1(a). The use of microscopes has greatly increased our understanding of the cell.

Cells come in different shapes and sizes.

Look at the diagrams of two **spherical** cells **A** and **B**.

Cell A

Cell B

Estimate how many times larger cell B is than cell A.

Describe the method you used to make your estimation.

Estimate _____ X larger

_____

_____

_____ **[3]**

(b).

(i) A group of students decide to look at human red blood cells and human egg cells using a light microscope.

Name a structure that would be visible in the human egg cell but **not** in the human red blood cell.

_____ [1]

(ii) A human egg cell is approximately 10^2 µm in diameter.

A human red blood cell is approximately 10 µm in diameter.

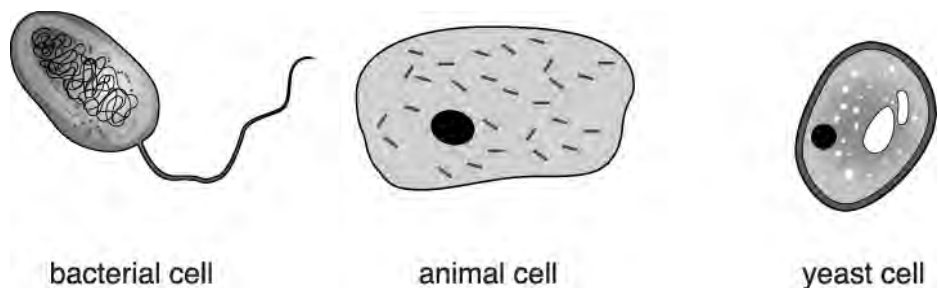How many times larger is an egg cell compared to a red blood cell?

_____ X larger [1]

(iii) Suggest an advantage of both cells being the size they are.

Human egg cell _____

_____

Red blood cell _____
_____ [2]

2. The diagrams show three different types of cell.

bacterial cell   animal cell   yeast cell

(i) Which of the structures below is **not** found in a bacterial cell?

Place a tick (✓) in the box next to the correct answer.

cell wall ☐

circular piece of DNA ☐

cell membrane ☐

mitochondrion ☐

[1]

(ii) Which of the structures below is **not** found in an animal cell or a yeast cell?

Place a tick (✓) in the box next to the correct answer.

cell wall ☐

circular piece of DNA ☐

cell membrane ☐

mitochondrion ☐

[1]

(iii) Which of the structures below is found in all **three** types of cell?

Place a tick (✓) in the box next to the correct answer.

cell wall ☐

circular piece of DNA ☐

cell membrane ☐

mitochondrion ☐

[1]

3.   **Table 4.2** gives information about plant cells and pathogens.

Cell type	Mean diameter (µm)	Mean diameter (m)
Plant cell		8×10^{-5}
Bacterium	2	
Virus	0.25	

Table 4.2

(i) Give the mean diameter of the plant cell in µm.

Mean diameter = ... µm **[1]**

(ii) Give the mean diameter of the bacterium in m.

Give your answer in standard form.

Mean diameter = ... m **[1]**

(iii) Give the mean diameter of the plant cell, in m, to the nearest order of magnitude.

Mean diameter = ... m **[2]**
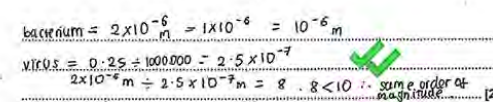
(iv) Show that the sizes of the bacterium and the virus are the same order of magnitude.

PhysicsAndMathsTutor.com

.... **[2]**

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1	a		Width answers i.e. 4 x larger ✔ Area answers i.e. 12 – 20 x larger ✔✔ Volume answers i.e. 60 – 70 x larger ✔✔✔	3	If estimates are incorrect allow max 2 marks for appreciation of area (1 mark) and volume (2 marks). Explanation is for using width or area or volume.
	b	i	Nucleus ✔	1	
		ii	10 ✔	1	
		iii	Only need one egg cell / makes it easier for sperm to find egg cell ✔ RBC needs to move through small spaces / need lots of RBCs ✔	2	**ALLOW** idea of food storage in egg cell
			Total	**7**	
2		i	mitochondrion	1	
		ii	circular piece of DNA	1	
		iii	cell membrane	1	**Examiner's Comments** About half of the candidates recognised that bacterial cells did not contain mitochondria with 'circular piece of DNA' generally being the most common misconception. Cell wall was probably the most common misconception seen for (ii) but most candidates recognised circular piece of DNA as the correct response for this question. There was no obvious pattern to the incorrect answers for (iii).
			Total	**3**	
3		i	80 (µm) ✔	1 (AO 2.2)	check for answer written in table **Examiner's Comments** This question assessed mathematical skill 1b, recognise and use expressions in standard form. Candidates appeared to be unaware of how many (µm) were in a (m) or could not deal with the number in standard form.

Question			Answer/Indicative content	Marks	Guidance
		ii	2×10^{-6} (m) ✓	1 (AO 2.2)	check for answer written in table

Examiner's Comments

This question assessed mathematical skill 1b, recognise and use expressions in standard form. Only approximately 20% of candidates correctly stated that 2 μm was equivalent to 2×10^{-6} m.

This is a key area for candidates to improve their knowledge. |
| | | iii | FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 10^{-4} (m) award 2 marks

$8 \times 10^{-5} \approx 10 \times 10^{-5}$ ✓
$\times 10^{-4}$ (m) ✓ | 2 (AO 2.2 × 2) | **Examiner's Comments**

This question assessed mathematical skill 2h, make order of magnitude calculations. Most candidates could not carry out the calculation.

Exemplar 6

This response is credited with both mark points as they have shown that the diameter is 8×10^{-5} which is nearly 10×10^{-5} giving the nearest order of magnitude to be 10^{-4}. |

Question			Answer/Indicative content	Marks	Guidance
		iv	2 ÷ 0.25 = 8 / bacterium is 8 times larger ✓ which is less than 10 times larger (so they are the same) order of magnitude) ✓	2 (AO 2.2 × 2)	**Examiner's Comments** This question assessed mathematical skill 2h, make order of magnitude calculations. Most candidates could not carry out the calculation. As with parts (i) & (ii) this is an area that candidates require an improvement in their knowledge. Exemplar 7 This response shows that the bacterium is 8 times larger (1st mark point) and that this is less than 10 times larger, so they are of the same order of magnitude. .
			Total	6	