Shenley Brook End Sixth Form
Summer transition tasks for Biology

Due date Monday 11 September 2023

Name : ....

This summer task will be due on 11th September, please hand into Dr Pichowski in lab 3

To aid your transition to A level biology. Please watch the following videos (Microscopy: Magnification, Resolution & Types of Microscopes | A-level Biology | OCR, AQA, Edexcel - YouTube; Eukaryotic Cell Structure & Organelles | A-level Biology | OCR, AQA, Edexcel - YouTube; AQA A Level Biology: Cell Organelles - YouTube **) and then complete the following tasks. It should take no longer than 7 hours.** **Units of measurement**

1) Complete the diagram below to show: names of the units of measurement, unit symbols, mathematical operations for converting between units.
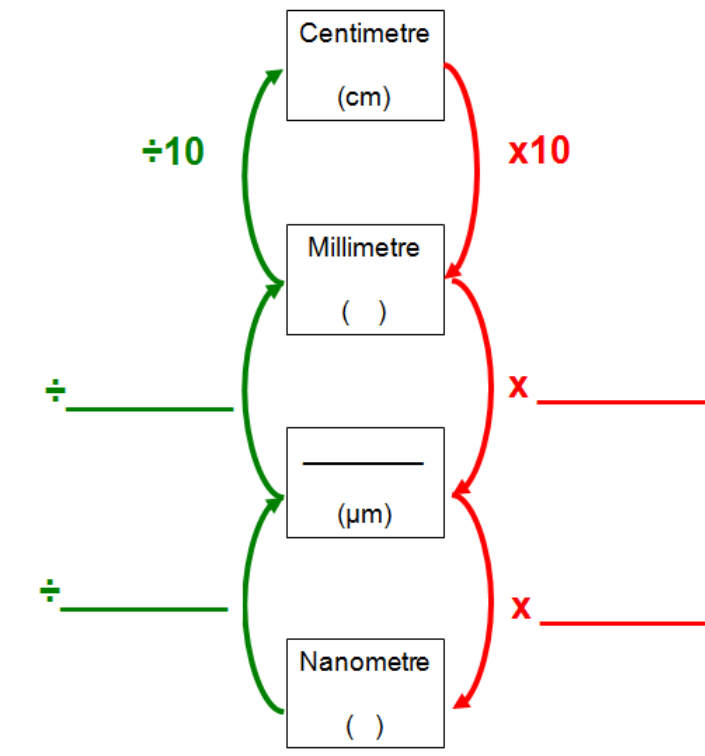
2) Complete the table below to show the corresponding value nanometres, micrometres and millimetres for the measurements given in each row. The first row has been completed for you. Ensure that your answers use the correct unit symbols.

Nanometre	Micrometre	Millimetre
5	0.005	0.000005
1		
	1	
		1
	3	
7		
		0.5

3) When studying cells structure using a microscope the smallest unit of measurement commonly used to describe findings is the nanometre. Explain why.

Magnification and Resolution

1) Define the following terms:
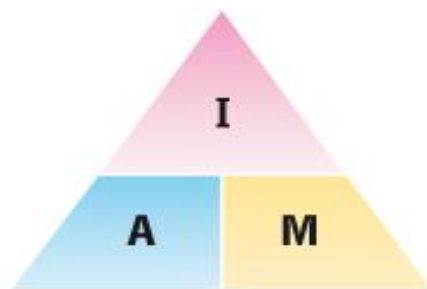
   Magnification:

   Resolution:

2) Visible light has a wavelength of 400-700 nm. Calculate the best resolution achievable with a light microscope? Show your working out:

3) If the electron gun produces an electron beam with 2 nm wavelength, what is the best resolution achievable?

