



Mark Scheme (Results)

January 2020

Pearson Edexcel International GCSE in
Biology (4BI1)
Paper 1B

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 1(a)(i) | <p>The only correct answer is B as there are three producers in the web</p> <p><i>A is incorrect as there is not one producer in web</i></p> <p><i>C is incorrect as there are not four producers in web</i></p> <p><i>D is incorrect as there are not nine producers in web</i></p> | 1 |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 1(a)(ii) | <p>The only correct answer is C as there are four secondary consumers in the web</p> <p><i>A is incorrect as there is not one secondary consumer in the web</i></p> <p><i>B is incorrect as there are not three secondary consumers in the web</i></p> <p><i>D is incorrect as there are not seven secondary consumers in the web</i></p> | 1 |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---|----------|
| 1(b)(i) | <ul style="list-style-type: none"> (eye) sight / vision / seeing / visual / optic / eq (1) | <p>Allow any word that implies vision</p> <p>no credit for retina / eyes</p> <p>No credit for sight and smell</p> | 1 |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---|----------|
| 1(b)(ii) | <ul style="list-style-type: none"> $530 \div 30.0$ 18 / 17.7 / 17.67 / 17.6(recurring) | <p>award full marks for correct numerical answer without working</p> <p>also allow any version of 17.667 17.6667 etc</p> <p>one mark for $530 \div 30.0$ or 17.6</p> | 2 |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 1(c) | An explanation that makes reference to two of the following points: <ul style="list-style-type: none">• anaerobic respiration (1)• provide energy / ATP (1)• less / need more/ without oxygen (1) | 2 |

Total = 7 marks

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---|----------|
| 2(a) | <p>An answer that makes reference to three of the following:</p> <ul style="list-style-type: none"> • have nucleus (1) • have organelles / mitochondria / chloroplasts eq (1) • have chromosomes / more than one chromosome (1) • lack plasmids (1) | <p>allow converse for prokaryotes</p> <p>prokaryotes have a nucleoid</p> <p>prokaryotes have circular chromosome / loop of DNA</p> | 3 |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---|----------|
| 2(b) | <p>An answer that makes reference to suitable organism and matched disease:</p> <ul style="list-style-type: none"> • plasmodium (1) • malaria (1) | <p>allow other examples</p> <p>e.g. amoeba and dysentery</p> <p>Trypanosoma and sleeping sickness</p> <p>must be matched</p> <p>so amoeba with malaria scores 1</p> <p>malaria plasmodium wrong way round scores 1</p> | 2 |

Total = 5 marks

| Question Number | Answer | additional guidance | Mark |
|-----------------|--|------------------------|----------|
| 3(a) | <p>A description that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • crush / grind nut / eq (1) • ethanol / Sudan III (1) • add water (1) • white / emulsion / red (layer) (1) | if add oil -1 to score | 3 |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---|----------|
| 3(b)(i) | <p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • peristalsis (1) • move food along intestine / prevent constipation / helps bowel movement / eq (1) • undigested material / indigestible / cellulose (1) | <p>ignore ref to prevent cancer</p> <p>ignore helps digestion</p> | 2 |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|-------------------------------|----------|
| 3(b)(ii) | <p>An explanation that makes reference the following points:</p> <ul style="list-style-type: none"> • (nut A) has <u>more</u> iron/protein (1) • (more) haemoglobin (1) | iron for haemoglobin scores 1 | 2 |

| Question Number | Answer | Additional guidance | Mark |
|------------------|--|--|----------|
| 3(b)(iii) | <ul style="list-style-type: none"> • $16.7 \times 10^{-2} = 0.167$ • $\times 28 = 4.68$ <p>allow 4.676 allow 4.7</p> | <p>award full marks for correct numerical answer without working</p> <p>should be 3 sig figs</p> <p>allow one mark for 0.167 or one mark for $\times 28$ one mark for any version 4676 or 47 or 468</p> | 2 |

