Q1. (2020)

| | | | | | | |
|---|---|---|---|---|---|---|
| **1** | | | C ✓ | **1** | **1.1** | |

Q2. (2020)

| | | | | | | |
|---|---|---|---|---|---|---|
| **2** | | | A ✓ | **1** | **1.2** | |

Q3. (2020)

| | | | | | | |
|---|---|---|---|---|---|---|
| **4** | | | A ✓ | **1** | **1.1** | |

Q4. (2020)

| | | | | | | |
|---|---|---|---|---|---|---|
| **5** | | | D ✓ | **1** | **1.1** | |

Q5. (2020)

| | | | | | | |
|---|---|---|---|---|---|---|
| **10** | | | A ✓ | **1** | **1.1** | |

Q6. (2020)

| | | | | | | |
|---|---|---|---|---|---|---|
| **12** | | | D ✓ | **1** | **2.2** | |

Q7. (2020)

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| **16** | **(a)** | | <table><tr><th>Feature</th><th>Structure</th></tr><tr><td>chlorophyll for photosynthesis</td><td>**chloroplast** ✓</td></tr><tr><td>enzymes for respiration</td><td>**mitochondria** ✓</td></tr><tr><td>receptor molecules for communication</td><td>**cell membrane** ✓</td></tr></table> | **3** | **1.1** | |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(b)** | **(i)** | **FIRST CHECK THE ANSWER ON ANSWER LINE**<br>**If answer = (×) 2000 award 2 marks**<br><br>60(mm) ÷ 0.03(mm) ✓<br>= (×) 2000 ✓ | **2** | **2.2** | |

C)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(ii)** | (use of a) stain ✓ | **1** | **1.2** | **ALLOW** named stain e.g. iodine / methylene blue / eosin<br>**ALLOW** dye<br>**IGNORE** colouring |

D)

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(c)** | **(i)** | there are four different bases in DNA ✓ | **1** | **1.1** | **ALLOW** nitrogenous bases<br>**ALLOW** names of the four bases / represents ATCG |

E)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(ii)** | phosphate (groups) ✓<br><br>sugars ✓ | **2** | **2 x 1.1** | **ALLOW** correct answers in either order<br><br>**ALLOW** deoxyribose |

Q8. (2021)

| | | | | | | |
|---|---|---|---|---|---|---|
| **1** | | | C✓ | **1** | **1.1** | |

## Q9. (2021)

| | | | | | | |
|---|---|---|---|---|---|---|
| **10** | | | C✓ | **1** | **1.1** | |

## Q10 (2021)

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| **16** | **(a)** | | <table><tr><th>Sub-cellular structure</th><th>Only in Eukaryotic cells</th><th>Only in Prokaryotic cells</th><th>In both Eukaryotic and prokaryotic cells</th></tr><tr><td>cell membrane</td><td></td><td></td><td>(✓)</td></tr><tr><td>nucleus</td><td>✓</td><td></td><td></td></tr><tr><td>mitochondria</td><td>✓</td><td></td><td></td></tr><tr><td>plasmid</td><td></td><td>✓</td><td></td></tr></table> | **3** | **3 x 1.1** | more than one answer in a row = no mark |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(b)** | **(i)** | <table><tr><td>adjust the focus knob to see the image</td><td>**5**</td></tr><tr><td>place the plant cells onto the microscope slide</td><td>**1**</td></tr><tr><td>place microscope slide on stage</td><td>**4**</td></tr><tr><td>place a coverslip over the plant cells</td><td>**2**</td></tr><tr><td>select low power objective lens</td><td>**(3)**</td></tr></table> | **2** | **2 x 1.2** | ALL correct = 2 marks<br>3 or 4 correct = 1 mark |

C)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(ii)** | (×)400 ✓ | **1** | **2.2** | |

D)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(iii)** | 2000 (µm) ✓ | **1** | **2.2** | **ALLOW** ECF from part (ii) for incorrect magnification |

E)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(v)** | Sugars are the monomers ✓<br><br>Sugars are joined together to make the (polymer/cellulose) ✓ | **2** | **2 x 2.1** | **ALLOW** sugar/glucose is smallest unit of carbohydrate<br>**ALLOW** cellulose is made up of glucose (molecules)<br><br>**ALLOW** (cellulose is a polymer) made up of sugar/glucose monomers = 2 marks |

