

## 2.1 CELL STRUCTURE, EUKARYOTES, PROKARYOTES, METHODOLOGY 1 – MARK SCHEMES

### Q1.

(a) Diffusion

*Automarker*

1

- (b) 1. **Droplets** increase surface areas (for lipase / enzyme action);  
 2. (So) faster hydrolysis / digestion (of triglycerides / lipids);  
 3. **Micelles** carry fatty acids and glycerol / monoglycerides to / through membrane / to (intestinal epithelial) cell;

1. *Context is important*
1. *Reject micelles increase surface area*
2. *Ignore 'breakdown'*
3. *Ignore 'small enough'*
3. *Accept description of membrane*
3. *Reject any movement through membrane proteins*

3

- (c) 1. Golgi (apparatus);  
 2. Modifies / processes triglycerides;  
 3. Combines triglycerides with proteins;  
 4. Packaged for release / exocytosis

**OR**

Forms vesicles;

*Ignore 'processes and packages' unqualified*

2. *Reject synthesises triglycerides*
3. *Accept 'forms / are lipoproteins'*

4

[8]

### Q2.

(a) × 20 000

*Accept range from 18 000 to 22 000*

1

(b)

✓	
✓	
	✓

*1 mark for each correct column*

2

- (c) 1. DNA contains thymine **and** RNA contains uracil;  
 2. DNA contains deoxyribose **and** RNA contains ribose.

2

[5]

**Q3.**

- (a) 1. **A:** phospholipid (layer);  
     1. *Reject hydrophobic / hydrophilic phospholipid*
2. **B:** pore / channel / pump / carrier / transmembrane / intrinsic / transport protein;  
     2. *Ignore unqualified reference to protein*

2

- (b) (i) Condensation (reaction);
- (ii) Organelle named; Function in protein production / secretion;  
     *Function must be for organelle named*  
     *Incorrect organelle = 0*

1

eg

1. Golgi (apparatus);  
     1. *Accept smooth endoplasmic reticulum*
2. Package / process proteins;

**OR**

3. Rough endoplasmic reticulum / ribosomes;  
     3. *Accept alternative correct functions of rough endoplasmic reticulum. ER / RER is insufficient*  
     3. *Accept folding polypeptide / protein*
4. Make polypeptide / protein / forming peptide bonds;

**OR**

5. Mitochondria;
6. Release of energy / make ATP;  
     6. *Reject produce / make energy*  
     6. *Accept produce energy in the form of ATP*

**OR**

7. Vesicles;
8. Secretion / transport of protein;

2

[5]

**Q4.**

- (a) (Group of) similar / identical cells / cells with a common origin;  
*Q Ignore references to function* 1
- (b) (i) Add iodine / stain specific for starch to the slide / cells / tissue / add iodine / stain specific for starch and examine under microscope;  
 Blue-black / blue / black / purple;  
*Reject sample* 2
- (ii) Need a single layer of cells / only a few cells thick / not too many layers / detail obscured by cells underneath;  
 Light must be able to pass through; 2
- (c) Both are polymers / made of monomers;  
 Joined by condensation / molecules can be broken down by hydrolysis;  
 Both have 1-4 links;  
 Contain C(arbon), H(ydrogen) and O(xygen) / both made up of glucose;  
 Both insoluble;  
 Both contain glycosidic bonds;  
*Accept other valid answers.*  
*Ignore ref to unbranched.* 2 max
- [7]**

**Q5.**

- (a) (i) Chloroplast; 1
- (ii) Photosynthesis;  
 Uses light (energy);  
 To produce carbohydrates / starch / glucose / sugars / ATP / reduced NADP;  
*Note that candidates cannot be expected to have a detailed knowledge of photosynthesis.* max 2
- (b) (i) **A**; 1
- (ii) **C**; 1
- (c) (i) Slows enzymes / prevents enzymes being denatured / prevents / stops self-digestion;  
*Ignore references to bacteria. Reject enzymes not working* 1

- (ii) To remove organelle C / nuclei;  
Which are larger / more dense; 2 [8]