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 3(c) | <p>An explanation that makes reference to five of the following points:</p> <ul style="list-style-type: none"> • more foxes (to eat squirrels) / increased predation (1) • foxes eat nuts (so less food) (1) • fewer trees (1) • other species enter woods and feed on nuts / eq (1) • <u>other</u> predators entered woodland (1) • disease / infection (1) • migration / eq (1) • time of year when numbers counted (1) • cold weather / lower temperature (1) • fox increase <u>is more than</u> tree decrease (1) • human impact / hunting (by humans) / eq (1) | 5 |

Total = 14 marks

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|--|----------|
| 4(a) (i) | <ul style="list-style-type: none"> (substance that) speeds up (chemical) reactions (1) | Allow correct reference to activation energy Ignore catalyses | 1 |

| Question Number | Answer | Mark |
|------------------|--|----------|
| 4(a) (ii) | <ul style="list-style-type: none"> (chemical) reactions / processes in cells / cytoplasm / body / organisms (1) | 1 |

| Question Number | Answer | additional guidance | Mark |
|-----------------|--|---|----------|
| 4(b) (i) | <p>An answer that includes:</p> <ul style="list-style-type: none"> scale linear and half of grid (1) lines drawn neatly between points (1) axis correct way around (1) points correctly plotted (1) axes labelled with (concentration in) number of discs (of potato) and oxygen (production) in $\text{cm}^3 \text{min}^{-1}$ or $\text{cm}^3 \text{per min}$ (1) | lose L if extrapolated bar charts lose L | 5 |

| Question Number | Answer | Additional guidance | Mark |
|------------------|--|---|----------|
| 4(b) (ii) | <p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> as enzyme concentration increases so does oxygen production / rate / it increases / eq (1) up to 8 (discs) / 8.2 (cm³ min⁻¹) / levels off after / from 8 (discs) / 8.2 (cm³ min⁻¹) / eq (1) more enzyme (molecules) available to react with / break down hydrogen peroxide / substrate / form enzyme substrate complexes / more collisions / eq (1) until all substrate molecules / hydrogen peroxide are combined with enzyme molecules / substrate limiting (1) | <p>must give value for discs or rate</p> <p>Ignore faster collisions</p> | 3 |

| Question Number | Answer | Mark |
|-------------------|--|----------|
| 4(b) (iii) | <ul style="list-style-type: none"> use (gas) syringe / (inverted) measuring cylinder / eq (1) | 1 |

| Question Number | Answer | additional guidance | Mark |
|------------------|--|---|----------|
| 4(b) (iv) | <p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> only one variable is changed / one independent variable / control variable / carry out valid experiment / produce accurate results / eq (1) these (also) affect / change the rate (1) | <p>allow make it a fair test</p> <p>allow so that they are controlled</p> | 2 |

| Question Number | Answer | additional guidance | Mark |
|-----------------|---|---------------------|----------|
| 4(b) (v) | <ul style="list-style-type: none">temperature / pH / type / eq of potato / eq (1) | ignore time | 1 |

Total = 14 marks

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 5(a) (i) | <p>An explanation that makes reference to two the following points:</p> <ul style="list-style-type: none"> • as temperature increases so does (rate of) <u>photosynthesis</u> (1) • increased (kinetic) energy (of molecules) / molecules move faster / more collisions (1) • <u>optimum temperature for enzymes</u> (1) • more glucose / starch / sugar / carbohydrate / eq produced (1) | 2 |

| Question Number | Answer | Mark |
|------------------|---|----------|
| 5(a) (ii) | <p>An explanation that makes reference to two the following points:</p> <ul style="list-style-type: none"> • it releases CO₂ (1) • CO₂ a reactant / used in / needed in / for photosynthesis / eq (1) • as CO₂ is limiting factor (1) | 2 |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---|----------|
| 5(b) (i) | <p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> • nitrate • for amino acids / proteins (1) • magnesium • for chlorophyll for chloroplasts (1) | <p>Allow other minerals and their function</p> <p>ignore nitrogen</p> <p>eg phosphate</p> <p>for ATP / DNA</p> <p>can only gain function if mineral is correct</p> | 2 |

