**Membrane Structure and Function Question Pack 2015 Mark Scheme**

**M1.**          (a)     *two of the following:*form(water) impermeable barrier to water-soluble substances / selectively  
permeable / allows non-polar molecules to pass through;  
allows cell to maintain different concentrations either side;  
makes membranes self-sealing/able to fuse with other  
membranes/able to form  
vesicles / gives flexibility/fluidity;

**2 max**

(b)     (surface/extrinsic protein) for cell recognition / binding to  
hormones/identification

**1**

(c)     (i)      involves carrier/transmembrane/transport proteins;  
*(reject channel proteins)*

**1**

(ii)     requires energy/requires use of ATP / moves  
substances/ions/molecules against a concentration gradient;

**1**

(iii)     the curve levels off above a certain external concentration of  
substance; as channel proteins are saturated with molecules  
(and no more can be carried);

**2**

**[7]**

**M2.**          (a)     feature and adaption; for example

1       phospholipid bilayer (as a barrier);

2       forms a barrier to water soluble / charged substances /   
allows non-polar substances to pass

OR

maintains a different environment on each side / compartmentalisation;

3       bilayer is fluid;

4       can bend to take up different shapes for phagocytosis /   
form vesicles / self repair;

5       channel proteins (through the bilayer)/intrinsic protein;

6       let water soluble/charged substances through / facilitated diffusion;

7       carrier proteins (through the bilayer);

8       allow facilitated diffusion / active transport;

9       surface proteins / extrinsic proteins, glycoproteins / glycolipids;

10     cell recognition / act as antigens / receptors;

11     cholesterol;

12     regulates fluidity / increases stability;

**6 max**

principle mark (only for 5, 6, 7, 8)

proteins transport material across the membrane

3 features max

**[6]**

**M3.**   (a)     B; D;

**2**

(b)     idea of molecules/named molecules moving = Fluid;  
idea of both proteins and phospholipids = Mosaic;

**2**

(c)     slow rise, sharp rise, levelling off (*reject ‘becomes constant’*);  
diffusion rate increases / description of diffusion rate,  
e.g. increase in kinetic energy increases loss of ions;

**1**

sharp rise / above 50oC proteins are denatured;  
levelling off due to concentration of chloride ions in water becoming  
equal / maximum loss of Cl- ions;

**2 max**

**[7]**

**M4.**   (a)     (i)      **A** = phospholipid

**B** = protein;

*(both correct)*

**1**

(ii)     allows movement of lipid soluble/non-polar molecules/named  
e.g. water/gases;  
prevents movement of water soluble/polar molecules/named  
e.g. ions / amino acids;  
idea of selection / membrane partially/differentially permeable/  
large molecules do not move through, small molecules do;

*(accept semi-permeable)*

**2 max**

(b)     (i)      diffusion

*(reject facilitated)*

**1**

(ii)     higher rate of exchange/diffusion;  
prevents cooling of the blood / prevents increase in viscosity;

**2**

(iii)     concentration gradient maintained / equilibrium never achieved;  
blood always meets fluid with lower concentration of urea;  
diffusion/exchange along the whole length of surface;

**2 max**

(iv)    0.2 × 60 = 12 dm3 h-1;

*(principle: volume per hour)*

12 × 5 = 60 dm3;

*(correct answer 2 marks)*

**2**

**[10]**

**M5.**   (a)     (i)      microvilli; (*reject brush border*)

**1**

(ii)     increased surface area (for diffusion);

**1**

**[2]**

**M6.**   (a)     (i)      Active transport;  
Low to high concentration / against concentration gradient;  
*Reject answers relating only to high concentration in cell*

**2**

(ii)     Rate of movement / diffusion proportional to concentration gradient/  
difference in concentration;  
High concentration of potassium ions inside cell compared to outside;  
*Must mention high concentration. Ignore reference to other factors if  
reasoning is appropriate.*

**2**

(b)     (i)      O  
 ||  
 C – N  
         |  
        H; **1**

(ii)     10; **1**

(c)     Action of vanilomycin depends on fluidity of membrane;  
Fluidity reduced / not fluid at low temperatures;  
Pore formed by gramicidin A remains in place / permanent;

**3**

(d)     Pore between sterol molecules lined with polyene antibiotic;  
Hydrophobic region next to sterol;

**2**

**[11]**

**M7.**   (a)     phospholipids in a double layer / area covered is twice total surface  
area of red blood cells;   
evidence of calculation of number × surface area (4.74 × 109 × 99.4 μm2 )/

calculation of area of 1 cell



0.471 m2 ≈ 0.5 × 0.92 m2 / 194 μm ≈ 2 × 99.4;

**3**

(b)     EITHER feature + explanation  
red blood cells do not contain organelles / nucleus;   
so only surface membrane / no internal membranes in macerate;  
OR  
red blood cells have simple / regular / spherical shape;  
so easy to calculate surface area;  
OR  
*any two features, e.g.*simple / regular shape;  
all same size;

**2**

**[5]**