**Q6.**

- (a) (i) (Human cells) don't have a cell wall;  
*Accept "they" refers to human cells.* 1
- (ii) (Affects) protein synthesis;  
*Allow description e.g. 'amino acids not joined together / translation.*  
*Reject: affects transcription.* 1
- (b) 1. Mutation present / occurs;  
*Ignore antibiotic causes mutation.*
2. Resistance gene / allele;  
*1. or 2.*  
*Reference to immunity disqualifies first credited marking point.*
3. Resistant bacteria (survive and) reproduce;  
*Reference to mitosis negates marking point 3.* 2 [4]

**Q7.**

- (a) (i) no cell wall / only has (plasma) membrane; 1
- (ii) has capsule / slime layer; 1
- (b) correct approach which makes use of scalebar; *ignore* reference to units. 1
- (c) cellulose / starch / amylose / amylopectin; 1
- (d) (i) water potential lower / more negative in cell;  
(water enters by) osmosis; 2
- (ii) plant cell wall made of a different substance / cellulose / penicillin  
does not affect cellulose; 1 [7]

**Q8.**

- (a) (i) A mitochondrion and B nucleus;  
(need both for one mark)

- 1
- (ii) increased surface area;  
for respiration / enzymes;
- 2
- (b) *any suitable feature*  
e.g. plasmid / capsule / 70S ribosomes / smaller  
ribosomes / complex cell wall / mesosome / no nucleus;
- 1
- (c) use of differential centrifugation / or description;  
first / low-spin pellet discarded / spin at low speed to remove cell  
wall material / cell debris;  
supernatant re-spun at higher speed / until pellet with chloroplasts is found;  
method of identifying chloroplasts e.g. microscopy;
- 3 max

[7]

**Q9.**

- (a) On diagram, correctly labelled:
- Light-dependent: granum / thylakoid membranes – labelled 'X'  
AND  
Light-independent: stroma – labelled 'Y';
- 1
- (b) Any two from:
- (Water) forms  $H^+$  / hydrogen ions and electrons /  $e^-$  ;  
  
 $O_2$  / oxygen formed; [*NOT 'O', NOT 'O'*]
- (Light) excites electrons / raises energy level of electrons / electrons to  
chlorophyll / to photosystem;
- max 2
- (c) (ATP) Provides energy for  $GP \rightarrow TP$  / provides P for  $RuP / TP \rightarrow RuBP$ ;  
  
(Reduced NADP) Provides H / electrons for  $GP \rightarrow TP$  / reduces GP to TP;
- 2

[5]

**Q10.**

- (a) Differentiation / specialisation
- 1
- (b) (i) (cellulose) Cell wall;
- 1
- (ii) Two marks for correct answer 2350–2500;;  
*Accept measured and real lengths in different units for one  
mark.*

One mark for a measured length divided by real length;

2

(iii) Chloroplasts absorb light;

*Q Do not accept chlorophyll as alternative to chloroplasts*

Or

Large vacuole pushes chloroplasts to edge (of cell);

Or

Thin / permeable (cell) wall to absorb carbon dioxide;

1 max

[5]

### Q11.

(a) (i) Mitochondrion;

*Neutral: cristae*

1

(ii) (Site of aerobic) respiration / ATP production / energy release;

*Q Reject: anaerobic respiration*

*Q Reject: energy produced*

Active transport / transport against the concentration gradient;

*Accept: energy produced in the form of ATP*

2

(b) 89 – 91 gains 2 marks;

*Correct answer gains 2 marks outright*

Principle of:

$$\frac{\text{correct measured length}}{\text{magnification}}$$

gains 1 mark;

*89-91 (mm) / 1000 or 8.9-9.1 (cm) / 1000 gains 1 mark*

2

(c) Suitable explanation given e.g.

