Biology

Higher level

Paper 1B

Markscheme

Question	Answers	Notes	Marks
1. a	- 8 histones with DNA wrapped around ✔. - **Linker DNA**: Connects nucleosomes; bound by H1 histone ✔.		2
1. b (i)	- **^{32}P (DNA) entered bacteria**, while ^{35}S (protein) did not ✔. - Only DNA could transmit genetic information to progeny phages ✔.		2
1. b (ii)	- Radioisotopes allowed **precise tracking** of molecules ✔. **OR** - Enabled **definitive falsification** of protein as genetic material ✔.		1
1. c	- Tetranucleotide hypothesis predicted uniform base ratios ✔. - Chargaff's data showed variable ratios, disproving repetition ✔.	Award 1 for hypothesis, 1 for falsification.	2

Question	Answers	Notes	Marks
2 a(i)	- **Reduces fluidity** by restraining phospholipid movement **OR** - **Prevents excessive melting** of the membrane at high temperatures	Accept either explanation	1
2 a(ii)	- **Prevents solidification** by spacing phospholipids **OR** - **Maintains flexibility** at low temperatures	Accept either explanation	1
2 b	- **Prediction**: Membrane becomes too fluid (high temps) **OR** too rigid (low temps) ✔ - **Justification**: Lacks cholesterol's buffering effect on fluidity ✔	Award 1 for prediction, 1 for justification	2
2 c	- **Phospholipids**: Form basic bilayer structure **AND** create semi-permeability ✔ - **Cholesterol**: Modulates fluidity WITHOUT contributing to structural framework ✔		2
2 d	**- Phospholipid bilayer** with hydrophilic heads and hydrophobic tails ✔ - **Proteins**: Integral (spanning) AND peripheral (surface) ✔ - **Other components**: Cholesterol (modulates fluidity) AND carbohydrates (cell recognition) ✔		3

Question	Answers	Notes	Marks
3a (i)	- **Label**: Microvilli ✔.		1
3a (ii)	- Increases absorption of nutrients/ions in PCT ✔.		1
3a (iii)	- Small intestine		1
3b	- **Erythrocytes**: Flattened biconcave shape (no nucleus) ✔. - **Type I pneumocytes**: Extremely thin (squamous) ✔. - **Shared trait**: Both reduce diffusion distance ✔.		3
3c	- **Prediction**: Impaired nutrient/waste exchange OR cell death ✔. - **Justification**: Low SA:V limits diffusion efficiency ✔.		2

Question	Answers	Notes	Marks
4 a(i)	- I-band shortens **OR** becomes narrower ✔.	Do not accept "disappears."	1
4 a(ii)	- A-band corresponds to myosin filament length ✔. - Myosin filaments do not shorten during contraction ✔.		2
4 a(iii)	1. ATP binds to myosin head, causing detachment from actin ✔. 2. ATP hydrolysis provides energy for myosin head reset (cocked position) ✔. 3. ATP regeneration (ADP+Pi → ATP) enables next cross-bridge cycle ✔. **OR** - "ATP breaks actin-myosin bonds AND powers reorientation"	Award 1 mark per distinct ATP role.	3
4 b(i)	- Acts as molecular spring (elastic recoil) ✔. - Pulls Z-discs back to resting position after stretch ✔. **OR** - "Stores potential energy during the stretch, releases it for recoil"		2
4 b(ii)	**-** Increased muscle stiffness ✔ **OR** **-** Higher risk of strains/tears ✔ **OR** **-** Reduced flexibility ✔.		1
4 b(iii)	- Titin anchors myosin to Z-disc, resisting overstretch ✔. - Limits sarcomere elongation when antagonistic muscles contract ✔. **OR** - "Acts as a brake by storing elastic energy during stretching"		2