

Model Answers: Easy

1

The correct answer is **A** because:

- As the size of an object appears larger (**magnification**), the ability to distinguish between two points on the object decreases (**resolution**)
- The ability to distinguish between two points on an object is limited by the wavelength of light (the resolution is limited to approximately half the wavelength of light)

B is incorrect as the scale on a stage micrometer will have a lower resolution as this is a slide which is viewed at a higher magnification; the eyepiece graticule is a disc placed into the eyepiece

C & D are incorrect as the magnification is calculated by **multiplying** the objective lens by the eyepiece lens.

2

The correct answer is **C** because:

- This is because the resolution of a beam of electrons is much higher than that of light, allowing much higher useful magnifications
 - **Magnification** is the process of making smaller objects appear larger
 - **Resolution** is the ability to distinguish between two points on an object

The other options in the table all have the electron microscope with a lower magnification or resolution than the light microscope.

3

The correct answer is **D** because:

- The maximum magnification with resolving power of a light microscope can be somewhere below x2000, but useful magnifications are closer to a maximum of x1000
- Magnification is making smaller objects appear larger
- Resolution is the ability to distinguish between two points on an object

The other options in the table all would be low enough magnification for a light microscope to have a clear resolution.

4

The correct answer is **D** because an electron microscope has a high enough **resolution** to see the cristae in mitochondria.

A is incorrect as it is not possible to see mRNA in all cells.

B is incorrect as it is possible to see the nucleus in eukaryotes with a light microscope (with appropriate staining).

C is incorrect as all microscopes have the ability to produce larger images of cells, this is a result of magnification and not resolution.

5

The correct answer is **B** because an eyepiece graticule is calibrated for the magnification you are working at against a stage micrometer and used to measure the object being magnified.

A is incorrect as the eyepiece graticule is in the eyepiece, not on the stage and therefore not magnified by the objective lens.

C is incorrect as the eyepiece graticule is not involved in the magnification of an object.

D is incorrect as an eyepiece graticule is not used to compare objects.

6

The correct answer is **C** because ribosomes in eukaryotes are 25 to 30 nm in size and in prokaryotes 20 nm. They would not be resolved at a resolution of 200 nm.

The structures in options **A**, **B** and **D** would all be resolved at a resolution of 200 nm.

7

The correct answer is **B** because:

- Resolution is limited by the **diffraction** of light as it passes through samples and lenses
- **Diffraction** is the tendency of light waves to spread as they pass close to physical structures such as those present in objects being viewed
- As the structures are close together the diffraction pattern created by each structure overlaps, meaning that it is hard to separate them from each other

A is incorrect as glass can produce high magnifications.

C is incorrect as the lamps in light microscopes can emit high intensity light and this will not limit the resolution.

D is incorrect as it is possible to cut extremely thin sections that allow light to pass through easily.

8

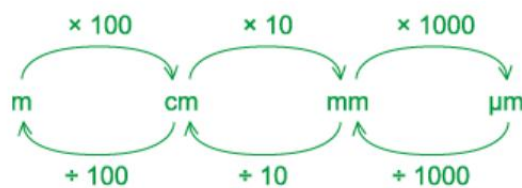
The correct answer is **D** because:

- 200 nm is the maximum resolution of a light microscope
- 0.5 nm is the maximum resolution of an electron microscope
- Resolution is the ability to distinguish between two points in an object.

9

The correct answer is **C** because:

- To change units from micrometers to nanometers you need to multiply by 1000.
- This is the same as converting from mm to μm



10

The correct answer is **C** because:

- As the size of the objects appear larger (magnification), the ability to distinguish between two points on an object decreases (resolution).
- The ability to distinguish between two points on an object is limited by the wavelength of light.

A is incorrect as this describes magnification.

B is incorrect as resolution is limited by the wavelength of light, but doesn't have this directly proportional relationship.

D is incorrect as this describes the total magnification of the light microscope.