GCSE Biology



Required Practical Answer Book

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**Required Practical 1: Microscopy**

**Use a light microscope to observe, draw and label a selection of plant and animal cells.**

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| Question 1 | (a)     contract / shorten  *ignore relax*  *do****not****allow expand*  **1**  to churn / move / mix food  *accept peristalsis / mechanical digestion*  *ignore movement unqualified*  **1**  (b)     400  *acceptable range 390-410*  *allow 1 mark for answer in range of 39 to 41*  *allow 1 mark for answer in range of 3900 to 4100*  **2**  (c)     to transfer energy for use  *allow to release / give / supply / provide energy*  *do****not****allow to ‘make’ / ‘produce’ / ‘create’ energy*  *allow to make ATP*  *ignore to store energy*  **1**  by (aerobic) respiration **or** from glucose  *do****not****allow anaerobic*  *energy released****for****respiration = max 1 mark*  **1**  (d)     (i)      to make protein / enzyme  *ignore ‘antibody’ or other named protein*  **1**  (ii)     too small / very small  *allow light microscope does not have sufficient magnification / resolution*  *allow ribosomes are smaller than mitochondria*  *ignore not sensitive enough*  *ignore ribosomes are transparent*  **1** |
| Question 2 | (a)      200  *correct answer gains 2 marks with or without working*  *allow 1 mark for 0.1 × 0.1 = 0.01 (mm2)*  **2** |
| Question 3 | (a)     45 (mm)  **1**  45 / 250 **or** 0.18 (mm)  *allow ecf*  **1**  180 (µm)  **1**  *allow 180 (µm) with no working shown for****3****marks*  (b)     0.2 µm  **1** |
| Question 4 | (a)     12500  *if correct answer, ignore working / lack of working*  *https://app.doublestruck.eu/content/AG_BLG/HTML/M/MBB04H14A_files/image001.png for****1****mark*    *ignore any units*  **2** |

**Required Practical 2: Osmosis**

**Investigate the effect of a range of concentrations of salt/sugar solutions on the mass of plant tissue.**

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| Question 1 | (a)     (0.15 / 1.35) × 100  **1**  11.1 (%)  *allow 11.1 (%) with no working shown for****2****marks*  **1**  (b)     to allow results to be compared  **or**  they had different masses at the start  **1**  (c)     axis correct scale and labelled  **1**  5 points correctly plotted  *allow ecf from****05.1***  *allow****1****mark for 4 points correctly plotted*  **2**  line of best fit  **1**  (d)     0.5  *allow 0.45–0.55*  **1**  (e)     (0.0 to 0.4) water moves into cells  **1**  (0.6 to 0.8) water leaves cells  **1**  by osmosis  **1**  (f)      any **two** from:  •        concentration of solutions  •        drying of chips  •        accuracy of balance  •        evaporation from tubes  **2** |
| Question 2 | (a)     award **3**marks per tube for each key idea            for tube 1:            expands **or** gets firmer **or** bigger**or**inflates            it gains water            because the concentration of water is less than its surroundings  *make sure answer is about water movement and not sucrose solution*  **3**            for tube 2            gets floppy **or** flaccid **or**contracts            it loses water            because the concentration of water is greater than its surroundings  **3** |

**Required Practical 3: Enzymes**

**Investigate the effect of pH on the rate of reaction of amylase enzyme.**

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| Question 1 | (a)     stomach is acidic / has low pH  *allow any pH below 7*  *ignore stomach is not alkaline*  **1**  lactase works best / well in alkali / high pH / neutral / non-acidic conditions  *allow any pH of 7 and above  accept works slowly in acid conditions*  *allow figures from table with a****comparison***  *ignore reference to temperature*  **1**  (b)     any **three** from  •        (below 45(°C)) increase in temperature increases rate / *speed* of reaction  •        reference to molecules moving faster / colliding faster / harder / more collisions  •        optimum / best at 45(°C)  *allow value(s) in range 41 - 49*  •        high temps / above 45(°C) (rate slows due to) denaturation of enzyme /lactase  *allow synonyms of denaturation but****not****killed*  *denaturation at high****and****low temperature does****not****gain this mark*  *ignore body temperature*  *ignore references to time / pH*  **3** |
| Question 2 | (a)     (i)      amino acid(s)  *accept peptide(s)*  *do****not****allow polypeptide(s)*  **1**  (ii)     protease  **1**  (b)     (i)      2  **1**  (ii)     repeat  *do not allow other enzyme / substrate*  **1**  using smaller pH intervals between pH1 and pH3  *allow smaller intervals on both sides of / around pH2*  *allow smaller intervals on both sides of / around answer to (b)(i)*  **1**  (iii)    enzyme / pepsin denatured / shape changed  *do****not****allow enzyme killed*  *allow enzyme ‘destroyed’*  **1**  enzyme / pepsin no longer fits (substrate)  *allow enzyme / pepsin does not work*  **1**  (c)     hydrochloric (acid)  *allow phonetic spelling*  *accept HCl*  *allow HCL*  *ignore hcl*  *do****not****allow incorrect formula –e.g. H2Cl / HCl2*  **1** |

