1 Fig. 3.1 shows the human respiratory system.

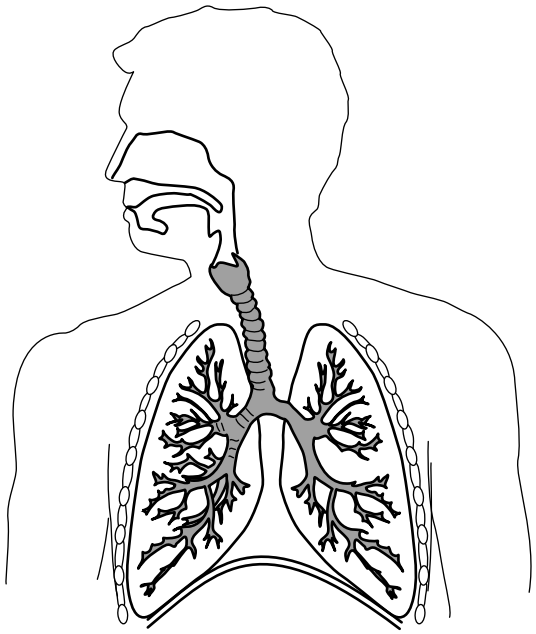


Fig. 3.1

(a) On Fig. 3.1 use label lines to identify:

a bronchiole;

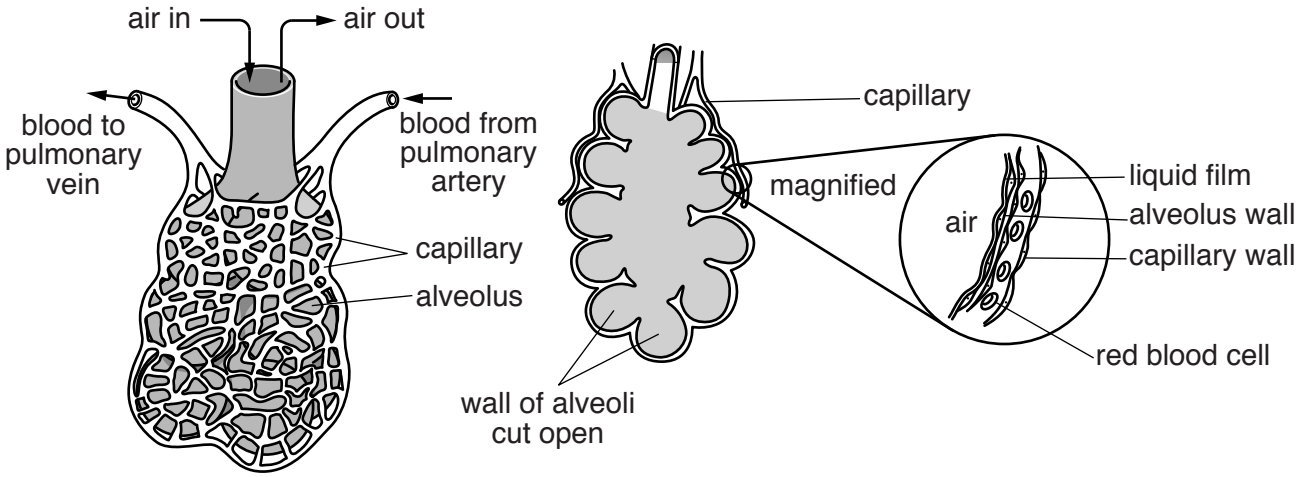
the larynx;

the trachea.

[3]

(b) Fig. 3.2 shows:

a group of alveoli and the capillaries surrounding them in a human lung;
a section through this group of alveoli with most of the capillaries removed;
a magnified section of part of the wall of an alveolus and its capillary.



group of alveoli and capillaries surrounding them

section through alveoli with most of the capillaries removed

magnified section of the wall of an alveolus and its capillary

Fig. 3.2

0610/21/M/J/15

Use Fig. 3.2 to describe **three** features of gas exchange surfaces in animals.

feature 1 .....

.....

feature 2 .....

.....

feature 3 .....

.....