| Question Number | Answer | Mark |
|------------------|--|----------|
| 5(b) (ii) | <p>An answer that makes reference to five of the following points:</p> <ul style="list-style-type: none">• increased soil concentration reduces water potential of soil (1)• prevents water uptake / absorption by osmosis / causes water loss (1)• so plant wilts / eq (1)• damaging effect of leaching / escaping / washing into rivers lakes / eq (1)• causes eutrophication (1)• leads to algal bloom/ plant growth in river / lake / eq (1)• loss of <u>aquatic</u> life / fish / <u>water</u> plants die /eq;• (may prefer to) use natural fertiliser / manure (1)• can produce organic earn more money (1)• other factors limit growth / there is excess fertiliser / not all fertiliser is used (1) | 5 |

Total = 11 marks

| Question Number | Answer | additional guidance | Mark |
|-----------------|---|---|----------|
| 6(a) | <p>An explanation that makes reference to four of the following points:</p> <ul style="list-style-type: none"> • <u>neutralise</u> acid (from stomach) (1) • optimum pH for enzymes (1) • emulsify fat / lipid (1) • small droplets / eq (1) • increase surface area (1) | ignore makes alkaline / increases pH | 4 |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 6(b) | <p>Only B is correct as there is 1 blood vessel that transports deoxygenated blood from the liver</p> <p><i>A is incorrect as there are not 0 blood vessels that transports deoxygenated blood from the liver</i></p> <p><i>C is incorrect as there are not 2 blood vessels that transports deoxygenated blood from the liver</i></p> <p><i>D is incorrect as there are not 3 blood vessels that transports deoxygenated blood from the liver</i></p> | 1 |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 6(c)(i) | <p>An explanation that makes reference three of the following points:</p> <ul style="list-style-type: none"> • glucose absorbed / taken in / stored / removed from blood (1) • insulin (1) • (glucose to) glycogen (1) • lowers blood glucose in hepatic vein / leaving liver (1) | 3 |

| Question Number | Answer | Additional Guidance | Mark |
|-----------------|--|--------------------------------|----------|
| 6(c)(ii) | <p>An explanation that makes reference two of the following points:</p> <ul style="list-style-type: none">• less food in gut / not eaten in a while / less absorption of glucose by gut / less glucose coming from small intestine / eq (1)• no insulin (released) (1)• glycogen to glucose (1)• glucose released from liver/eq (1) | Allow glucagon released | 2 |

Total = 10 marks

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 7(a) | <p>Only A is correct as both are heterozygous</p> <p><i>B is incorrect as both are not homozygous</i></p> <p><i>C is incorrect as both do not have long wings</i></p> <p><i>D is incorrect as one is not heterozygous and one homozygous</i></p> | 1 |

| Question Number | Answer | Mark | | | | | | | | | | | | | | | | | | |
|-----------------|---|------|---|---|---|----|----|---|----|----|--|---|---|---|----|----|--|--|--|----------|
| 7(b)(i) | <p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> female gamete(s) as X (1) offspring as XX and XY (1) <div style="text-align: center;"> <table border="1"> <tr> <td></td> <td>X</td> <td>Y</td> </tr> <tr> <td>X</td> <td>XX</td> <td>XY</td> </tr> <tr> <td>X</td> <td>XX</td> <td>XY</td> </tr> </table> </div> <p>This also scores 2</p> <div style="text-align: center;"> <table border="1"> <tr> <td></td> <td>x</td> <td>y</td> </tr> <tr> <td>X</td> <td>XX</td> <td>XY</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table> </div> | | X | Y | X | XX | XY | X | XX | XY | | x | y | X | XX | XY | | | | 2 |
| | X | Y | | | | | | | | | | | | | | | | | | |
| X | XX | XY | | | | | | | | | | | | | | | | | | |
| X | XX | XY | | | | | | | | | | | | | | | | | | |
| | x | y | | | | | | | | | | | | | | | | | | |
| X | XX | XY | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 7(b)(ii) | <p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> • random / role of chance / eq (1) • fertilisation / eq (1) • fewer Y sperm / more X sperm / Y sperm die / X sperm swim better / eq (1) | 2 |

