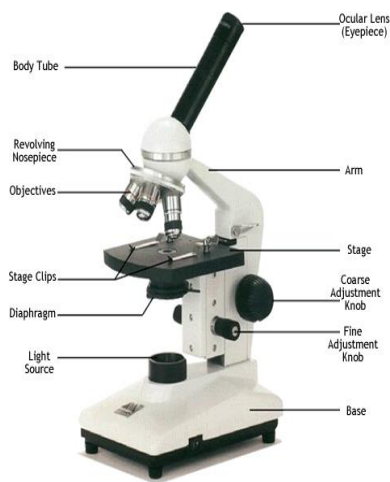


## Transition Work for AS Biology

The A level Biology course covers the topics in much greater detail than you have experienced at GCSE level. You must prepare for your AS course by completing the 'Head Start to AS Booklet' produced by CGP books and also complete the following transition activities.

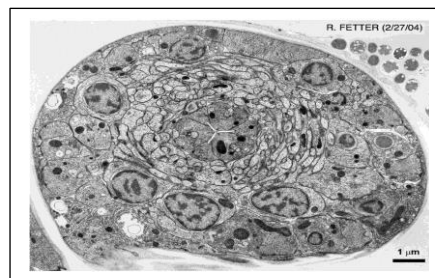
### 1. Research

#### The Light Microscope



1. What is meant by the term **magnification**?
2. What is meant by the term **resolution**?
3. What is the maximum **magnification** of a light microscope?
4. What is the maximum **resolution** of a light microscope?
5. What limits the maximum resolving power of the light microscope?

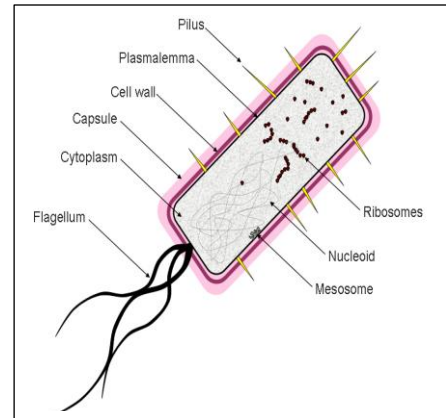
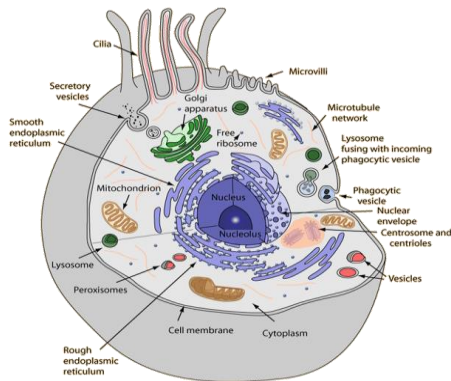
#### The Electron Microscope



1. Name the two types of electron microscope.
2. What is the maximum magnification of each microscope.
3. What is the maximum resolving power of the electron microscope?

