

Question 17 (Answer: **A**)

- Inspiration needs the chest volume to increase.
- The diaphragm contracts and flattens downwards.
- The external intercostal muscles contract to pull the ribs up and out; the internal ones are used in forced expiration.

Question 16 (Answer: **A**)

- Breathing in needs the chest cavity to get bigger.
- The diaphragm contracts and flattens downwards.
- The external intercostal muscles contract to lift the ribs up and out.

Question 18 (Answer: **D**)

- Expiration needs the chest cavity to get smaller.
- The external intercostal muscles relax, so the ribs fall.
- The diaphragm relaxes and moves back *up* into its domed shape.

Question 18 (Answer: **A**)

- Lung volume increases during inspiration and decreases during expiration.
- Inspiration needs the diaphragm to contract and flatten, and the external intercostals to contract.
- So read whether the volume is rising or falling at the marked point and match the muscle actions.

Question 6 (Answer: **A**)

- Diffusion is fastest with a large surface area, a steep concentration gradient and a short path.
- All three factors work in the same direction here.
- So the fastest case is high area, high gradient and short distance.

Question 20 (Answer: **B**)

- Total air per minute = breathing rate $\times$ volume of each breath.
- So read both columns and multiply them for each time.
- The rise during exercise supplies the extra oxygen the muscles need for aerobic respiration.

Question 18 (Answer: **C**)

- Moving away from the larynx, the airways branch and each branch is narrower.
- So the trachea has the widest lumen and a bronchiole the narrowest.
- Read the two plotted points: the one further from the larynx must have the smaller diameter.

1(a)(i)	A trachea ; B bronchus / bronchi ; C bronchiole(s) ;
1(a)(ii)	to keep the airway open / prevents collapse (of airway) ;
1(a)(iii)	<i>any four from:</i> 1 diaphragm, contracts / flattens / lowers ; 2 external intercostal muscles contract (and internal intercostal muscles relax) ; 3 ribs / ribcage, lifted / AW, up / out / forwards ; 4 increase the volume, in the thorax / lungs / chest ; 5 decreasing the pressure, in the thorax / lungs / chest ; 6 air is drawn in to equalise the pressure (between atmosphere and lungs) ;
1(b)(i)	1 <i>any two named cells from:</i> • goblet (cells) • ciliated (cells) • lymphocytes • phagocytes <i>plus any two from:</i> 2 goblet cells, secrete / produce, mucus to trap, particles / pathogens / AW ; 3 cilia on ciliated cell, move / AW, mucus, up / out / away / AW ; 4 lymphocyte produces antibodies ; 5 phagocyte carry out phagocytosis OR engulf, pathogens / particles / AW ;

1(b)(ii)	<i>any four from:</i> 1 blockage / narrowing of, airways / lumen / AW ; 2 reduced, diffusion / surface area (for gas exchange) ; 3 <i>ref. to</i> less / slower, (delivery of) oxygen / (removal of) carbon dioxide / gas exchange ; 4 into, blood / muscle ; 5 less (aerobic) respiration / (more) anaerobic respiration ; ora 6 less energy (released) / ATP (produced) ; ora 7 for muscle contraction ;
1(c)	1 <i>correct parental genotypes:</i> Ff <u>and</u> Ff ; 2 <i>correct gametes:</i> F, f <u>and</u> F, f ; 3 <i>correct offspring genotypes:</i> FF, Ff, (Ff), ff ; 4 <i>correct offspring phenotypes:</i> no cystic fibrosis <u>and</u> no cystic fibrosis (no cystic fibrosis) <u>and</u> cystic fibrosis ; 5 <i>probability:</i> 0.25 / 25(%) / 1 out of 4 / 1:3 ;