*Accept: converse arguments*

Reduced surface area; (So) less absorption;

*Neutral: structure Z incorrectly named*

(Membrane-bound) enzymes less effective;

(So) proteins / polypeptides not digested;

*Reduced surface area for absorption gains 2 marks*

Cell membranes damaged;

(So) Fewer / less effective carrier / channel proteins;

*Accept: references to diffusion and active transport for 'absorption'*

Carrier / channel proteins damaged;

(So) less absorption;  
*Reject: active transport if linked to channel proteins*

2

[7]

**Q12.**

(a) (Plasma / cell) membrane;

*Reject: nuclear membrane*

1

(b) Nucleus / nuclear envelope / nuclear membrane / nucleolus;

*Accept: membrane-bound organelles only if an example has not been given*

Mitochondrion;

(Smooth / rough) ER;

Lysosome;

Microvillus / brush border;

*Neutral: villi*

Golgi;

Linear / non-circular DNA / chromosome;

*Neutral: DNA strands*

80S / denser / heavier / larger ribosomes;

*Neutral: ribosomes*

2 max

(c) (i) Higher resolution / higher (maximum) magnification / higher detail (of image);

**OR**

Allows internal details / structures within (cells) to be seen / cross section to be taken;

*Accept: 'better' instead of 'higher'*

*Neutral: shorter wavelength*

*Reject: longer wavelength*

*Reject: can be used on living specimens*

**Q Do not accept 'clearer' image**

1

(ii) Thin sections do not need to be prepared / shows surface of specimen / can have 3-D images;

*Accept: can be used on thick(er) specimens*

*Reject: can be used on living specimens*

*Neutral: refs. to staining / preparation / artefacts / colour*

1

(d) Two marks for correct answer of 0.42 – 0.46;;

One mark for incorrect answers in which candidate clearly divides measured width by magnification;

*Correct answer = 2 marks outright*

*Accept: 0.4 or 0.5 only if working is correct for 2 marks*

*Do not award a mark for 0.4 or 0.5 if there is no working out*

*Ignore rounding up*

2

- (e) As height increases, the number of deaths decrease / inversely proportional / negative correlation;

Correct reference to increase / decrease at 14-30m;

*Accept: converse statement*

*Must give a trend and not simply give individual points*

*Do not penalise for 'more likely to get cholera'*

2

[9]

### Q13.

- (a) Peptide;

*Q Do not accept polypeptide*

*Neutral: covalent*

1

- (b) (F) H J E (K);

*All three boxes correct = 2 marks*

*Two boxes correct = 1 mark*

2

- (c) (Site of aerobic) respiration;

Release ATP / energy for active transport / transport against the concentration gradient / protein synthesis / exocytosis;

*Q Reject: anaerobic respiration*

*Q Reject: produces / makes energy*

*Accept: produces ATP for energy*

*Reject: produces ATP for respiration*

*Neutral: protein secretion*

2

- (d) (i) Breaks open cells / disrupts cell membrane / releases cell contents / releases organelles / break up cells;

*Reject: breaks down cell wall*

*Neutral: separates the cells*

*Reject: breaks up cells so they can be separated*

*Reject: breaks up / separates organelles*

1

- (ii) Removes (cell) debris / complete cells / tissue;

*Neutral: to isolate organelle G / mitochondria*

*Neutral: removes unwanted substances / impurities*

*Reject: removes organelles / cell walls*

1



- (iii) Reduces / prevents enzyme activity;

*Reject: ref. to denaturation*

1

- (iv) Prevents osmosis / no (net) movement of water / water does not enter organelle / water does not leave organelle;

So organelle / named organelle is not damaged / does not burst / does not shrivel;

*Neutral: ref. to water potential*

**Q** *Ref. to cells rather than organelles negates the second mark only*

*Reject: ref. to turgid / flaccid for second mark*

*Reject: organelle 'explodes' for second mark*

2

[10]

### Q14.

- (a) (i) (Aerobic) respiration;

*Accept ATP production / energy release*

*Reject anaerobic respiration*

*Reject energy production*

1

- (ii) Golgi (apparatus / body);

*Ignore smooth ER*

1

- (b) ('It' = Optical microscope)

*Ignore reference to magnification*

1. Has low resolution / not high enough resolution;

*Accept converse relating to EM*

2. (Because) wavelength of light not short enough / too long;

*Accept larger wavelength*

*Accept statements that microscopes have a wavelength*

2

[4]

### Q15.

- (a) Cell wall;

Starch (store);

Chloroplast;

*Accept: phonetic spelling*

2 max

- (b) Insoluble;

Reduces / 'stops' water entry / osmosis / does not affect water potential / is osmotically inactive;

