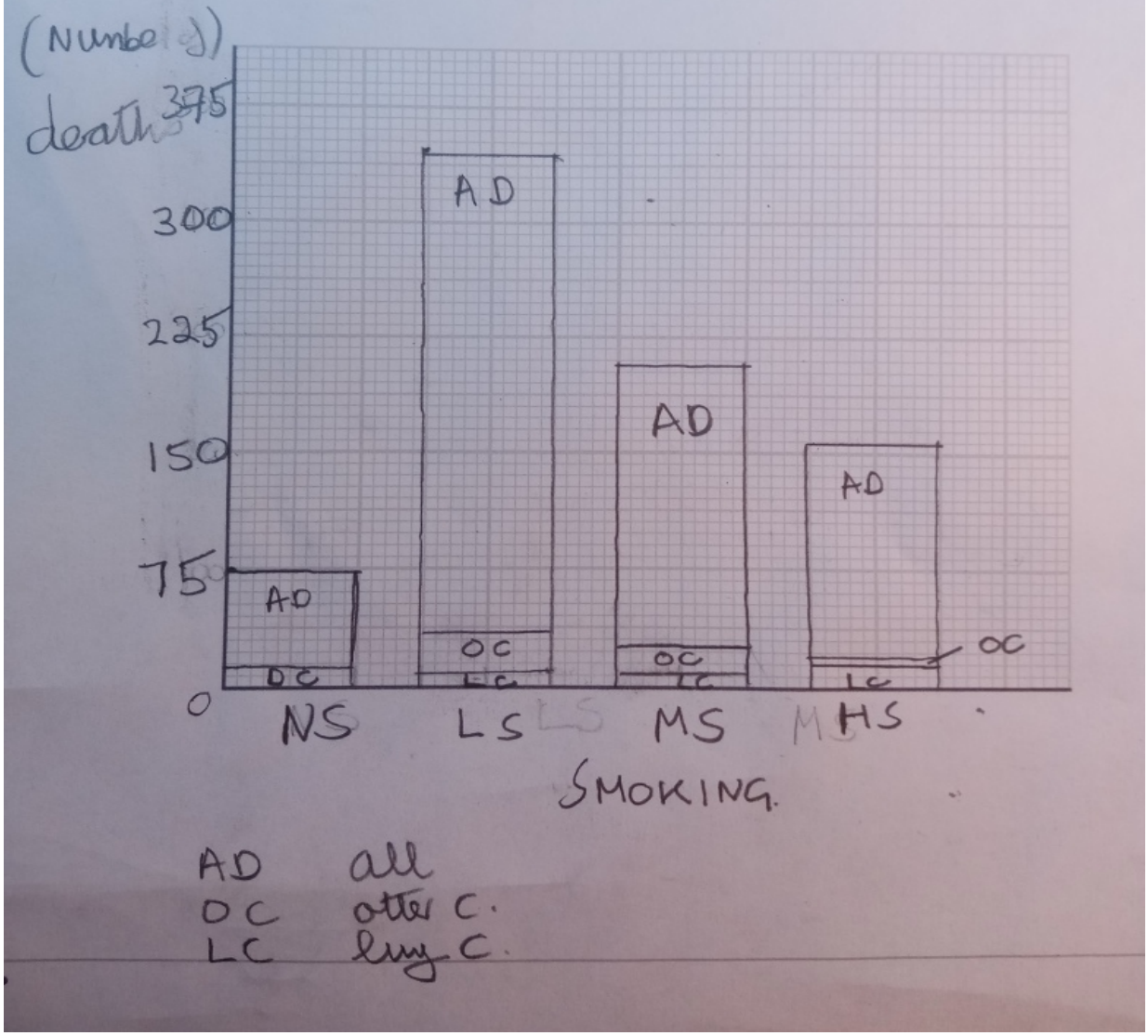
lung cancer	0	12	11	13	36
other cancers	15	35	24	18	92
all deaths	82	345	206	157	790

(a) (i) Plot a bar chart to show the number of deaths from lung cancer and from other cancers for each of the four groups.

(5)



AD all
OC other C.
LC lung C.