[3]

MARK SCHEME:

(a)	bronchiole ; larynx ; trachea ;	[3]	one mark for each labelled line in the correct position.
(b)	large surface area (per volume) ; thin / small diffusion distance ; moist / wet / liquid film ; (alveolar) wall permeable ; well ventilated / diffusion gradient maintained ; well supplied with capillaries / diffusion gradient maintained ;	max [3]	**A** answers in context applying to animals other than mammals.

2 Fig. 6.1 shows a diagram of the gas exchange system.

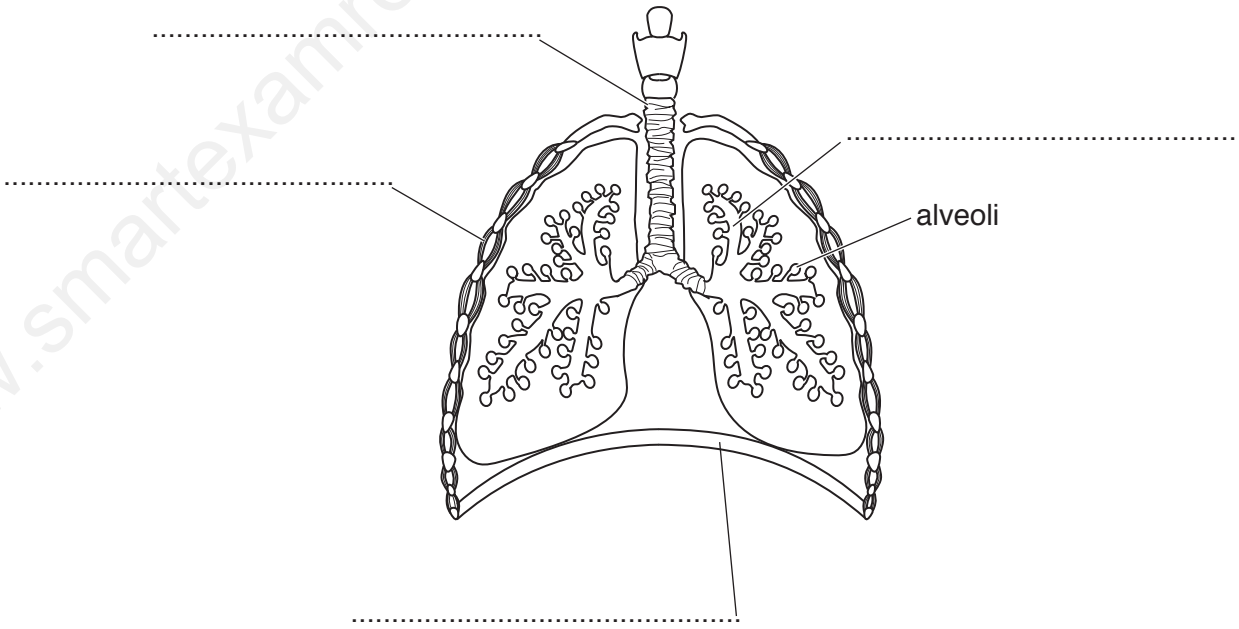


Fig. 6.1

(a) Complete the labelling of Fig. 6.1 using the words from the list.

bronchiole **diaphragm** **intercostal muscle** **trachea**

[4]

(b) Alveoli are gas exchange surfaces.

State **two** features that make alveoli good gas exchange surfaces.

1 .....

2 .....

[2]

(c) There is less oxygen in expired air than in inspired air.

(i) Describe **two other** ways in which expired air is different from inspired air.

1 .....

2 .....

[2]

(ii) State the name of a process that uses oxygen in the body.

.....[1]

(d) State an example of a cell and an organ from the gas exchange system.

cell .....

organ .....
[2]

[Total: 11]

MARK SCHEME:

(a)	bronchiole, diaphragm, intercostal (muscle), trachea labelled ;;;;	4	1 mark for each correct label
(b)	good blood supply ; thin ; ventilated ; large surface (area) ; AVP ; e.g. moist / permeable	2	
c(i)	more water vapour ; more carbon dioxide ; higher temperature ;	2	**A** saturated **A** warmer
c(ii)	(aerobic) respiration ;	1	**A** removal of lactic acid / oxidation **R** anaerobic respiration
(d)	*cell* red blood cell / ciliated cell / muscle cell / white blood cell ; **A** guard cell *organ* lung / trachea / bronchus / bronchiole / larynx ; **A** leaf	2	1 mark for example of a cell / goblet cell 1 mark for example of an organ

3 (Describe the difference between *respiration* and *breathing*.