*Accept: description for first point e.g. 'does not dissolve'.*

2

(c) Light sensitive eyespot / eyespot detects light;

Flagellum enables movement towards light;

Chloroplast / chlorophyll absorbs light / for photosynthesis;

*Do not penalise references to 'many chloroplasts'.*

3

[7]

**Q16.**

(a) 1. Granum / grana / thylakoid;

*Ignore references to membranes, stacks or discs.*

2. Stroma;

*Allow phonetic spellings.*

2

(b) 1. Absorbs / traps / uses light;

*Light dependent reaction = marking point 1.*

2. For photosynthesis;

3. Produces carbohydrates / sugars / lipids / protein;

*Accept any named product of photosynthesis for marking point 3.*

*Reference to light dependent and light independent reactions = two marks*

2 max

(c) Correct answer in range of 2.53 - 2.66;

Any length divided by 30000 = 1 mark;

2

[6]

**Q17.**

(a) (i) Golgi (apparatus / body);

1

(ii) 1. Nucleus;

*Accept: nucleolus / nuclear envelope / nuclear membranes*

2. Mitochondrion;

*Accept cristae / mitochondrial membranes*

3. Endoplasmic reticulum / ER;

*Ignore reference to rough / smooth*

4. Lysosome;

*Reject lysozyme*

2 max

(b) (Aerobic) respiration / ATP production / provide energy;  
*Accept Krebs cycle / electron transport.*  
*Ignore 'produces energy'*  
*Reject anaerobic respiration*  
*Ignore what energy is used for*

1

(c) 1. High / better resolution;  
2. Shorter wavelength;  
3. To see internal structures / organelles / named organelles;  
*Accept ultrastructure*

2 max

[6]

### Q18.

(a) Electron microscope has higher resolution (than optical microscope).

1

(b) Cytoplasm of red blood cell filled with haemoglobin.

1

(c) 1. Membrane has phospholipid bilayer;  
2. Stain binds to phosphate / glycerol;  
3. On inside and outside of membrane.  
*Accept phospholipid head / protein*

3

(d) 1. Carrier / channel protein;  
2. (Protein) specific / complementary to substance;  
3. Substance moves down concentration gradient;  
*Allow down electrochemical gradient*  
*Reject 'along' concentration gradient*

3

[8]

### Q19.

(a) QWC

1. (Phagocyte engulfs) to form vacuole / vesicle / phagosome;  
*Accept surrounds bacteria with membrane*

2. Lysosome empties contents into vacuole / vesicle / phagosome;  
*Accept joins / fuses*

3. (Releasing) enzymes that digest / hydrolyse bacteria;  
*Ignore breakdown / destroy / lytic enzymes*

3

(b) Two suitable structures;;

Examples,

1. Cell wall;
2. Capsule / slime layer;
3. Circular DNA;  
*Reject "circular chromosome"*
4. Naked DNA / DNA without histones;
5. Flagellum;
6. Plasmid;
7. Pilus;
8. 70s / smaller ribosomes;
9. Mesosome;

2 max

[5]

**Q20.**

- (a)
1. Bilayer;  
*Accept double layer*  
*Accept drawing which shows bilayer*
  2. Hydrophobic / fatty acid / lipid (tails) to inside;
  3. Polar / phosphate group / hydrophilic (head) to outside;  
*2. & 3. need labels*  
*2. & 3. accept water loving or hating*

2 max

- (b) (i)
1. (Rough endoplasmic reticulum has) ribosomes;  
*accept "contains / stores"*
  2. To make protein (which an enzyme is);  
*Accept amino acids joined together / (poly)peptide*  
*Reject makes amino acids*  
*Ignore glycoprotein*

2

(ii) (Golgi apparatus) modifies (protein)

**OR**

packages / put into (Golgi) vesicles

**OR**

transport to cell surface / vacuole;

*Accept protein has sugar added*  
*Reject protein synthesis*  
*Accept lysosome formation*

1

[5]

**Q21.**

(a) **B** Golgi (body / apparatus);

**C** Mitochondria / mitochondrion;

2

(b) 1. Chloroplasts / plastids

2. Cell wall

3. Cell vacuole

4. Starch grains / amyloplasts;

*Any 2 for 1 mark*

1 max

(c) 1. Ice-cold – Slows / stops enzyme activity to prevent digestion of organelles / mitochondria;