## Q11. (2021)

A)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **18** | **(a)** | **(i)** | <table><tr><th>Stage</th><th>Description of what happens</th></tr><tr><td>**S**</td><td>DNA replication</td></tr><tr><td>G2</td><td>growth and preparation for mitosis</td></tr><tr><td>**M**</td><td>movement of chromosomes</td></tr><tr><td>**G1**</td><td>cell growth</td></tr></table> | ✓✓ | **2** | **2 x 1.1** | All 3 correct = 2 marks<br><br>1 or 2 correct = 1 mark |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(ii)** | Double helix ✓ | **1** | **1.1** | |

C)

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(b)** | **(i)** | Differentiated cells can do different jobs/functions ✓<br><br>Allowing organisms to become more efficient ✓ | **2** | **2 x 1.1** | **ALLOW** organism can become more complex<br><br>If no other mark scored credit make specialised cells |

D)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(ii)** | Meristem✓ | **1** | **1.1** | |

Q12. (2021)

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| **20** | **(a)** | **(i)** | Sensory neurone/nerve ✓ | **1** | **1.1** | |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(ii)** | Hormones ✓<br><br>Travel through the blood(stream)✓ | **2** | **2 x 1.1** | **ALLOW** chemical messengers<br><br>**ALLOW** hormones bind to specific receptors on cells |

Q13. (2021) – 21b

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(b)** | **(i)** | Menstrual blood cells are adult stem cells / Menstrual blood cells/adult stem cells can only form certain types of cells ✓<br><br>(Embryo stem cells) can produce a wide range of cell types ✓ | **2** | **2 x 2.1** | **ALLOW** Menstrual blood cells can only specialise into blood cells / menstrual blood cells are multipotent/partially differentiated<br><br>**ALLOW** Embryo stem cells can produce any type of cell / embryo stem cells are pluripotent |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(ii)** | **FIRST CHECK THE ANSWER ON ANSWER LINE**<br>**If answer = 77.6 (hours) award 2 marks**<br><br>4 (generations) ✓<br><br>4 x 19.4 = 77.6 (hours) ✓ | **2** | **2 x 2.2** | |

C)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(iii)** | $\frac{48}{19.4}$ = 2.5 ✓ | **1** | **2.2** | **ALLOW** 2.4742 etc<br>**ALLOW** any correct rounding |

D)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(iv)** | **Any two from:**<br>Quick to culture / divide rapidly / fast growth ✓<br><br>Easily obtainable source of stem cells ✓<br><br>Frequently accessible source of stem cells ✓<br><br>Less ethical issues in obtaining them (compared to stem cells from embryo tissue) ✓ | **2** | **2 x 3.1b** | **ALLOW** reverse argument for embryo stem cells if stated<br>assume menstrual blood stem cells if not stated<br><br>**IGNORE** just quicker<br><br>**ALLOW** idea of less invasive technique<br><br>**IGNORE** just supply more |

Q14. (2022)

| | | | | |
|---|---|---|---|---|
| **1** | B ✓ | **1** | **1.1** | |

Q15. (2022)

| | | | | |
|---|---|---|---|---|
| **3** | A ✓ | **1** | **1.1** | |

Q16. (2022)

| | | | | |
|---|---|---|---|---|
| **5** | B ✓ | **1** | **1.1** | **ALLOW** 2 |

Q17. (2022)

| | | | | |
|---|---|---|---|---|
| **6** | B ✓ | **1** | **1.1** | |

Q18. (2022)

| | | | | |
|---|---|---|---|---|
| **8** | D ✓ | **1** | **2.1** | |

Q19. (2022)

| | | | | |
|---|---|---|---|---|
| **13** | B ✓ | **1** | **2.1** | |

Q20. (2022)

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| **16** | **(a)** | **(i)** | stain ✓<br>stage ✓<br>objective ✓<br>focus ✓ | **4** | **4 x 1.2** | |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(b)** | **(i)** | Correctly identifies the centre cell on the right-hand side ✓ | **1** | **1 x 2.1** | |

C)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(ii)** | Correctly identifies a nucleus ✓ | **1** | **1 x 2.1** | **DO NOT ALLOW** arrow not touching the nucleus |

D)

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(c)** | | Contains meristem cells /<br>cell division/mitosis occurs ✓ | **1** | **1 x 2.1** | **ALLOW** stem cells<br>**ALLOW** multiply<br>**IGNORE** auxins / growth |