.....

.....

..... [2]

[Total: 6]

MARK SCHEME:

respiration is release of energy (from sugar);
A – correct equation with ref. to energy
R – produce/make energy

breathing is moving air/gases in and out of lungs/body/OWTTE;
I – ref. to specific gases [2]

4 The terms eating and breathing are often wrongly stated as characteristics of living organisms.

Breathing is often confused with respiration.

Define the term *respiration*.

.....

.....

.....

..... [2]

MARK SCHEME

	1 the release energy; 2 by the breakdown / oxidation of glucose / sugar;	[2]	A – reaction of oxygen with glucose / sugar

6 **(a)** Fig. 5.1 shows the human breathing system.

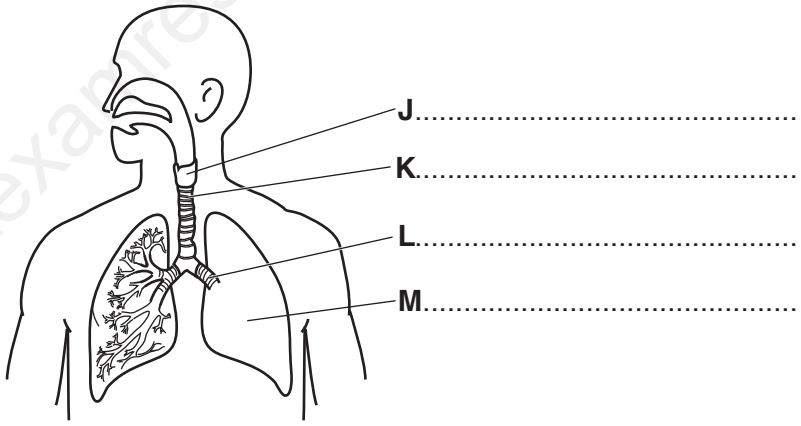


Fig. 5.1

Name the structures labelled **J**, **K**, **L** and **M**.

Write your answers on Fig. 5.1. [4]

(b) Fig. 5.2 shows four sections through groups of alveoli and their blood capillaries.

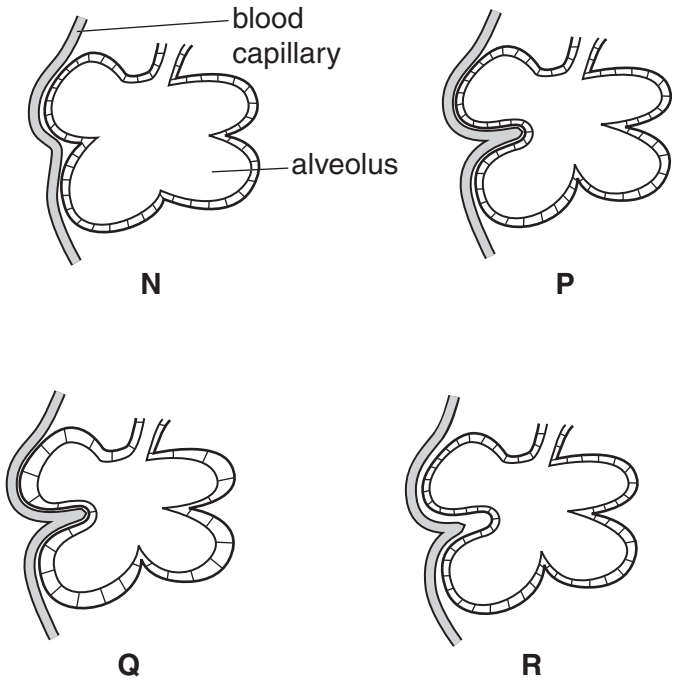


Fig. 5.2

State which diagram, **N**, **P**, **Q** or **R**, shows the most efficient gas exchange surface.

Give **one** reason for your answer.

most efficient gas exchange surface .....

reason .....

.....

[2]

(c) (i) State the word equation for aerobic respiration in cells.

..... + ... → ..... + ...

[2]

(ii) Respiration releases energy.