2. Buffered – Maintains pH so that enzymes / proteins are not denatured;

*Reject reference to cells*

3. Same water potential – Prevents osmosis so no lysis / shrinkage of organelles / mitochondria / **C**;

*Ignore damage*

*For each mark must link reason to relevant property*

3

(d) 1. Break open cells / homogenise / produce homogenate;

2. Remove unbroken cells / larger debris;

2

(e) Nucleus / nuclei;

1

(f) Mitochondria / organelle **C** less dense than nucleus / organelle in first pellet;

*Accept 'lighter' for less dense*

1

[10]

**Q22.**

(a)

Protein synthesis	<b>L</b> ;
Modifies protein	<b>H</b> ;

Aerobic respiration	N;
---------------------	----

3

- (b) 1800–2200;  
*1.8, 2.0 or 2.2 in working or answer = 1 mark.*  
*Ignore units in answer.*

1 mark for an incorrect answer in which student clearly divides measured length by actual length (of scale).

*Accept I / A or I / O for 1 mark but ignore triangle.*

*Accept approx 60mm divided by 30µm for 1 mark*

2

[5]

**Q23.**

- (a) A mitochondria;  
 B ribosomes (*accept ribosomes and rER*)
- (b) idea of sections or cuts;  
 idea of mitochondria orientated differently or in different positions / description of 3D structure of mitochondria, e.g. sausage-shaped;
- (c) translation / protein / polypeptide synthesis;
- (d) provide / produce energy or ATP (*reject create energy*);  
*(disqualify first mark if 'for respiration')*  
 high respiration (rate) (*accept lots*) for active uptake / transport  
*(accept description)*;  
 absorption of digested food / substances / products / correctly named product  
*(only accept monosaccharides, amino acids, dipeptides);*

2

2

1

3

[8]

**Q24.**

- (a) (i) microvilli; (*reject brush border*)
- (ii) increased surface area (for diffusion);

1

1

- (b) (i)  $\frac{16 \times (1000)}{0.1}$  principle of  $\frac{\text{measuring scale bar}}{\text{dividing by 0.1}}$  ;  
*(15–17 tolerance)*

160000;

*(correct answer award 2 marks)*

2

- (ii) electron microscope has a greater resolving power / objects closer

together can be distinguished;  
electron (beams) have a shorter wavelength;

2

- (c) short diffusion pathway / short pathway to the centre / large SA:V ratio for faster, more diffusion;

1

[7]

### Q25.

- (a) **A** – receptor /extrinsic (protein);  
*Accept glycoprotein/antigen*
- B** – transmembrane/intrinsic/channel/carrier (protein);  
*Accept hydrophobic tail*
- C** – phospholipid;  
*Ignore ref. to bilayer*

3

- (b) Cell wall;  
*Accept smaller/70S ribosome(s)*

Capsule/slime layer;  
*Accept DNA without histone*

(Bacterial) flagellum;  
*Reject capsid*

Circular DNA/chromosome;

Plasmid;

Mesosome;

2 max

[5]

### Q26.

- (a) (i) Ribosome(s);

1

- (ii) Plasma/cell (surface) membrane;  
*Accept membrane unless disqualify with, e.g. nuclear membrane*

1

- (b) **Two** suitable comparisons, accepting bacterial cell has;

Examples,  
Bacterial cell has capsule/slime layer;  
Cell wall;  
(Bacterial) flagellum;  
Mesosome;

Different size ribosomes;  
 Circular DNA;  
 Human cell has nucleus;  
 Membrane-bound organelles;  
 Two named examples of membrane-bound organelles;  
*Reject ref to thin and flat*

2 max

- (c) Carry genetic information/genes;  
*Reject/ignore to carry DNA to carry genetic code*  
*Accept genetic material with coded information – information for protein synthesis*  
*Ignore genetic material on its own*

1

[5]

**Q27.**

- (a) X = mitochondria;  
 Y = (rough) endoplasmic reticulum;  
*Accept ribosomes/ER/RER for Y*  
*Reject smooth endoplasmic reticulum for Y*