Q21. (2022) – 18c

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(c)** | | **Similarity** – (both have) cell membrane/ cell wall/ ribosomes/ cytoplasm ✓<br><br>**Difference** – bacterial/prokaryotic cells do not have chloroplast/nucleus/mitochondria/ ✓<br>**OR**<br>**Difference -** bacteria/prokaryotic cells have plasmids/flagellum/pili/are smaller ✓ | **2** | **2 x 1.1** | **IGNORE** DNA<br><br>**ALLOW** ORA for plant differences<br>**ALLOW** bacterial/prokaryotic cells do not have a permanent vacuole<br>**ALLOW** reference to composition of the cell walls<br><br>**IGNORE** growth rate |

Q22. (2022) – 20c

| | | | | | | |
|---|---|---|---|---|---|---|
| | (c) | | Prevent rejection ✓ | 1 | 1 x 2.1 | **ALLOW** do not attack the cells/no immune response<br>**IGNORE** same DNA<br>**ALLOW** ORA for using donor stem cells |

Q23. (2022)

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| 23 | (a) | (i) | Lipase✓<br>Fatty acids ✓<br>Glycerol ✓ | 3 | 3 x 2.1 | **ALLOW** enzyme |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | (ii) | Curve that goes up (and down) ✓<br>Curve that shows peak/maximum in alkaline pH ✓ | 2 | 2 x 2.1 | **ALLOW** any pH peak/maximum greater than 7 |

Q24. (2023)

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| 16 | (a) | | **Statement about DNA** / **True (T)** / **False (F)**<br>DNA is a polymer. / ✓ / <br>DNA is made of 4 strands. / / ✓<br>The strands in DNA form a double helix. / ✓ / <br>A DNA nucleotide is made of a sugar, a phosphate group and a base. / ✓ / <br>The 4 bases found in DNA are A, C, G and U. / / ✓<br>✓✓✓ | 3 | 3 x 1.1 | 5 correct ticks = 3 marks<br>4 correct ticks = 2 marks<br>2/3 correct ticks = 1 mark<br>**DO NOT ALLOW** more than 1 tick for each statement |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | (b) | | eukaryote — chromosomes — cytoplasm<br>prokaryote — plasmids — nucleus<br>✓✓ | 2 | 2 x 1.1 | 4 correct lines = 2 marks<br>3/2 correct lines = 1 mark<br>**DO NOT ALLOW** more than 1 line from each box |

C)

| | | | | | | |
|---|---|---|---|---|---|---|
| | (c) | (i) | Stage ✓ | 1 | 1.2 | |

D)

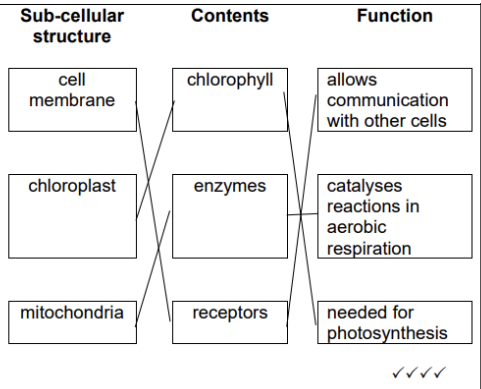
| | | | | | | |
|---|---|---|---|---|---|---|
| | | (ii) | Objective ✓ | 1 | 1.2 | |

E)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | (iii) | Focusing knob ✓ | 1 | 1.2 | |

Q24. (2023)

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| 23 | (a) | |  | 4 | 4 x 1.1 | 6 correct lines = 4 marks<br>5/4 correct lines = 3 marks<br>3 correct lines = 2 marks<br>2 correct lines = 1 mark<br><br>**DO NOT ALLOW** more than 1 line from each box |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | (b) | (i) | Correct outline shape of this mitochondrion drawn with continuous lines and no shading ✓<br><br>Double outer membrane and internal membranes accurately drawn ✓ | 2 | 2 x 2.2 | **IGNORE** labels |

C)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | (ii) | Electron microscope ✓<br><br>The image is highly magnified /<br>The image is in a lot of detail /<br>Can see organelles /<br>The resolution is high ✓ | 2 | 2 x 2.1 | **ALLOW** TEM or SEM<br><br>Second marking point is dependent on the first<br>**IGNORE** image is black and white<br>**ALLOW** ORA for light microscopes for each reason |

D)

| | | | | | | |
|---|---|---|---|---|---|---|
| | (c) | | Ribosome / cell membrane / cytoplasm ✓ | 1 | 1.1 | |