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Question Number	Answer	Additional guidance	Mark
9(a)(ii)	• percentage of deaths due to lung cancer in heavy = 13/157 x 100 = 8.3% • percentage of deaths caused by lung cancer in light smokers = 12/345 x 100 =3.5% • difference = 4.8% (3)	Allow 1 mark for 8.3 or 8.28/etc Allow 1 mark for 3.5 or 3.48/etc Allow full marks for 4.8%/ 4.802 etc	**3**

Question Number	Answer	additional guidance	Mark
9(b)	An explanation that makes reference to two of the following • as age increase higher incidence of cancers /eq (1) • as cells more likely to mutate /eq (1) • smoked for longer period / eq (1) • weak immune system / eq(1)	eg 'old people get more cancer'	**2**

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Question Number	Answer	additional guidance	Mark
9(c)	An explanation that makes reference to one pair of the following • causing CHD / heart disease / heart attack / blood clots /eq (1) • due to narrowing / blocking of arteries / blood vessels / damage to artery lining /blood vessels lining/ eq (1) OR • bronchitis / pneumonia/ emphysema / lung infection / shortness of breath / eq(1) • due to damage to alveoli / reduces SA / damages cilia / build-up of mucus / prevents removal of mucus (1) OR • affects oxygen transport / shortness of breath / eq (1) • due to carbon monoxide binding to Hb /eq (1)	ignore veins second point must match first to score 2 ignore 'cough(ing)' can get second point without first eg smoking causes build-up of mucus	**2**

Total = 12 marks

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Question Number	Answer	Mark
10(a)	• homeostasis (1)	**1**

Question Number	Answer	additional guidance	Mark
10(b)	An answer that makes reference to 4 of the following points. • receptors in skin surface detect stimulus / are stimulated /(1) • impulse (1) (once) • sensory neurone to relay neurone / CNS / eq (1) • via diffusion of neurotransmitters / eq (1) (once) • synapse (1) (once) • motor neurone to muscle / effector (1) • effector/ muscle contracts eq (1)	allow action potential ignore message / signal eq	**4**

Question Number	Answer	Mark
10(c)(i)	An explanation that makes reference to the following points. • less sweat released /eq (1) • less (sweat) evaporates / less cooling / less heat loss /eq (1)	**2**

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Question Number	Answer	additional guidance	Mark
10(c)(ii)	An explanation that makes reference to 3 of the following points. • B / blood vessels (to surface) constrict / vasoconstriction / eq (1) • less blood flows (to skin surface) / eq (1) • less heat loss / heat conserved /eq (1) • less convection / radiation (1)	allow converse ignore capillaries constrict more blood away from surface / eq	**3**

Question Number	Answer	Mark
10(d)	An explanation that makes reference to 4 of the following points. • variation in amount of body hair / eq (1) • caused by mutation (1) • less hair increased heat loss / can lose heat in sun / warm / hot climate / chase animals / started to wear clothes / eq (1) • survive and reproduce (1) • pass on alleles / genes to offspring (1)	**4**

Total = 14 marks

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Question Number	Answer	Mark
11(a)(i)	An explanation that makes reference to 3 of the following points. • (sulfur dioxide) released dissolves in water (vapour) (1) • forms sulfuric acid (1) • acid rain (1) • causes damage to plants / deforestation / eq (1) • breathing problems for humans / animals / eq (1) • death of fish /aquatic organisms / eq (1)	**3**

Question Number	Answer	additional guidance	Mark
11(a)(ii)	• less burning / use of fossils fuels / named fossil fuel / low sulfur fuel / named example of alternative to using fossil fuels / eq (1)	allow examples use public transport / use wind power / cycling / electric/hybrid vehicles / etc	**1**

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Question Number	Answer	additional guidance	Mark
11(b)	An answer that makes reference to 6 of the following points. • C with and without HCO_3 / changes concentrations of HCO_3 (1) • O use same species / age / size / strain / type of seedling /eq (1) • R repeat (for each concentration of HCO_3) (1) • M1 measure / yield / height / mass / count number of leaves / number of plants that germinate / eq (1) • M2 after <u>stated time</u> 48 hours + (1) • S1 control light / CO_2 / temperature /eq (1) • S2 control compost / water / humidity / moisture /minerals / fertiliser/ volume of solution / eq (1)	not just same time for M2	**6 Exp**

Total = 10

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