| Question Number | Answer | additional guidance | Mark |
|-----------------|--|-------------------------|----------|
| 7(c) | <p>An answer that makes reference to six of the following points:</p> <ul style="list-style-type: none"> • C uses (rotting) apples and bananas (1) • O uses same flies / species / age /sex (1) • R uses several apples and bananas / repeat (1) • M1 counts / record number of flies / eq (1) • M2 measures after a <u>stated period</u> of time (1) • S1 controls age / number / mass / size of fruit / state of decomposition / no other fruit present / eq (1) • S2 controls temperature / light / oxygen / distance from fruit / size of room /container release same number of flies / eq (1) | not time to reach fruit | 6 |

Total = 11 marks

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 8(a) (i) | <p>Only B is correct as this transports amino acids</p> <p><i>A is incorrect as this does not transport amino acids</i></p> <p><i>C is incorrect as this does not transport amino acids</i></p> <p><i>D is incorrect as this does not transport amino acids</i></p> | 1 |

| Question Number | Answer | Mark |
|------------------|---|----------|
| 8(a) (ii) | <p>Only C is correct as this absorbs most sunlight</p> <p><i>A is incorrect as this does not absorb most sunlight</i></p> <p><i>B is incorrect as this does not absorb most sunlight</i></p> <p><i>D is incorrect as this does not absorb most sunlight</i></p> | 1 |

| Question Number | Answer | Mark |
|-------------------|---|----------|
| 8(a) (iii) | <p>Only C is correct as this transports the products of photosynthesis</p> <p><i>A is incorrect as it does not transport the products of photosynthesis</i></p> <p><i>B is incorrect as it does not transport the products of photosynthesis</i></p> <p><i>D is incorrect as it does not transport the products of photosynthesis</i></p> | 1 |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 8(a)(iv) | <p>Only A is correct as it reduces water loss</p> <p><i>B is incorrect as it does not reduce water loss</i></p> <p><i>C is incorrect as it does not reduce water loss</i></p> <p><i>D is incorrect as it does not reduce water loss</i></p> | 1 |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---|----------|
| 8(b) | <p>An explanation that makes reference to four of the following points:</p> <ul style="list-style-type: none"> • R / palisade are near top / surface to absorb as much light as possible / eq (1) • R / palisade contain <u>many</u> / eq chloroplasts / lots of chlorophyll to absorb as much light as possible / eq (1) • R / palisade / are densely packed/ rectangular / long / arranged vertically to absorb as much light as possible / eq (1) • T / spongy are near bottom of leaf / stomata for absorption of CO₂ (1) • T / spongy are less densely packed / have air spaces/ gaps for diffusion / gas exchange / gas movement /eq (1) | <p>Adaptation and reason needed for each mark</p> <p>Need only mention absorb light once</p> <p>must indicate many / eq</p> | 4 |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|--|----------|
| 8(c) | <ul style="list-style-type: none"> measure leaf = 29 (mm) / 2.9 (cm) $29 \div 100 = 0.29$ mm | <p>Allow 1 mark for 29-33 (mm) or 2.9 (cm) to 3.3 (cm)</p> <p>Allow 1 mark for <u>dividing</u> by 100</p> <p>Allow two marks for correct answer</p> <p>Allow range from 0.29 mm to 0.33 mm</p> | 2 |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 8(d) | <p>An answer that makes reference to two the following points:</p> <ul style="list-style-type: none"> lower surface in water / upper in air / stomata would be in water / eq (1) (stomata) able to absorb CO_2 / gases (by diffusion) / allows gas exchange (1) (stomata) able to lose water (by transpiration / evaporation) / to allow transpiration (1) | 2 |