2

- (b) (i) (Sections cut at) different angles/in different planes;  
*Ignore name given to organelle*

1

- (ii) Z modifies/packages/transportes/secretetes mucus/ Z adds sugars to proteins;  
 X provides ATP/energy (for this);  
*Accept makes in relation to Z but not X*  
*Ignore names of organelles if function correct*

2

[5]

**Q28.**

- (a)

White blood cell		✓	✓
Bacteria cell	✓	✓	

2

- (b) 2.80 (µm);;  
*Answer in range 2.76–2.83 scores 2 marks*  
*If length incorrect but divided by 30 000, allow 1 mark*

2

- (c) (i) Circular DNA / smaller/70S ribosomes / no introns / no histones/proteins associated with DNA;  
*Ignore reference to plasmids*

1

- (ii) 1. Able to respire aerobically;  
 2. So make (more) ATP/ release (more) energy;



**Q29.**

(a)

Feature	Bacterium	Human immunodeficiency virus (HIV) particle
RNA	✓	✓
Cell wall	✓	
Enzyme molecules	✓	✓
Capsid		✓

1 mark for each correct vertical column

2

- (b) 1. (Complementary) nucleotides/bases pair  
**OR**  
A to T **and** C to G;  
*Ignore 'DNA polymerase forms base pairs/nucleotide pairs'*
2. DNA polymerase;
3. Nucleotides join together (to form new strand)/phosphodiester bonds form;  
*Ignore 'DNA polymerase forms base pairs/nucleotide pairs'*  
*If clearly writing rote answer about DNA replication **2 max***  
*e.g. helicase or separating strands*

3

- (c) 1. DNA double stranded/double helix **and** mRNA single-stranded;  
*Contrast requires both parts of the statement*
2. DNA (very) long **and** RNA short;  
*Accept 'RNA shorter' or 'DNA bigger/longer'*
3. Thymine/T in DNA **and** uracil/U in RNA;
4. Deoxyribose in DNA **and** ribose in RNA;  
*R Deoxyribonucleic/ ribonucleic acid*  
*Ignore ref. to histones*  
*Ignore ref. to helix and straight chain alone*
5. DNA has base pairing **and** mRNA doesn't/ DNA has hydrogen bonding and mRNA doesn't;
6. DNA has introns/non-coding sequences **and** mRNA doesn't;  
*Ignore ref to splicing*

3 max

[8]

**Q30.**

- (a) 1. From ADP and phosphate;

Accept  $P_i/PO_4^{3-}$  /  $\textcircled{P}$ 

Reject P/Phosphorus

Reject use of water in the reaction

2. By ATP synthase;

3. During respiration/photosynthesis; 2 max
- (b) 1. To provide energy for other reactions/named process;  
*Reject 'produce' energy*
2. To add phosphate to other substances **and** make them more reactive/change their shape; 2
- (c) (Can see) 3D image; 1
- (d) Crista/cristae;  
*Ignore matrix* 1
- (e) Value between 20,750 (83mm) and 21,250 (85mm) two marks;;  
 Formula given/used but calculation wrong, award 1 mark  

$$\text{Magnification} = \frac{\text{image size}}{\text{Object size}}$$
*(Large number divided by 4)* 2
- [8]**

### Q31.

- (a) 1. Cellulose is made up of  $\beta$ -glucose (monomers) **and** glycogen is made up of  $\alpha$ -glucose (monomers);  
 2. Cellulose molecule has straight chain **and** glycogen is branched;  
 3. Cellulose molecule has straight chain **and** glycogen is coiled;  
 4. glycogen has 1,4- and 1,6- glycosidic bonds **and** cellulose has only 1,4-glycosidic bonds;  
*Ignore ref. to H bonds / microfibrils* 2 max
- (b) Any **two** from:  
 1. Insoluble (in water), so doesn't affect water potential;  
 2. Branched / coiled / ( $\alpha$ -)helix, so makes molecule compact;  
**OR**  
 Branched / coiled / ( $\alpha$ -)helix so can fit many (molecules) in small area;  
 3. Polymer of ( $\alpha$ -)glucose so provides glucose for respiration;  
 4. Branched / more ends for fast breakdown / enzyme action;  
 5. Large (molecule), so can't cross the cell membrane  
*Require feature **and** explanation for 1 mark*  
 1. *Accept  $\Psi$  or WP*  
 1. *Accept Insoluble so doesn't affect osmosis*  
 1. *Do **not** allow ref to 'doesn't affect water leaving cells*  
 4. *Ignore 'surface area'*  
 4. *Accept 'branched so glucose readily released'* 2 max
- (c) Iodine/potassium iodide; 1
- (d) For correct answer of 40 ( $\mu\text{m}$ ) award 2 marks;  
 Evidence of division by 500: award 1 mark

