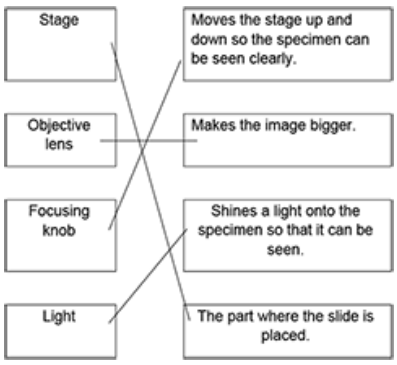
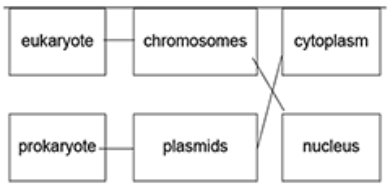
Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1		i	(The nucleus) contains the DNA / genetic material / chromosomes / faulty gene ✓	1 (AO 2.1)	**Examiner's Comments** Less than half of all candidates answered this correctly. There were a lot of vague responses about the nucleus controlling the cell.
		ii	Make sure it is safe / identify side effects / To see if it works / To find the correct dosage ✓	1 (AO 1.1)	**ALLOW** could go wrong / unknown effect **IGNORE** cannot test on humans **Examiner's Comments** This question was answered well by candidates. Commonly seen responses included: to ensure it was safe, or to make sure there were no side effects.
			Total	**2**	
2	a		 ✓✓✓	3 (3 x AO 1.2)	4 correct lines = 3 marks 3/2 correct lines = 2 marks 1 correct line = 1 mark **DO NOT ALLOW** more than 1 line for each statement **Examiner's Comments** This question in Section B was the most accessible for the candidates, with the vast majority obtaining maximum marks for correctly identifying the role of each of the part of the microscope.
	b	i	**First check the answer on the answer line** **If answer = 40 award 2 marks** 400 ÷ 10 ✓ = 40 ✓	2 (2 x AO 2.2)	**IGNORE** units **Examiner's Comments** Many candidates obtained full marks here and applied their knowledge of calculating total magnification. Several candidates did not know how to

					calculate the magnification of the objective lens with the eyepiece magnification and total magnification provided in the stem. **Assessment for learning** Centres should make sure that knowledge gaps are revisited throughout the KS4 programme and maths is embedded with: Total magnification = eye piece magnification x objective lens magnification.
		ii	**Any three from**: Use a (sharp) pencil ✓ Draw with continuous lines ✓ No shading ✓ No colour ✓ Consider proportion ✓ Labels ✓ Display the magnification ✓ Copy (image) ✓	3 (3 x AO 1.2)	**ALLOW** single lines **ALLOW** no dashes/sketchy lines **ALLOW** similar/same size/shape **ALLOW** key structures labelled **IGNORE** trace **Examiner's Comments** This question challenged many students and they wrote about how to focus the microscope to see the pollen seeds. The most commonly given mark was for labelling the drawing. Several candidates did not gain any marks. **Assessment for learning** Centres should make sure that PAG's delivered allow for candidates to

					develop their skills in scientific drawings and give them the rules which should be applied.
	c		**ANY two from**: (Electron microscopes have) high magnification ✓ (Electron microscopes have) a high resolution ✓ Produces a 3D image ✓	2 (2 x AO 1.1)	Assume answer refers to electron microscope unless stated **ALLOW ORA** for light microscope for each reason **IGNORE** zoom **Examiner's Comments** This question discriminated between students at different grades well and the full range of marks given was equally spread. The most common incorrect response was that electron microscopes can zoom in better. Candidates need to make sure they use the scientific terms of magnification and resolution.
			Total	**10**	
3			D	1 (AO 1.1)	
			Total	**1**	
4			A	1 (AO 1.1)	**Examiner's Comments** The majority of candidates could identify that chloroplasts are found in plants and not in animal cells. The most common incorrect answer was ribosomes.
			Total	**1**	
5	a		 ✓ ✓	2 (2 ×AO 1.1)	4 correct lines = 2 marks 3/2 correct lines = 1 mark **DO NOT ALLOW** more than 1 line from each box **Examiner's Comments** The majority of candidates were able to correctly identify the cell type with the form of DNA it takes and location within the cell.
	b	i	Stage ✓	1 (AO 1.2)	**Examiner's Comments**

					Most candidates were able to identify that microscope slides are placed on the stage of a microscope.
		ii	Objective ✓	1 (AO 1.2)	**Examiner's Comments** Many candidates were able to identify the objective lens is used to change the magnification of the object to be viewed.
		iii	Focusing knob ✓	1 (AO 1.2)	**Examiner's Comments** Most candidates correctly identified the focussing knob moves the lens.
			Total	**5**	
6	a		Pathogen ✓ Mutation ✓ Gene ✓	3 (3 × AO 1.1)	More than 1 answer for each line negates the mark **Examiner's Comments** This question differentiated well between lower and higher ability candidates. Candidates had to correctly complete each sentence from the list of words about genetics. Most candidates gained at least one mark.
	b		Microscopes didn't have the magnification/resolution / could not see the virus which was very small ✓	1 (AO 2.2)	**ALLOW** microscopes were not developed enough to see viruses **ALLOW** need an electron microscope / cannot be seen with a light microscope **ALLOW** ORA for modern day microscopes **IGNORE** technology **Examiner's Comments** Candidates found this question challenging and were unable to identify that microscopes would not have had the resolution or magnification ability to see the virus. Most answers which did not gain any marks wrote about technology not advanced.
			Total	**4**	
7			**Similarity** – (both have) cell membrane/ cell wall/ ribosomes/ cytoplasm ✓	2 (2 × AO 1.1)	**IGNORE** DNA **ALLOW** ORA for plant differences

			Difference – bacterial/prokaryotic cells do not have chloroplast/nucleus/mitochondria/ ✓ **OR** **Difference** – bacteria/prokaryotic cells have plasmids/flagellum/pili/are smaller ✓		**ALLOW** bacterial/prokaryotic cells do not have a permanent vacuole **ALLOW** reference to composition of the cell walls **IGNORE** growth rate **Examiner's Comments** This was a good differentiator, with more successful responses scoring both marks. The main points scored were identifying that they both had a cell wall and that bacteria do not have a nucleus. Some candidates did not refer to bacteria or plants for the difference so the examiner would not be able to know which cell had or did not have the structure to award the mark.
			Total	**2**	
8	a		stain ✓ stage ✓ objective ✓ focus ✓	4 (4 × AO1.2)	**Examiner's Comments** The majority of candidates achieved full marks here for correctly completing each sentence from the list of words about how to prepare a slide.
	b	i	Correctly identifies the centre cell on the right-hand side ✓	1 (1 × AO 2.1)	**Examiner's Comments** This question challenged many of the candidates and the majority did not apply their understanding of mitosis to the cell images. **Assessment for learning** Centres could use real microscope images to illustrate cell division when teaching this part of the syllabus.
		ii	Correctly identifies a nucleus ✓	1 (1 × AO 2.1)	**DO NOT ALLOW** arrow not touching the nucleus **Examiner's Comments** The majority of candidates scored this mark. Those who didn't gain the mark

					did a ‘no response’ and did not attempt the question.
			Total	**6**	
9			A ✓	1 (AO 1.1)	
			Total	**1**	