Question Number	Answer	Additional Guidance	Mark
10(a)(i)	• correct measurements from the photograph (1) • correct answer (1)	<u>Example of calculation</u> Starch grain 27mm and width of chloroplast 60mm 27000 ÷ 22 = 12 273 60000 ÷ 12 273 = 4.889 (μm) ALLOW 4.9 / 4.89 / 4.8 recurring (μm) (ALLOW one mark for correct calculation from different measurements)	**(2)**

Question Number	Answer	Additional Guidance	Mark
10(a)(ii)	An explanation that makes reference to three of the following: • (granum) is formed from many layers of thylakoid membranes to increase surface area (for absorbing light) (1) • thylakoid membranes contain chlorophyll to absorb light (1) • electron carrier molecules in thylakoid membrane involved in ATP production (1)	ALLOW stacks of thylakoids provide a large surface area ALLOW photosystems / photosynthetic pigments in place of chlorophyll ALLOW for light dependent reaction in place of absorb light ALLOW ATP synthase / photophosphorylation	**(3)**

Question Number	Answer	Additional Guidance	Mark
10(b)	A description that makes reference to the following: • two GALP used to produce a glucose molecule (1) • (glucose molecules are) joined together by glycosidic bonds to form starch (1) • by condensation reactions (1) • producing amylose and amylopectin (1)	ALLOW triose phosphate instead of GALP ALLOW maltose / polysaccharide	**(4)**

Question Number	Indicative content
***10(c)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. Basic information • Use of all 4 herbicides • Control of a variable e.g. temperature, pH or light intensity • Variable related to barnyard grass considered e.g. age of plant Evidence of linkages • Sensible herbicide concentration selected, either a range from 0 to 10 μg cm^{-3} or 0.1 μg cm^{-3} • Hill reaction / use of DCPIP to measure light dependent reactions • Isolate chloroplasts • Method for controlling abiotic variables Evidence for sustained scientific reasoning • Suitable control described e.g. tubes in the dark • Description of how the reaction would be quantified e.g. time taken to decolourise DCPIP / use of a colorimeter • Statistical analysis to compare effectiveness of herbicides on photosynthesis • Measure of effectiveness described e.g. the more effective the herbicide the longer the time taken to decolourise the DCPIP, the herbicide that had most effect on decolourisation of DCPIP at the lowest concentration

Level	Mark	Descriptor	
0	Marks	No awardable content	
Level 1	1-2	An explanation of how the investigation should be modified may be attempted but with limited analysis, interpretation and/or evaluation of the scientific information. Generalised comments made. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.	Description of use of herbicides Control of a variable e.g. temperature, pH or light intensity Variable related to barnyard grass considered e.g. age of plant
Level 2	3-4	An explanation of how the investigation should be modified will be given with occasional evidence of analysis, interpretation and/or evaluation of the scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure.	Sensible range of herbicide concentrations between 0 and 100 μg cm^{-3} Hill reaction / use of DCPIP to measure light dependent reactions Isolate chloroplasts Method for controlling abiotic variables
Level 3	5-6	An explanation of how the investigation should be modified is given which is supported throughout by evidence from the analysis, interpretation and/or evaluation of the scientific information. The explanation shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured.	Focus on range of herbicide concentrations between 0 and 1 μg cm^{-3} Suitable control described e.g. tubes in the dark Description of how the reaction would be quantified e.g. time taken to decolourise DCPIP / use of a colorimeter Statistical analysis to compare effectiveness of herbicides on photosynthesis