M1.(a) 1. (Overall) outward pressure of 3.2 kPa;
2. Forces small molecules out of capillary.

2

(b) Loss of water / loss of fluid / friction (against capillary lining).

1

(c) 1. High blood pressure = high hydrostatic pressure;
2. Increases outward pressure from (arterial) end of capillary / reduces inward pressure at (venule) end of capillary;
3. (So) more tissue fluid formed / less tissue fluid is reabsorbed.

Allow lymph system not able to drain tissues fast enough

3

(d) 1. Water has left the capillary;
2. Proteins (in blood) too large to leave capillary;
3. Increasing / giving higher concentration of blood proteins (and thus wp).

3

[9]

M2.(a) 1. Contraction of internal intercostal muscles;
2. Relaxation of diaphragm muscles / of external intercostal muscles;
3. Causes decrease in volume of chest / thoracic cavity;
4. Air pushed down pressure gradient.

4

(b) 19(%);

1

(c) 1. Muscle walls of bronchi / bronchioles contract;
2. Walls of bronchi / bronchioles secrete more mucus;
3. Diameter of airways reduced;
4. (Therefore) flow of air reduced.

4

[9]

M3.(a) 1. Water potential becomes lower / becomes more negative (as sugar enters phloem);
2. Water enters phloem by osmosis;
3. Increased volume (of water) causes increased pressure.

3

(b) 1. Rate of photosynthesis related to rate of sucrose production;
2. Rate of translocation higher when sucrose concentration is higher.

2

(c) 1. Rate of translocation does not fall to zero / translocation still occurs after 120 minutes;
2. But sucrose no longer able to enter cytoplasm of phloem cells.

2

[7]

M4.(a) 1. Trachea and bronchi and bronchioles;
2. Down pressure gradient;
3. Down diffusion gradient;
4. Across alveolar epithelium.

Capillary wall neutral

5. Across capillary endothelium / epithelium.

4 max

(b) (About) 80.0%.

1

(c) 1. (Group **B** because) breathe out as quickly as healthy / have similar FEV to group **A**;
2. So bronchioles not affected;
3. FVC reduced / total volume breathed out reduced.

*Allow this marking point for group **C***

3

[8]

M5.(a) 1. Lower affinity for oxygen / releases more oxygen / oxygen is released quicker / oxygen dissociates / unloads more readily;

Q Neutral: the organism / body has a lower affinity for oxygen / releases more oxygen

2. (To) muscles / tissues / cells

3. (For) high / rapid respiration;

*Q Reject: '**produces** more energy' on its own*

Neutral: reference to partial pressure

Accept: (for) respiration to produce more energy in the form of ATP / release more energy

3

(b) (i) 1. Small SA:VOL;

Neutral: small limbs / small ears / extremities

Neutral: small SA

Accept: large VOL:SA

Neutral: reference to fat / blubber / insulation

2. (So) reduces heat loss / (more) heat retained;

Note: MP2 is independent of MP1

2

(ii) 1. Brain is the same, others fall;

Note: 1. might not be given in the same sentence

Assume that 'other organs fall' = all three organ categories fall

Accept: 'blood flow is reduced to all organs except for the brain'

2. Brain controls other organs / remains active / needs constant supply of oxygen;

Accept: 'seal would die' = brain remains active

3. Lungs not used / are used less / seal is not breathing / heart rate decreases / heart pumps less / blood diverted to muscles;

Reject: seal is not respiring

3

[8]