4. Identify which of the micrographs above is taken from which type of electron microscope?

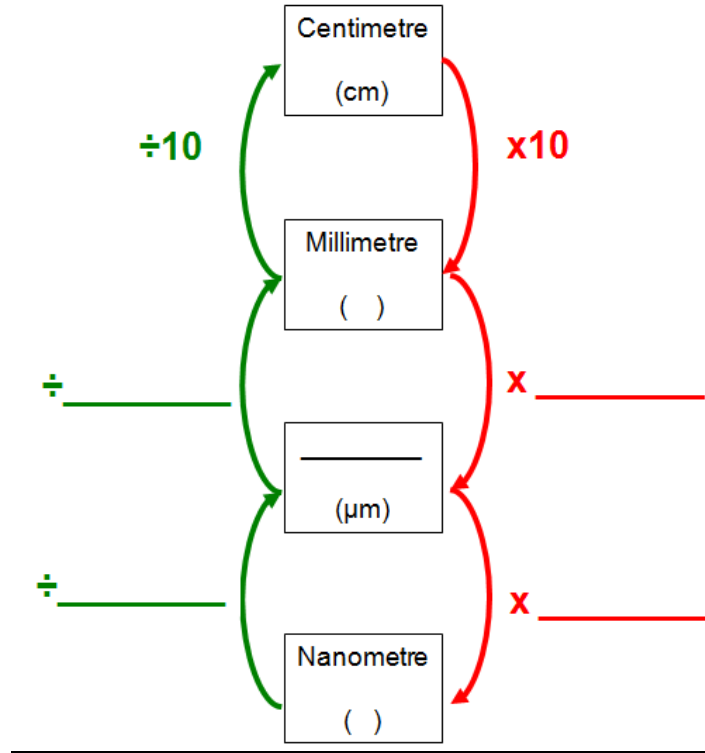
## Cell Structure



1. Find out what is meant by a eukaryotic cell and a prokaryotic cell.
2. Describe the differences between the types of cell.
3. Describe the structure and function of one organelle found in animal cells and one organelle found only in plant cells.

## 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.

| <u>Nanometre</u> | <u>Micrometre</u> | <u>Millimetre</u> |
|------------------|-------------------|-------------------|
| 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

### Calculating total Magnification of a compound light microscope

| <b>Eyepiece Magnification</b> | <b>Objective Magnification</b> | <b>Overall Magnification</b> |
|-------------------------------|--------------------------------|------------------------------|
| X10                           | X4                             |                              |
| X10                           | X10                            |                              |
| X10                           | X40                            |                              |
| X10                           | X100                           |                              |

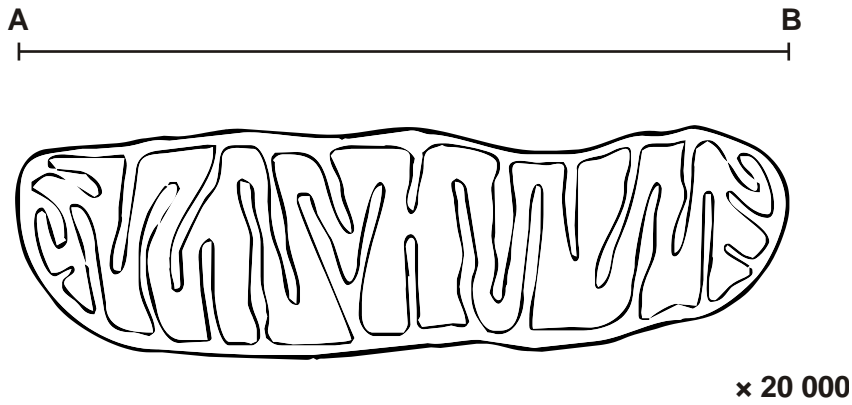
### Calculating Cell Magnification from images



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

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

The diagram below is a drawing of an organelle from a ciliated cell as seen with an electron microscope.

