**1.** State the maximum magnification that can be achieved by a light microscope and a transmission electron microscope.

Select your answers from the list below.

10x 40x 100x 400x 1500x 25 000x 50 000x 500 000x

light microscope ................................... x

transmission electron microscope ................................... x [Total 2 marks]

**2.** Describe what is meant by the term *resolution*.

..................................................................................................................................

..................................................................................................................................

..................................................................................................................................

.................................................................................................................................. [Total 2 marks]

**14.** The figure below is a diagram of an animal cell as seen using a transmission electron microscope.



(i) Name the structures of the cell labelled **A**, **B**, **C** and **D**.

**A** ....................................................................

**B** ....................................................................

**C** ....................................................................

**D** .................................................................... [4]

(ii) Structures **C** and **E** are examples of the same organelle.

Suggest why **E** looks so different to **C**.

.........................................................................................................................

.........................................................................................................................

.........................................................................................................................

......................................................................................................................... [2]

(iii) Calculate the actual length of structure **C**.

Show your working and give your answer in micrometres (µm).

Answer = .................................................. µm [2] [Total 8 marks]

**42.** The table below compares features of typical eukaryotic and prokaryotic cells.

(i) Complete the table by placing one of the following, as appropriate, in each empty box of the table.

• a tick ()

• a cross ()

• the words ‘sometimes present’

Some of the boxes have been completed for you.

|  |  |
| --- | --- |
| eukaryotic cell | prokaryotic cell |
| cell wall | sometimes present |  |
| nuclear envelope |  |  |
| Golgi apparatus |  |  |
| ribosomes |  |  |
| flagellum | sometimes present |  |

(ii) Outline the roles of the Golgi apparatus and the ribosomes.

Golgi apparatus ..............................................................................................

.........................................................................................................................

......................................................................................................................... [4]

Ribosomes ......................................................................................................

......................................................................................................................... [2]

[Total 6 marks]

**57.** The diagram below is an electron micrograph of part of a cell from a human liver.

This cell is responsible for converting glucose in the body into glycogen for storage. The glycogen can be seen as granules in the cytoplasm.



(i) Identify the organelle labelled **X** in the diagram above.

......................................................................................................................... [1]

(ii) Suggest why liver cells of the type shown in the diagram contain many of these organelles.

......................................................................................................................... [1]

[Total 2 marks]

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



(i) Name the organelle shown in the diagram.

.........................................................................................................................

[1]

(ii) State the function of this organelle.

.........................................................................................................................

.........................................................................................................................

[2]

(iii) State why ciliated cells contain relatively large numbers of these organelles.

.........................................................................................................................

.........................................................................................................................

[1]

(iv) Calculate the actual length of the organelle as shown by the line AB in the diagram. Express your answer to the nearest micrometer (m).

Show your working.

Answer = ........................................... m

[2]

[Total 6 marks]

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



An image drawn to the same magnification as in the diagram could be produced using a light microscope.

Explain why such an image would be of little use when studying cells.

..................................................................................................................................

..................................................................................................................................

..................................................................................................................................

.................................................................................................................................. [Total 2 marks]

**110.** Below is a drawing of an animal cell as seen under an electron microscope.



Complete the following table by:

• identifying the parts of the cell **A** to **E**

• naming the part of the cell responsible for the function stated.

The first one has been done for you.

|  |  |  |
| --- | --- | --- |
| function | part of cell | label |
| controls activities of the cell | *nucleus* | ***A*** |
| carries out aerobic respiration |  |  |
| attaches to mRNA in protein synthesis |  |  |
| produces secretory vesicles |  |  |
| contains digestive enzymes |  |  |

[Total 8 marks]

**1.** 1500;

500 000; **ACCEPT** 1400 **and** 300,000 for 1 max only [2]

**2.** ability to see (two) objects (that are close together) as separate objects / AW;

**ACCEPT** ability to distinguish two objects

see detail;