Allow tolerance of 0.5mm i.e.  $20 \pm 0.5$ mm

2

- (e) 1. Scanning electron (microscope);  
2. 3D (image);  
*Accept SE(M)*  
2. *Ignore any other correct features*

2

[9]

### Q32.

- (a) 1. (Nerve impulse / depolarisation of membrane) causes  $Ca^{2+}$  channel (proteins) to open;  
2.  $Ca^{2+}$  enter by (facilitated) diffusion;  
3. Causes (synaptic) vesicles to fuse with (presynaptic) membrane;  
*Accept single reference to ions to cover 1 and 2*  
*Penalise once for no reference to ions*  
1. *Reject carrier proteins*  
3. *Reject ref to release of vesicles*  
3. *Ignore vesicles bind to membrane (but accept merge with)*

3

- (b) 1. Myosin head attaches to actin **and** bends / performs powerstroke;  
2. (This) pulls mitochondria past / along the actin;  
3. Other / next myosin head attaches to actin (and bends / performs powerstroke);  
1. *Accept change shape / change angle*  
2. *Ignore pulls actin along*  
2. *Ignore refs to cytoskeleton*  
*Accept plural or singular statements*

2 max

- (c) 1. (Mitochondria) supply (additional) ATP / energy;  
2. To move vesicles / for active transport of ions / for myosin to move past actin  
**OR**  
Re-synthesis / reabsorption of neurotransmitter / named neurotransmitter;  
1. *Reject produces energy*  
2. *Ignore ref. to ATP for opening calcium ion channels/making vesicles fuse with membrane*

2

[7]

### Q33.

- (a) 16 gains 2 marks;  
*(accept 15.5 . 16.5)*  
*(principal of calculation i.e.*  
*measured distance (31-33mm / 3.1-3.3cm) gains 1 mark)*  
*Mag*

2

- (b) relevant adaptation;  
and explanation for second mark; e.g.
- idea of many chloroplasts / lots of chlorophyll;  
to trap or absorb light (energy);*
- elongated cells;  
*idea of maximum light absorption / light penetration;*
- chloroplasts move;  
to trap or absorb light (energy);
- range of pigments;  
can absorb a range of wavelengths / colours / for max light absorption;
- large S.A. or cell wall feature e.g. thin / permeable;  
for (rapid) CO<sub>2</sub> absorption;

2

[4]

**Q34.**

- (a) 1. How to break open cells and remove debris;  
2. Solution is cold / isotonic / buffered;  
3. Second pellet is chloroplast.

3

- (b) 1. **A** stroma;  
2. **B** granum.

*Accept thylakoid*

2

- (c)  $\left( \frac{\text{length of chloroplast}}{\text{length of bar}} \right) \mu\text{m}$

1

- (d) **Two** of the following for **one** mark:  
Mitochondrion / ribosome / endoplasmic reticulum / lysosome / cell-surface  
membrane.

1 max

[7]

**Q35.**

- (a) Any two from:  
Loop of DNA; Non-cellulose cell wall;  
Plasmid; Capsule;  
Flagellum; Mesosome;

*Accept small ribosomes*

2

- (b) (i) (Granules) turn blue-black / dark blue / black / purple with iodine;

1

- (ii) Cellulose / pectin;

1

- (c) Use principle:

Feature of starch;  
Consequence in terms of storage;  
e.g.  
Insoluble;  
Therefore will not “wash” out of cell / affect water  
potential / affect osmosis;  
OR  
Molecule coiled / branched;  
Therefore large amount stored in small space / compact  
OR  
Does not affect water potential;  
So no effect on entry of water (into cell);

2

[6]