**Required Practical 4: Food Tests**

**Use qualitative reagents to test for a range of carbohydrates, lipids and proteins.**

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| Question 1 | 1. separate sample for each test;   equal volume of each sample;  **1**  simple sugars :- Benedict’s ;  heat / boil; ignore warm  stays blue is negative  blue to green / yellow / orange / brown / red / AW;  **2**  protein:- biuret or sodium/potassium hydroxide + copper sulphate;  blue to mauve / purple/violet;  **2**  repeat;  **1** |
| Question 2 | 1. starch – iodine solution – turns blue/black if starch present **2** 2. sugar – benedict’s solution – turns orange/red if sugar present **2** 3. lipid – ethanol – turns milky/cloudy if lipids present **2** 4. protein – biuret solution – turns purple if protein present **2** |

**Required Practical 5: Photosynthesis**

**Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as**

**pondweed.**

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| Question 1 | Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a ‘best-fit’ approach to the marking.  **Level 3 (5–6 marks):**  A description of how the apparatus is used to measure the **rate** of photosynthesis at different light **intensities** is given.  For full marks reference must be made to a control variable  **or**  repeats  **Level 2 (3–4 marks):**  A description of how the apparatus is set up  **and**  a description of how photosynthesis can be measured.  **or**  a description of how light intensity is varied  **or**  a control variable **or** any other relevant point  **Level 1 (1–2 marks):**  A partial description of how the apparatus is set up  **or**  a description of how light is supplied  **or**  a simple description of how photosynthesis can be measured.  **or**  a control variable  **0 marks:**  No relevant content.  **examples of the points made in the response:**  •        apparatus set up:  – weed in water in beaker  – light shining on beaker  •        method of varying the light intensity–eg changing distance of lamp from plant  •        method of controlling other variables  – use same pond weed **or** same length of pond weed  – temperature: water bath or heat screen  – CO2  •        leave sufficient time at each new light intensity before measurements taken  •        method of measuring photosynthesis – eg counting bubbles of gas released or collecting gas and measuring volume in a syringe  •        measuring **rate of photosynthesis** by counting bubbles for set period of time  •        repetitions  **extra information:**  *allow information in the form of a diagram*  **[6]** |
| Question 2 | 1. any **two** from:   *do****not****accept temperature-apply list principle*  *ignore reference to time*  •        carbon dioxide (concentration)  •        light intensity  *allow****one****mark for light if neither intensity or colour are awarded*  •        light colour / wavelength  •        pH  •        size / amount plant  •        same / species / type plant  *allow ‘the plant’*  •     amount of water in the tube  *ignore amount of water alone*  **2**  (b)     number / amount of bubbles **or** amount of gas / oxygen  *allow volume of bubbles (together)*  *ignore ‘the bubbles’ unqualified*  **1**  (relevant reference to) time / named time interval  *allow how long it bubbles for*  *do****not****accept time bubbles start / stop*  *ignore speed / rate bubbles*  *ignore instruments*  *do****not****accept other factors eg temperature*  *accept how many bubbles per minute for****2****marks*  **1**  (c)     (i)      temperature  *allow heat / °C / cold*  **1**  (ii)     carbon dioxide / CO2  *CO2 / CO2 / Co2 / Co2 / co2 / co2*  *do****not****accept CO / 2CO*  **1** |
| Question 3 | (a)   rate / number of bubbles decreases  *accept converse with reference to increasing light****or****shorter distance*  **or**  less oxygen / gas released  *ignore reference to rate of photosynthesis*  **1** |