Calculating total Magnification of a compound light microscope

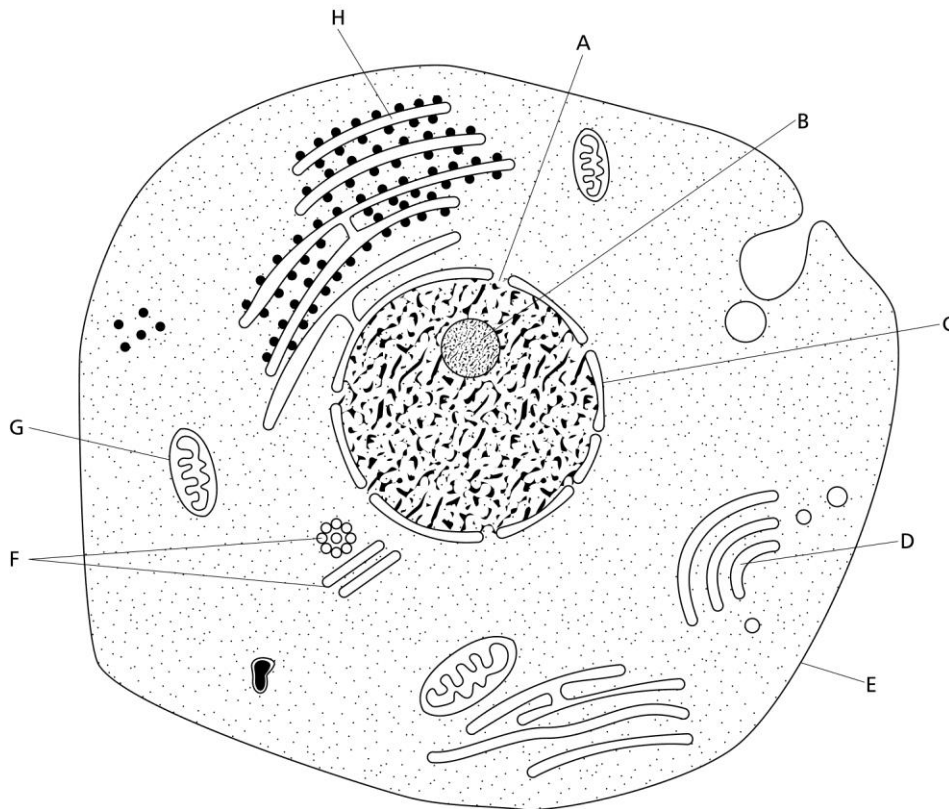| Eyepiece Magnification	Objective Magnification	Overall Magnification
X10	X4	
X10	X10	
X10	X40	
X10	X100	

Calculating Cell Magnification from images

$$\text{Actual size} = \frac{\text{Image size}}{\text{Magnification}}$$

$$\text{Magnification} = \frac{\text{Image size}}{\text{Actual size}}$$

The diagram below shows the general structure of an animal cell as seen under an electron microscope.

5μm

1) Calculate the magnification factor of the diagram

2) Calculate the length of structure G. What is it?

3) Calculate the diameter of structure B. What is it?

4) Calculate the diameter of the nucleus

5) Calculate the diameter of the cell at its widest point

The diagram below shows the general structure of a plant cell when viewed under and electron microscope.