Outline **three** uses of this energy in the human body.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

[Total: 11]

MARK SCHEME:

(a)	*J* – larynx; *K* – trachea; *L* – bronchus; *M* – lung;	**4**	
(b)	**P**; *idea of:* large(r) surface area (than N) / alveolar wall is thin(ner) / small diffusion distance / blood vessel closer to alveolar wall (than R or N) / more rapid diffusion of gases / thin(ner) or smaller cells than Q;	**1** **1**	
(c)	oxygen ***and*** glucose (on LHS); water ***and*** carbon dioxide (on RHS);	**2**	

1 Fig. 8.3 shows an alveolus and an associated blood capillary.

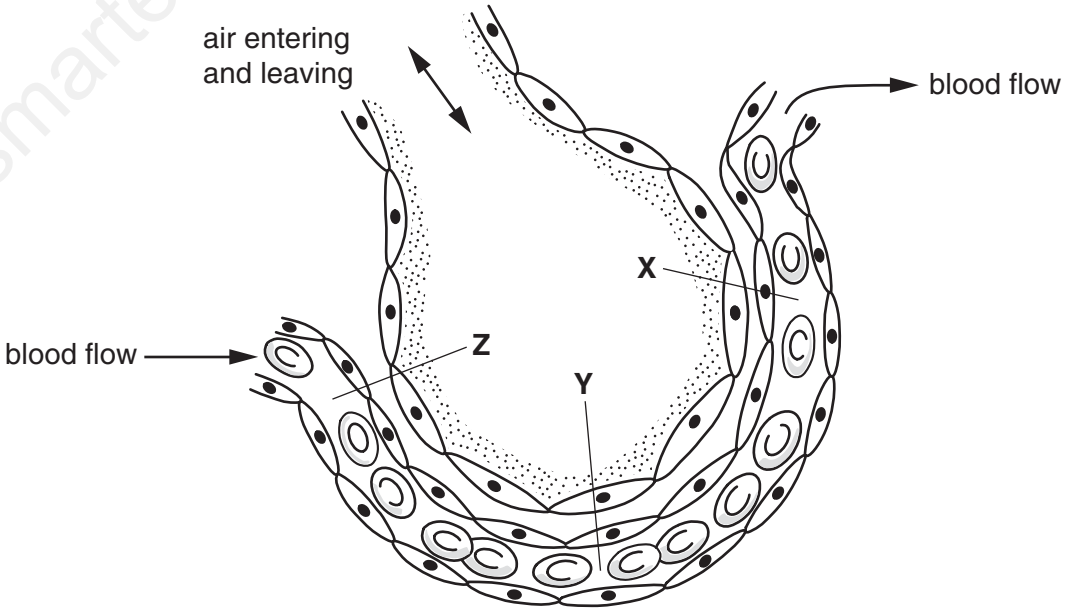


Fig. 8.3

(i) Suggest at which point, **X**, **Y** or **Z**, the rate of diffusion of carbon dioxide will be highest.

.....

.....[1]

(ii) The bronchi and bronchioles are lined with ciliated epithelium tissue and a thin layer of mucus. Describe the role of the cilia and mucus.

.....

.....

.....[2]

MARK SCHEME:

(i) (point) **Z;** **[1]**

(ii) mucus traps bacteria/dust;

cilia push mucus towards trachea/throat/away from lungs; **[2]**

2 Fig. 9.1 shows an alveolus in which gaseous exchange takes place.

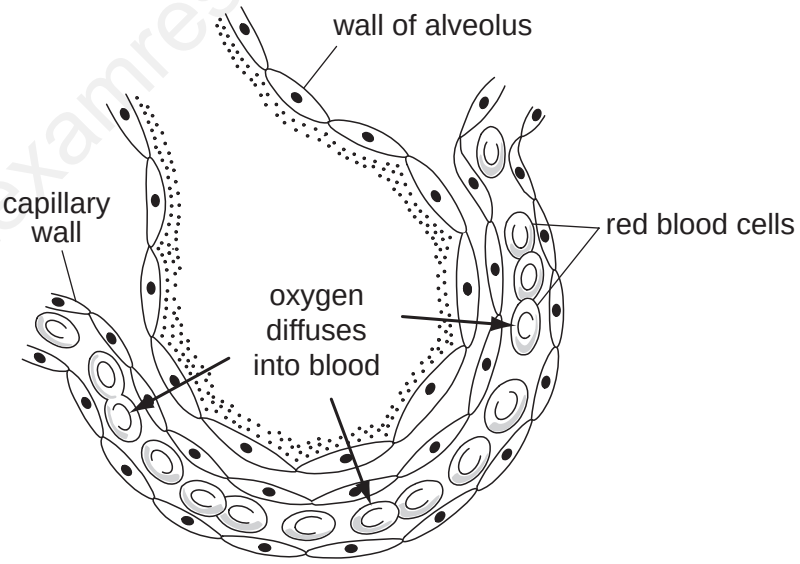


Fig. 9.1

(a) (i) Define the term *diffusion*.