**Required Practical 6: Reaction Time**

**Plan and carry out an investigation into the effect of a factor on human reaction time.**

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| Question 1 | (a)     any **two** from:  •        drop the ruler from the same height each time  •        let the ruler drop without using any force  •        same type / weight of ruler  •        thumb should be same distance from the ruler each time at the start  •        use the same hand to catch the ruler each time  •        carry out the experiment with the lower arm resting in the same way on the table  *allow description of holding bottom edge of ruler opposite the catcher’s thumb*  **2**  (b)     117  **1**  (c)    https://app.doublestruck.eu/content/AG_BLG/HTML/M/MSP182H06_files/img01.png  **1**  0.1539  *allow 01539 with no working shown for****2****marks*  **1**  0.154  *allow 0.154 with no working shown for****3****marks*  **1**  *allow ecf as appropriate*  (d)     no indication beforehand when the colour will change  **or**  you might be able to tell when the person is about to drop the ruler  **1**  measurement of time is more precise (than reading from a ruler)  **or**  resolution (of computer timer) is higher  **1**  (e)     cerebral cortex  *allow cerebrum*  **1**  *ignore identified lobes*  (f)     cerebellum  **1** |
| Question 2 | (a)     (i)      receptor cells  **1**  (ii)     eye(s)  *accept retina*  **1**  (b)     (i)      any **one** from:  •        gender / sex  •        quality of eyesight  *eg wearing glasses*  •        eg of factor that might affect reaction times  *eg alcohol consumption / distractions / tiredness / health / time of day / amount of practice (at this test)*  *do not allow time / age*  **1**  (ii)     182  *allow 182.0*  **1**  (iii)     Any anomalies can be identified.  **1**  (iv)     reaction time (too) long **or** reactions (too) slow  **1**  *allow reaction time (too) slow*  *allow examples of data quoted****or****derived from the table, eg (mean) reaction time for 90 year olds is 162 ms longer than for 75 year olds*  (so) more likely to have / cause an accident  **1** |

**Required Practical 7: Field Investigations**

**Measure the population size of a common species in a habitat.**

**Use sampling techniques to investigate the effect of a factor on the distribution of this species.**

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| Question 1 | (a)    place all the quadrats randomly on the lawn  **1**  (b)     (i)      1   4  2   2  3   2  4   0  *all 4 counts correct*  **1**  Total = 15  *total correct for their figures*  **1**  (ii)     1.5  *allow ecf from (b)(i)*  **1**  (iii)    180  *correct answer with or without working*  *if answer incorrect, allow****1****mark for https://app.doublestruck.eu/content/AG_BLG/HTML/M/M13W2F04_files/img01.png x 120****or****15 x 20*  ***or****https://app.doublestruck.eu/content/AG_BLG/HTML/M/M13W2F04_files/img01.png x 12 x 10*  ***or****1.5 x 12 x 10****or****1.5 x 120*  *allow ecf from (b)(ii)*  *allow****1****mark if only 1 error*  **2**  (c)     use a larger sample size / more quadrats  *ignore repeats but allow repeat in different places*  *ignore ‘count them all’*  **or**  use bigger quadrats  **1** |
| Question 2 | (a)     (i)      counts / 12  **1**  × 120 × 80 / × 9600 **or**  × area of field  **1**  (ii)     (more) quadrats / repeats  **1**  placed randomly  *ignore method of achieving randomness*  **1**  (b)     (i)      any **three** from:  •        temperature / warmth / heat  •        water / rain  •        minerals / ions / salts (in soil)  *allow nutrients / fertiliser / soil fertility*  *ignore food*  •        pH (of soil)  •        trampling  •        herbivores  *ignore predators*  •        competition (with other species)  •        pollution qualified e.g. SO2 / herbicide  •        wind (related to seed dispersal).  *ignore space / oxygen / CO2 / soil unqualified*  **3** |
| Question 3 | (a)     (i)      to get data re position of seaweed / of organism  **1**  in relation to distance from sea / distance down shore / how long each seaweed was exposed  **1**  (ii)     repeat several times  *minimum = 2 repeats*  **1**  elsewhere along the shore  **1**  (iii)    bladder wrack is further up the shore (than the sea lettuce) / exposed for longer  *ignore found in dry areas / on bare rock*  **1**  sea lettuce (only) in rock pools / in the sea / (only) in water  **1**  (b)     gets more light / closer to light  *allow better access to CO2*  **1**  (so) more photosynthesis  *allow 1 mark for light for photosynthesis*  *allow 1 mark for CO2 for photosynthesis*  *ignore reference to oxygen for respiration*  *‘more’ only needed once for 2 marks*  **1** |

**Required Practical 8: Plant Responses**

**Investigate the effect of light or gravity on the growth of newly germinated seedlings.**

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| Question 1 | 1. gravity   **1**  caused redistribution of auxin/hormone to lower side of stem  **1**  these hormones stimulate growth of the cells on the lower side of the stem only  **1**  so the stem grows upwards  **1** |
| Question 2 | (a)     grown down  *allow longer*  **1**  towards gravity / gravitropism  *allow geotropism*  **1**  (b)     grow up  **1**  towards the light  *allow phototropism*  **1**  (c)     3  **1**  (d)     repeat the experiment  **1** |