_____
40mm
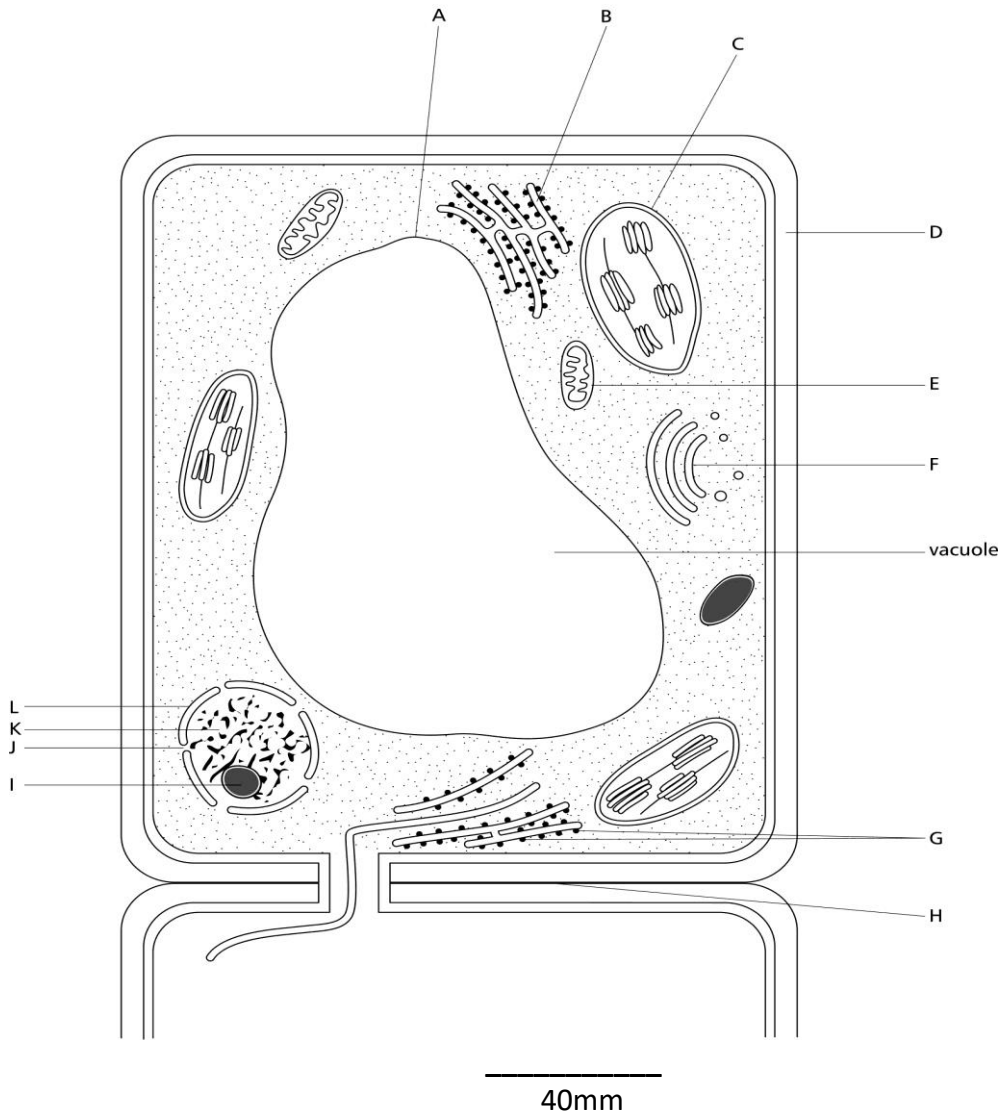
1) Calculate the magnification factor of the diagram

2) Calculate the thickness of the cellulose cell wall.

3) Calculate the length of the cell.

4) Calculate the length of structure C. What is it?

5) Calculate the length of the vacuole.

Types of microscope

Feature	Light Microscope	Transmission electron microscope (TEM)	Scanning electron microscope (SEM)
Source of image			
How is the beam focused			
Maximum effective magnification			
Maximum resolution			
Can a live specimen be used?			
Section or external view of the specimen			
Cost			
Can the image be viewed directly			
Is staining of the specimen required?			

1) Why is the maximum effective magnification of a light microscope said to be 1500x when it is possible to produce higher magnifications with improved lenses?

2) Use a named example to explain the need for staining when using a light microscope.

3) State a possible disadvantage of staining a specimen for observation when using a light microscope

4) State 2 advantages of using electron microscopes to study cells over a light microscope.

5) State 2 disadvantages of using electron microscopes to study cells.

6) Describe with reference to the role of staining how the transmission electron microscope differs from a scanning electron microscope?

7) Explain why a vacuum necessary in an electron microscope?