Q25. (2024)

| | | | | |
|---|---|---|---|---|
| 1 | A | 1 | 1.1 | |

Q26. (2024)

| | | | | |
|---|---|---|---|---|
| 2 | D | 1 | 1.1 | |

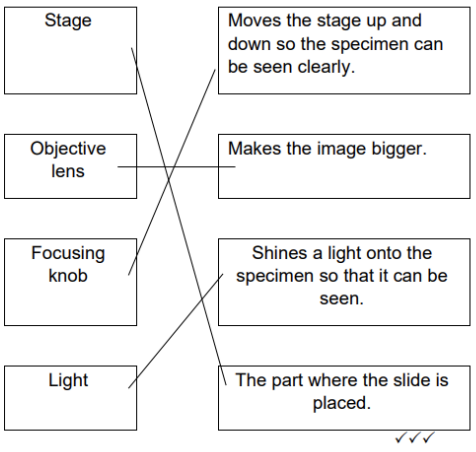
Q27. (2024)

Q28. (2024)

| | | | | |
|---|---|---|---|---|
| 14 | D | 1 | 1.1 | |

Q29. (2024)

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| 16 | (a) | |  ✓✓✓ | 3 | 3 x 1.2 | 4 correct lines = 3 marks<br>3/2 correct lines = 2 marks<br>1 correct line = 1 mark<br><br>**DO NOT ALLOW** more than 1 line for each statement |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | (b) | (i) | **First check the answer on the answer line**<br>**If answer = 40 award 2 marks**<br><br>400 ÷ 10 ✓<br>= 40 ✓ | 2 | 2 x 2.2 | <br><br><br>**IGNORE** units |

C)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | (ii) | **Any three from**:<br><br>Use a (sharp) pencil ✓<br><br>Draw with continuous lines ✓<br><br>No shading ✓<br><br>No colour ✓<br><br>Consider proportion ✓<br><br>Labels ✓<br><br>Display the magnification ✓<br><br>Copy (image) ✓ | 3 | 3 x 1.2 | <br><br>**ALLOW** single lines<br>**ALLOW** no dashes/sketchy lines<br><br><br><br>**ALLOW** similar/same size/shape<br><br>**ALLOW** key structures labelled<br><br><br>**IGNORE** trace |

D)

| | | | | | | |
|---|---|---|---|---|---|---|
| | (c) | | **ANY two from:**<br><br>(Electron microscopes have) high magnification ✓<br><br>(Electron microscopes have) a high resolution ✓<br><br>Produces a 3D image ✓ | 2 | 2 x 1.1 | Assume answer refers to electron microscope unless stated<br>**ALLOW ORA** for light microscope for each reason<br>**IGNORE** zoom |

Q30. (2024)

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| | (c) | | C D E A B ✓✓ | 2 | 2 x 1.1 | D correct ✓<br>A before B ✓ |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(d)** | | 2 (orders of magnitude) ✓ | **1** | **2.2** | |

Q31. (2024)

A)

| | | | | | | |
|---|---|---|---|---|---|---|
| **23** | **(a)** | **(i)** | Embryonic (stem cell) ✓ | **1** | **2.1** | **ALLOW** embryo stem cells |

B)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(ii)** | Can differentiate into any type of cell✓ | **1** | **2.1** | |

C)

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(b)** | **(i)** | 46% improvement is not a cure / 46% is not a large improvement / hearing is not fully restored ✓<br><br>These results are only after 10 weeks / may not be a long-term cure / have not observed long term effects ✓<br><br>Only 18 rodents were used / not a large sample size ✓<br><br>Idea that an improvement of 46% on average means some may have less than 46% improvement ✓<br><br>Only tested on rodents / results in humans might be different ✓ | **3** | **3 x 3.2a** | **ALLOW** answers referring to **only** 46% hearing restored / 46% is not very high / less than half of their hearing was regained<br>**DO NOT ALLOW** only 46%/less than half have been cured/regained hearing |

D)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **(ii)** | Test the procedure on more rodents /<br><br>Monitor the rodents hearing for longer / | **1** | **3.3b** | |
| | | | Try a different number/more nerve cell transfers /<br><br>Use different type of stem cells /<br><br>Try the technique on more species/humans ✓ | | | **IGNORE** reference to making deaf in two ears |

E)

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(c)** | | **First check the answer on the answer line**<br>**If answer = 1.5 award 2 marks**<br><br>10 x 0.15<br>**OR**<br>15/100 x 10 ✓<br><br>= 1.5 ✓ | **2** | **2 x 2.2** | **ALLOW** any correct calculating method<br><br>**ALLOW** 1 500 000 on the answer line for one mark max |