Question Number	Answer	Additional Guidance	Mark
1(a)(i)	**D** – passive transport		**(1)**

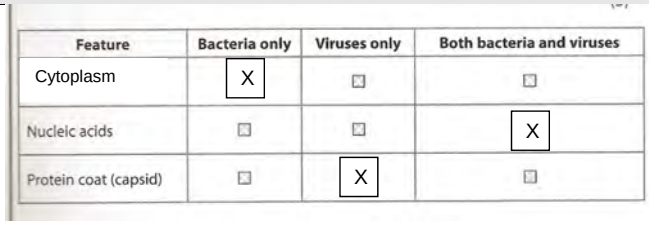
Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	**C** - ions move down a concentration gradient		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	**B** - involves the production of a vacuole or vesicle		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	1. idea that the rate of uptake {is constant for first 5 minutes / reduces after 5 minutes} ; 2. idea that { concentration of W reaches a maximum / no more uptake / stays at 0.6 mol dm^{-3} } from 10 minutes ; 3. suitable manipulation of figures e.g. rate of uptake in first 5 minutes is 0.1 $moldm^{-3}$ per minute ;	**1. ACC T** idea of linear increase in first 5 minutes	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	1. uptake {slows down / is less / stops} / eq ; 2. because of smaller {concentration / diffusion } gradient / eq ; 3. credit argument for why it is not another process e.g. not osmosis as the solute concentration rises from 0, not active transport as it will continue to rise and not reach a maximum ;	**2 ACCEPT** converse	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(c)	1. idea that water has moved into the cell ; 2. by osmosis ; 3. idea of a solute concentration gradient ; 4. cell membrane ruptures / eq ;	**3. ACC T** water {potential / concentration} gradient	**(3)**

Question Number	Answer	Mark
2(a)		(3)

Feature	Bacteria only	Viruses only	Both bacteria and viruses
Cytoplasm	X	☐	☐
Nucleic acids	☐	☐	X
Protein coat (capsid)	☐	X	☐

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	1. idea of little difference between the groups (at each incubation time) ; 2. idea of {large / eq} error bars ; 3. idea of {overlapping / eq} error bars ;	2 and 3 **ACCEPT** range bars	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	1. idea that membrane {receptors / proteins / glycosidic groups / eq} interacts with bacteria ; 2. idea of {pseudopodia formed around / macrophage surrounds} the bacteria ; 3. idea that membranes (of pseudopodia) {fuse / pinch off / eq} ; 4. to form a vacuole (that contains the bacteria) / eq ; 5. idea that {change in shape / fusion /movement / eq} of membrane is due to fluidity of membrane ; 6. caused by the {movement of phospholipids / presence of cholesterol / eq } ;	**1 ACCEPT** antibodies bind to both bacteria and macrophage / opsonisation **2 IGNORE** engulf **4 ACCEPT** vesicle, phagosome	(4)

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	1. bacteriostatic antibiotics stop the bacteria from dividing / eq ; 2. bactericidal antibiotics {kill / eq} the bacteria ;	**IGNORE** description of mechanism **1 ACCEPT** growing, replicating	(2)

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	1. idea that viruses are non-living ;	**ACCEPT** viruses do not have the target sites for antibiotics	(1)

Question Number	Answer	Additional Guidance	Mark
3 (a)	1. increasing ethanol concentration increases the intensity (of colour of the solution) / eq ; 2. idea that increase in intensity is non-linear e.g. greatest increase between 30 and 70% ethanol / less increase above 70% / less increase below 30% ethanol ; 3. intensity of colour higher in test 2 than test 1 (at all ethanol concentrations) / eq ; 4. credit correct manipulation of figures e.g. 0.1 increase from 0 to 30% in test 1 ;	1. ACCEPT positive correlation IGNORE descriptions of sequences of changes 2. ACCEPT greatest increase between 50 and 70, no increase above 70 in test 2 ACCEPT comments on gradient e.g. steeper IGNORE rapid / faster / slower 4. ACCEPT subtraction from identified test IGNORE quoted figures, unidentified test	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(b)	1. idea that ethanol causes the membrane to be {disrupted / eq} ; 2. idea that this is due (phospho)lipids dissolve in ethanol ; 3. idea that (membrane) proteins denatured by ethanol ; 4. comment on the disruption of the vacuole membrane / eq ; 5. idea that {betalain / pigment} can escape from the {cell / vacuole /eq } when the membrane is disrupted ;	1. IGNORE more permeable, more fluid ACCEPT gaps in the membrane 3. ACCEPT protein changes shape NB this also gains Mp1 5. ACCEPT dye	**(4)**

Question Number	Answer	Additional Guidance	Mark
3 (c)	1. beetroot cells may have been damaged when cutting / eq ; 2. idea that beetroot pieces not rinsed before being placed in ethanol solution ; 3. idea that colorimeter was not {calibrated / zeroed / eq} (properly) ; 4. idea that test 2 is done some time after test 1 OR beetroot left in solution longer than 20 minutes in test 2 ; 5. idea that different parts of the beetroot may have different pigment concentrations ; 6. smaller volume of ethanol used in test 2 ;	2. ACCEPT blotted IGNORE dried 5. IGNORE different beetroot	**(2)**

Question Number	Answer	Additional Guidance	Mark
4 (a)	1. (oxygen) is a {small / non polar} (molecule) ; 2. (oxygen) is able to diffuse (through phospholipid bilayers) ; 3. cell surface membrane has a phospholipid bilayer ;	1. NOT if large or polar ACCEPT uncharged	**(2)**

Question Number	Answer	Additional Guidance	Mark
4 (b)	1. chloride ions are charged ; 2. idea that (chloride ions) are NOT able to diffuse through {a phospholipid bilayer / artificial membrane} ; 3. idea that (chloride ions) need a {carrier / channel / transport / eq } protein (to move across a membrane) ; 4. reference to {active transport / facilitated diffusion} ; 5. reference to CFTR channel protein (present in epithelial cells) ;	IGNORE chlorine 1. IGNORE chloride ions are big / polar 3. ACCEPT transmembrane	**(3)**

Question Number	Answer	Additional Guidance	Mark
4 (c)	1. the cell membrane is more permeable to water (than the artificial membrane) ; 2. idea that water can move across the phospholipid bilayer ; 3. idea that water can also move through channel proteins ;	IGNORE references to rates or concentration gradients 1. NOT artificial membrane is impermeable to water 3. ACCEPT transmembrane proteins, aquaporins	**(2)**

Question Number	Answer	Additional guidance	Mark
5(a)	1. phospholipid bilayer – correct orientation ; 2. glycosidic protein – in outer layer only ; 3. intrinsic protein – spanning both layers ;	IGNORE labels 1. NOT if gap between layers bigger than one phospholipid 2. NOT if floating above layer 3 ACCEPT in one layer only	**(3)**

Question Number	Answer	Additional guidance	Mark
5(b)			**(3)**

Description	Process		
	Simple diffusion	Facilitated diffusion	Active Transport
ATP required	×	×	✓
Membrane protein molecules involved	×	✓	✓
Direction of transport is always down a concentration gradient	✓;	✓;	×;

Question Number	Answer	Additional guidance	Mark
5(c)	1. idea that the rate increases when the concentration increases / eq ; 2. this increases the concentration gradient / eq ; 3. idea that {plateau / levelling off} of curve due to channel proteins being saturated with molecules (of the substance) / eq ; 4. idea that no more can be carried (per unit time) / max rate of entry reached /eq ;		**(2)**