.....

.....

..... [2]

(ii) State what causes oxygen to diffuse into the blood from the alveoli.

.....

..... [1]

(iii) List three features of gaseous exchange surfaces in animals, such as humans.

1 .....

.....

2 .....

.....

3 .....

..... [3]

(b) (i) At high altitudes there is less oxygen in the air than at sea level.
Suggest how this might affect the uptake of oxygen in the alveoli.

.....

.....

..... [2]

(ii) In the past some athletes have cheated by injecting themselves with extra red blood cells before a major competition.
Predict how this increase in red blood cells might affect their performance.

.....

.....

..... [2]

[Total: 10]

MARK SCHEME:

(a) (i) the movement of molecules / particles / ions;

from a higher to a lower concentration/ down concentration gradient; **[2]**

(ii) because there is a lower concentration in the blood than in the air /

in the alveolus / ORA; **[1]**

(iii) large surface area;

thin surface / wall / wall one cell thick; R - cell walls

moist surface;

rich blood supply;

Any three – 1 mark each **[3]**

(b) (i) concentration difference / gradient between air and blood smaller / less steep;

less / slower diffusion / diffusion rate lower;

less oxygen absorbed;

Any two – 1 mark each **[2]**

(ii) (more red blood cells means) more oxygen carried;

allows greater rate of respiration (in muscles / tissues); R – ref to breathing

leads to greater energy release;

could allow better performance / OWTTE;

Any two – 1 mark each **[2]**

Total: [10]

3 Fig. 2.1 shows a section through the human chest (thorax).

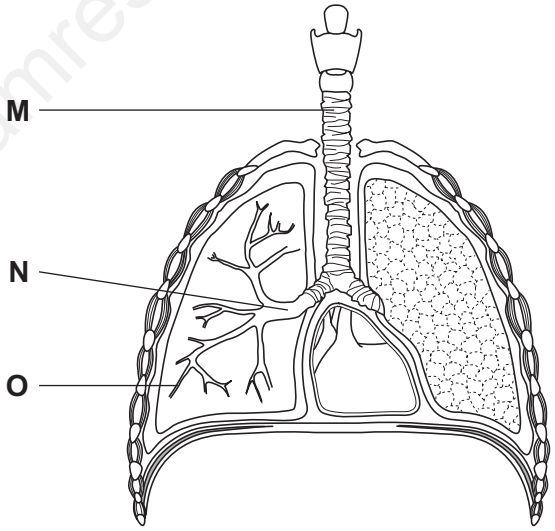


Fig. 2.1

(a) Name the structures labelled **M**, **N** and **O**.

M .....

N .....

O ..... [3]

(b) The breathing rates of some students were measured before they started running.

Describe how you could measure the breathing rates.

.....

.....

.....

..... [2]

MARK SCHEME:

(a)	**M** – trachea; **N** – bronchus; **O** – bronchioles;	[3]	A – cartilage, windpipe A – bronchi, I – ref to position left/right A – alveolus / alveoli
(b)	observe rise and fall of chest / OWTTE; count number of inhalations in known period of time;	[2]	A – ref to breathing monitors A – 15 s to 5 mins

4 Inspired air has a different composition to expired air.

Complete Table 2.1 to show how inspired air is different from expired air.

Table 2.1

substance	how inspired air is different from expired air
carbon dioxide	
dust particles	
oxygen	
water vapour	

[4]

[Total: 4]

substance	how inspired air is different from expired air
carbon dioxide	less in inspired air;
dust particles	more in inspired air;
oxygen	more in inspired air;
water vapour	less in inspired air;

[4]

A – ORA if specify reverse comparison
No credit for absolutes for oxygen, carbon dioxide, water vapour

[Total: 4]