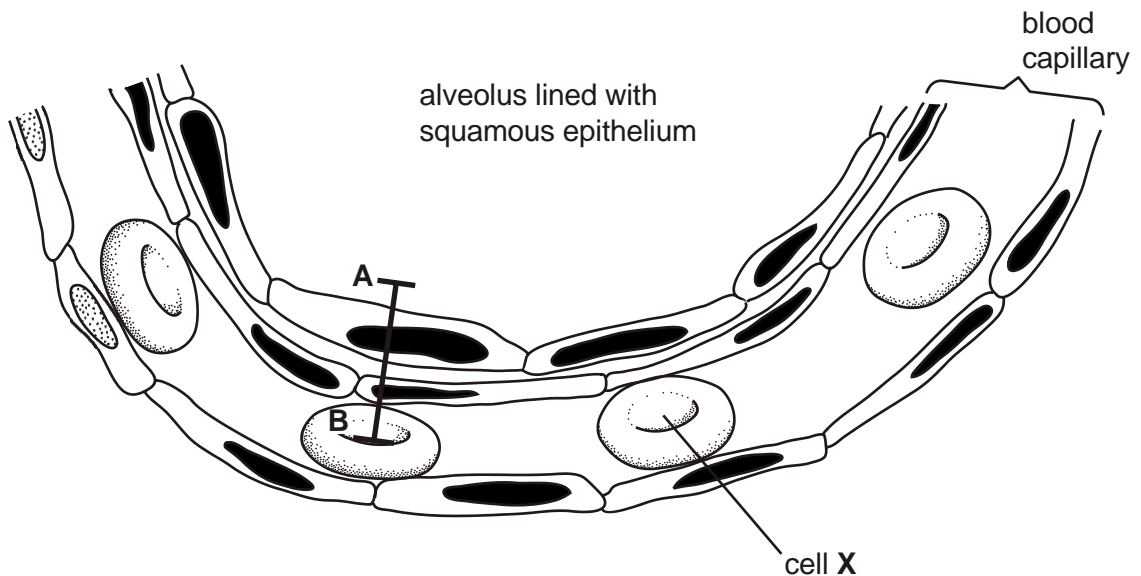


Calculate the actual length of the organelle as shown by the line AB in the diagram. Express your answer to the nearest micrometer ( $\mu\text{m}$ ).

Show your working.

Answer = .....  $\mu\text{m}$

The diagram below is a drawing of an alveolus together with an associated blood capillary.

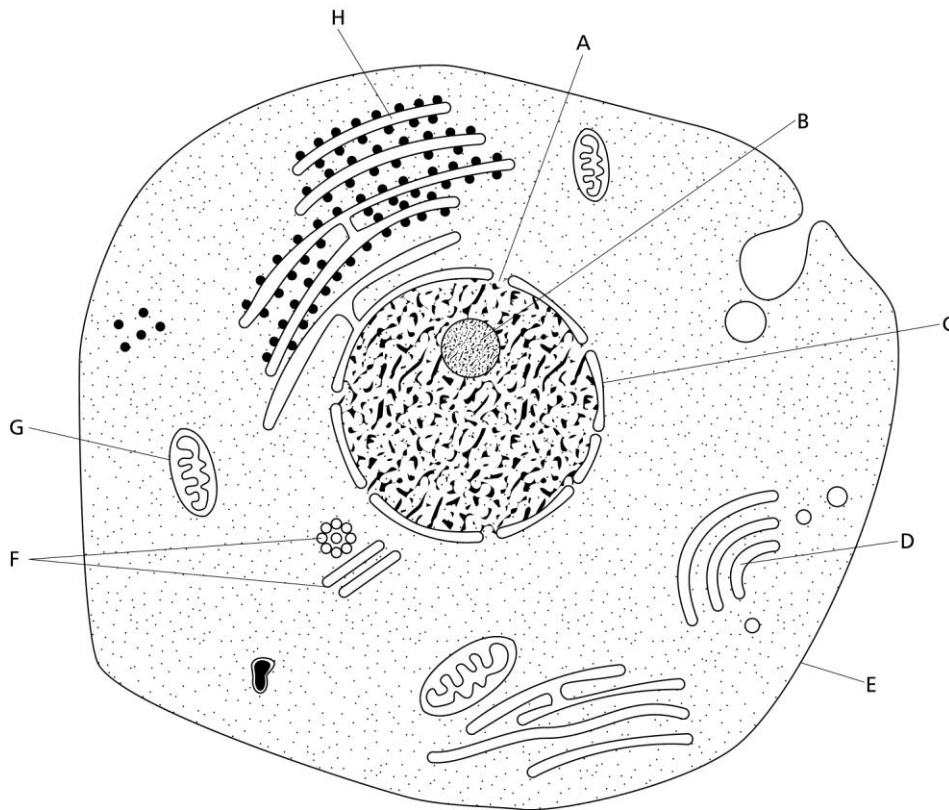


The line **AB** in the diagram represents an actual distance of  $1.5 \mu\text{m}$ .

Calculate the magnification of the drawing. Show your working.

Answer = x .....

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



5 μm

- 1) Calculate the magnification factor of the diagram
- 2) Calculate the actual length of structure G
- 3) Calculate the diameter of the nucleolus (structure B)
- 4) Calculate the diameter of the nucleus
- 5) Calculate the diameter of the cell at its widest point

## Data Analysis

1. In the winter wild birds cannot find food easily.

A student carried out an investigation to find the best kind of food to put out for wild birds in winter.