**IGNORE** clarity / clear [2]

**14.** (i) **A** smooth endoplasmic reticulum / SER  
**B** nuclear, membrane / envelope;  
**C** mitochondrion;  
**D** nucleolus;

mark first response on each line **only**

**ACCEPT** nucleus, membrane / envelope  
**ACCEPT** mitochondria  
**DO NOT ACCEPT** nucleous 4

(ii) (mitochondria) vary in shape;  
longer than wide;

**ACCEPT** sausage shaped/long and thin  
**ACCEPT** if shown by drawing

cut in different planes / angles / AW;

just divided / growing;  
artefact / deformed during preparation of section;

need comparative statement  
**ACCEPT** C has been cut in longitudinal plane, E has  
been cut in transverse, section / plane  
**ACCEPT** one cut horizontally, other cut vertically  
**ACCEPT** in different positions / one viewed from  
above the other from the side 2 max

(ii) correct answer = two marks

3.75 / 3.8;;

*if answer incorrect* ***ALLOW*** *one mark for correct working*

**ACCEPT** if 3.75 or 3.8 is seen anywhere in response  
(even if later rounded to 4)  
**Max 1** if response is 4 with no working

how to award one mark for working e.g.

candidate shows correct calculation but wrong answer  
actual length = 

**OR**candidate uses magnification (× 4000) in calculation:

actual length = 15000 / 4000;

length of C should be 15mm / 15000μm

**ACCEPT** ecf for working mark if length of C is not  
measured correctly but incorrect figure is used in  
calculation correctly

2

**42.** (i) 4

|  |  |
| --- | --- |
| eukaryotic cell | prokaryotic cell |
| cell wall |  |  |
| nuclear envelope |  | ; |
| Golgi apparatus | ; |  |
| ribosomes | ; |  |
| flagellum |  | sometimes present; |

(ii) Golgi apparatus  
repackage / transport, proteins;add carbohydrate group to protein; *max 1*

*ribosome*site of protein synthesis; 2

**57.** (i) mitochondrion; **A** *mitochondria* 1

(ii) (liver requires) a lot of, energy/ATP; **R** *statements including ‘produce/create/make, energy’* 1 [2]

**79.** (i) mitochondrion; **A** mitochondria 1

(ii) aerobic respiration;ATP production; **A** provides ATP  
energy release; **A** provides energy **R** produce / create / make / etc  
AVP; e.g. Krebs cycle / regenerate NAD  
 oxidative phosphorylation  
 protein synthesis  
 lipid synthesis  
 oxidation of fats  
 ornithine / urea, cycle 2 max

(iii) (energy / ATP needed) for, movement / wafting (of cilia); **R** flagellum / molecules 1

(iv) *award two marks if correct answer (5) is given  
award one mark for calculation*

5;;  
*if answer incorrect, allow 1 mark for*100 +/– 2 (mm) *or* 10 +/– 0.2 (cm) ÷ 20000 2

[6]

**80.** low resolution;*ora*(close) points not easily distinguished;  
wavelength (of visible light) is too long;  
max resolution of light microscope =, 200 nm / 0.2 µm; **A** anything close  
no more detail visible than seen at,×1500 / ×1000;

**A** comparative statements  
**R** reverse arguments for points 2 – 5 2 max

[2]

**110.** *mark two columns separately first. If letter and part of cell both incorrect,  
look to see if the part of the cell corresponds to this letter. If so, allow 1 mark ecf*

|  |  |  |
| --- | --- | --- |
| function | part of cell | label |
| controls activities of the cell | *nucleus* | *A* |
| carries out aerobic respiration | mitochondrion / mitochondria; | D; |
| attaches to mRNA in protein synthesis | ribosome(s) / rough ER / RER; | C; |
| produces secretory vesicles | Golgi; | B; |
| contains digestive enzymes | lysosome(s); | E; |

8

[8]