Total = 12 marks

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 9(a) | <p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • antibodies (1) • specific (1) • antigens / foreign / invading cells/ bacteria / virus /pathogen / eq (1) • attach to / clump / kill / destroy pathogens / make memory cells (1) | 3 |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 9(b) | <p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> • killed / destroyed (1) • digested / broken down (1) • by enzymes / named enzyme (1) • products absorbed (by phagocyte) (1) | 3 |

| Question Number | Answer | Mark |
|-----------------|---|----------|
| 9(c)(i) | <p>Only A is correct as 85 per hour is the rate of ingestion of bacteria in the control</p> <p><i>B is incorrect as the rate is not this per hour</i></p> <p><i>C is incorrect as the rate is not this per hour</i></p> <p><i>D is incorrect as the rate is not this per hour</i></p> | 1 |

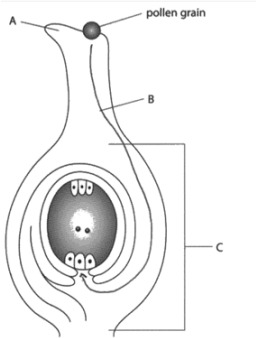
| Question Number | Answer | Mark |
|-----------------|--|----------|
| 9(c)(ii) | <ul style="list-style-type: none"> • concentration of vitamin C | 1 |

| Question Number | Answer | Additional guidance | Mark |
|------------------|--|---|----------|
| 9(c)(iii) | <p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • number / amount / concentration / volume / type of / size of phagocytes (1) • number / amount / concentration of bacteria (1) • species of bacteria / type / culture of bacteria / no other bacteria / aseptic environment / sterilise test tubes / eq (1) | <p>mark as list</p> <p>Allow same phagocytes</p> <p>Ignore number of bacteria ingested</p> | 2 |

| Question Number | Answer | Additional Guidance | Mark |
|-----------------|--|------------------------------------|----------|
| 9(c)(iv) | <p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> • vitamin C increases ingestion (by phagocytes) / digested / killed / removed (1) • only done once / not reliable / not repeated (1) • done in vitro / in test tube / not in human / body (1) • need to test with other bacteria / bacteria that are pathogenic / may not work with other bacteria / species (1) • not all pathogens are bacteria / some pathogens are virus / eq (1) • not done at 37°C / not done at body temp / eq (1) | <p>Ignore done at 35 °C</p> | 4 |

Total = 14 marks

| Question Number | Answer | Mark |
|-----------------|--|----------|
| 10(a)(i) | <ul style="list-style-type: none"> • A stigma (1) • B style (1) • C ovary (1) | 3 |

| Question Number | Answer | Additional guidance | Mark |
|------------------|---|--|----------|
| 10(a)(ii) | <p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> • tube going down style (1) • tube entering the micropyle (1) |  <p>Reject arrows pointing upwards</p> | 2 |

| Question Number | Answer | additional guidance | Mark |
|-------------------|---|---------------------|----------|
| 10(a)(iii) | <p>A description that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • ovule becomes seed (1) • ovule wall becomes seed coat / testa (1) • ovary becomes fruit (1) | Ignore ovum | 2 |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|--|----------|
| 10(b)(i) | <ul style="list-style-type: none"> • 476 - 432 • $44 \div 432 \times 100 =$ • allow 10.2 / 10.19 /10.185/ 10.1852/ 10.18519 | <p>award full marks for correct numerical answer without working</p> <p>Allow one mark for 44</p> | 2 |

| Question Number | Answer | additional guidance | Mark |
|------------------|---|--|----------|
| 10(b)(ii) | <p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • in warm (and wet) conditions there are more fungi / bacteria/ microbes / eq (1) • so seeds are diseased or contents digested / consumed / seeds killed (by fungi /bacteria /microbes / eq) / eq (1) • enzymes are activated in storage (1) • seeds have (already) started to germinate in storage (1) | Allow converse for wet and cold | 2 |

| Question Number | Answer | additional guidance | Mark |
|-------------------|--|---------------------|----------|
| 10(b)(iii) | <p>A description that makes reference to one the following:</p> <ul style="list-style-type: none"> • (seed / testa) split / eq(1) • radicle / root (is seen) (1) • plumule / shoot (is seen)/ eq (1) • sprouts (1) | | 1 |

Total = 12 marks