- She nailed six black dishes to a piece of wood.
- She put 100 g of a different type of seed into each dish.
- She placed the piece of wood in her garden.
- She observed the birds that visited each of the dishes before school, after school and at weekends.
- At the end of the investigation, she weighed the amount of each type of seed remaining.
- She also calculated the percentage of each type of seed that was eaten by the birds.

1 (a) Name **two** control variables in this investigation.

1 .....

2 .....

(2 marks)

1 (b) **Table 1** shows the number of bird visits to each dish of seeds that she recorded.

**Table 1**

| Bird species           | Number of visits to each dish of seeds |       |           |           |        |        |
|------------------------|--|-------|-----------|-----------|--------|--------|
|                        | Corn                                   | Niger | Safflower | Sunflower | Peanut | Millet |
| Morning Dove           | 12                                     | 10    | 6         | 13        | 2      | 10     |
| Red-bellied Woodpecker | 1                                      | 0     | 0         | 1         | 4      | 0      |
| Dark-eyed Junco        | 3                                      | 6     | 1         | 4         | 0      | 3      |
| Northern Cardinal      | 0                                      | 0     | 1         | 1         | 2      | 0      |
| American Goldfinch     | 0                                      | 31    | 5         | 18        | 0      | 0      |
| House Finch            | 1                                      | 5     | 23        | 19        | 1      | 3      |
| House Sparrow          | 16                                     | 1     | 0         | 4         | 0      | 11     |
| <b>Total visits</b>    | 33                                     | 53    | 36        | 60        | 9      | 27     |

---

1 (bi) Which type of seed had visits from the greatest number of **different** bird species?

.....

(1 mark)

1 (bii) Calculate the mean number of visits to a dish by the morning dove. Show your working.

.....

..... (2 marks)

1 (biii) What is the mode number of visits to the sunflower dish?

..... (1 mark)

1 (biv) Calculate the median number of visits to the sunflower dish? Show your working

.....

..... (2 marks)

1 (c) **Table 2** shows:

- the percentage of each type of seed eaten
- the percentage of fat in each type of seed.

**Table 2**

| Type of seed | Percentage eaten | Percentage of fat |
|--------------|------------------|-------------------|
| Corn         | 68               | 2                 |
| Niger        | 77               | 40                |
| Safflower    | 86               | 3                 |
| Sunflower    | 91               | 35                |
| Peanut       | 4                | 48                |
| Millet       | 99               | 2                 |

1 (c) (i) The girl concluded that the most popular seeds for the birds were the seeds with the highest percentage of fat.

Was her conclusion justified by the data in **Table 2**?

Draw a ring round your answer. **Yes / No**

Give a reason for your answer.

.....

.....

(1 mark)

**1 (c) (ii)** Most winter bird food for sale in shops contains niger and sunflower seeds.

Use the information in **Table 1** and **Table 2** to suggest **two** reasons why.

1 .....

.....

2 .....

.....(2 marks)

## Extension Task

### Standard Deviation

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Where:

$\sum$  is the sum of

$x$  is the the values measured

$\bar{x}$  with an overscore is the mean of the values

$n$  is the number of values

1. Calculate the mean and then the standard deviation for each concentration of carbon dioxide in the following set of data, which shows locust ventilation rates in different concentrations of carbon dioxide. Which row of data has the least spread and is therefore the most reliable?

| Carbon dioxide % | Ventilation Rate/ Breaths per minute |    |    |    |    | Mean |
|------------------|--------------------------------------|----|----|----|----|------|
| 0                | 2                                    | 1  | 2  | 6  | 4  |      |
| 5                | 14                                   | 13 | 21 | 11 | 14 |      |
| 10               | 19                                   | 22 | 24 | 14 | 21 |      |
| 15               | 21                                   | 23 | 21 | 14 | 31 |      |
| 20               | 25                                   | 32 | 38 | 31 | 39 |      |