**Required Practical 9: Decay**

**Investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change.**

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| Question 1 | (a)     (i)      glycerol  **1**  (ii)     pancreas / small intestine  *accept duodenum / ileum*  *ignore intestine unqualified*  **1**  (b)     any **two** from:  •         type of milk  •         volume / amount of milk  •         vol. bile equals vol. water  •         volume of lipase  •         concentration of lipase  •         temperature  *ignore time interval*  *ignore solution unqualified*  *do****not****allow pH*  *ignore starting pH*  *ignore volume / amount of bile / water*  *ignore concentration of bile*  *accept amount of lipase if neither volume nor concentration given*  **2**  (c)     (i)      fatty acid (production)  **1**  (ii)     faster reaction / digestion (with bile) **or** pH decreases faster (with bile) **or** takes less time (with bile) **or** steeper fall / line (with bile)  *allow use of data*  *ignore easier*  **1**  (iii)    all fat / milk digested **or** same amount of fatty acids present **or** (lower pH) denatures the enzyme / lipase  *allow all reactants used up*  *ignore reference to neutralisation*  *allow enzyme won’t work at low pH*  *do****not****allow enzyme killed*  **1** |
| Question 2 | (a)     any **one** from:  *ignore reference to recording results every 5 minutes****or****concentrations of lipid / lipase*  •        (same) volume / amount / 1 cm3 lipase  *allow amount of solution*  •        (same) volume / amount / 5 cm3 lipid  *allow keep same volumes in the test tubes*  •        mixed after 3 minutes / same time before mixing  *do****not****accept temperature*  **1**  (b)     so that the lipase and the lipid reached the right temperature  **1**  (c)     any **two** from  *ignore explanations*  •        decrease in time **or** faster (breakdown)  •        then increase in time **or** then slower (breakdown)  •        fastest / least time / optimum at 35°C  **2**  (d)     any **two** from:  *ignore ‘test at more temperatures’ unqualified*  •        test more regularly eg test every minute  *any interval < 5min*  •        test at smaller temperature intervals  *any value <15°C*  *allow test more temperatures in the range*  •        test between 50 (°C) and 95 (°C)  *any value in range, eg test at 70*  •        repeat at same temperatures **or** repeat the investigation **or** compare results with others  *allow do****it****again*  **2**  (e)     (i)      (lipase / it) denatured / destroyed / changed shape  *allow damaged / deformed*  *do****not****accept killed*  *ignore broken (down)*  **1**  (ii)     fatty acids and glycerol  **1** |

**Required Practical 10: Microbiology**

**Investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring**

**zones of inhibition.**

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| Question 1 | (a)     A (inoculating / wire) loop  **1**  B Petri dish  *allow (agar) plate*  *ignore ref to culture medium*  **1**  (b)     (i)      to kill (unwanted) bacteria / microorganisms / microbes  *allow fungi*  *ignore viruses / germs*  **1**  (ii)     Using a flame  **1**  (iii)    any **one** from:  •        so bacteria / microorganisms / microbes / pathogens / fungi (growing in dish) do not get out  *ignore reference to gases*  *ignore viruses / germs*  •        so bacteria / microorganisms / microbes / pathogens / fungi (from the air) do not get in.  *ignore viruses / germs*  **1**  (c)     25 °C  **1** |
| Question 2 | (a)     Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the [Marking guidance](https://app.doublestruck.eu/resources/AG_BL/menus/Markingguidance.pdf), and apply a ‘best-fit’ approach to the marking.  **0 marks** No relevant content.  **Level 1 (1-2 marks)** There is a brief description of at least one of the stages (pre-inoculation, inoculation, post-inoculation).  **Level 2 (3-4 marks)** There is a simple description of at least two stages and an explanation of at least one of them.  **Level 3 (5-6 marks)** There is a clear description of all three stages and an explanation of at least two of them.  **Examples of Biology points made in the response:**  ***Pre-inoculation***  •         Petri dish and agar sterilised before use  •         to kill unwanted bacteria  •         inoculating loop passed through flame / sterile swab  •         to sterilise / kill (other) bacteria  ***Inoculation***  •        loop/swab used to spread/streak bacterium onto agar  *Allow other correct methods, eg bacterial lawns*  •        lid of Petri dish opened as little as possible  •        to prevent microbes from air entering  ***Post-inoculation***  •        sealed with tape  •        to prevent microbes from air entering  •        incubate  •        to allow growth of bacteria  **6**  (b)     (i)      bacteria killed / destroyed  *ignore fights / attacks / stops growth / got rid of*  **1**  (ii)     *Might be correct*  largest area / space where no bacteria are growing  *allow most bacteria killed*  **1**  *Might not be correct*  (need more evidence as) D may be harmful to people / animals / surfaces  *ignore ref to cost / dangerous or harmful unqualified*  **1**  **or** may work differently with different bacteria  **or** disinfectants may be different concentrations  *ignore different amounts of disinfectant unless reference to different drop size*  **or** may not last as long  *ignore take longer to work*  *allow reference to anomalous result or not repeated* |