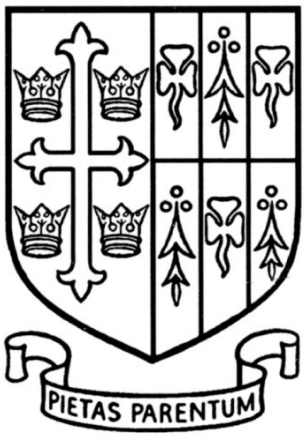
ST EDWARD'S OXFORD



14+ Entrance Assessment
2014

Science
1 hour

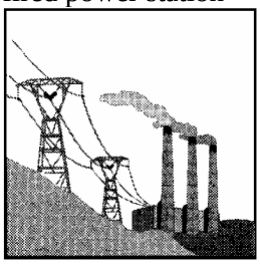
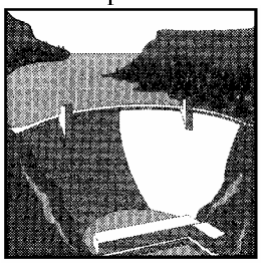
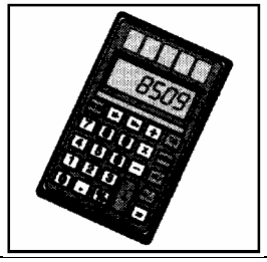
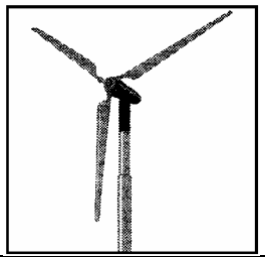
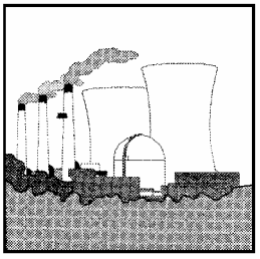
Candidate Name: …….

PHYSICS

1. Electricity may be produced from a number of different energy resources.

(a) (i) Complete the table below.

The first one has been done for you.

Device	**Energy resource**	**Useful energy transfer from resource**
Coal-fired power station 	Coal	Chemical ⟶ electrical
Hydroelectric power station 	Stored water	..... ⟶ electrical
Solar cell in calculator 	Sun	..... ⟶ electrical
Wind turbine 	Wind	..... ⟶ electrical
Gas-fired power station 	Gas	..... ⟶ electrical

(4)

(ii) Give **one** of the five energy resources opposite, which is **not** classified as renewable.

.....
.

(1)

(iii) State another non-renewable energy resource.

.....
.

(1)

(b) A 100 W light bulb gives out light at the rate of 10 J/s.

1 watt (W) = 1 joule per second (J/s)

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

(i) What is the efficiency of the light bulb?

.....
.

(1)

(ii) What has happened to the remainder of the energy supplied to the light bulb?

.....
.

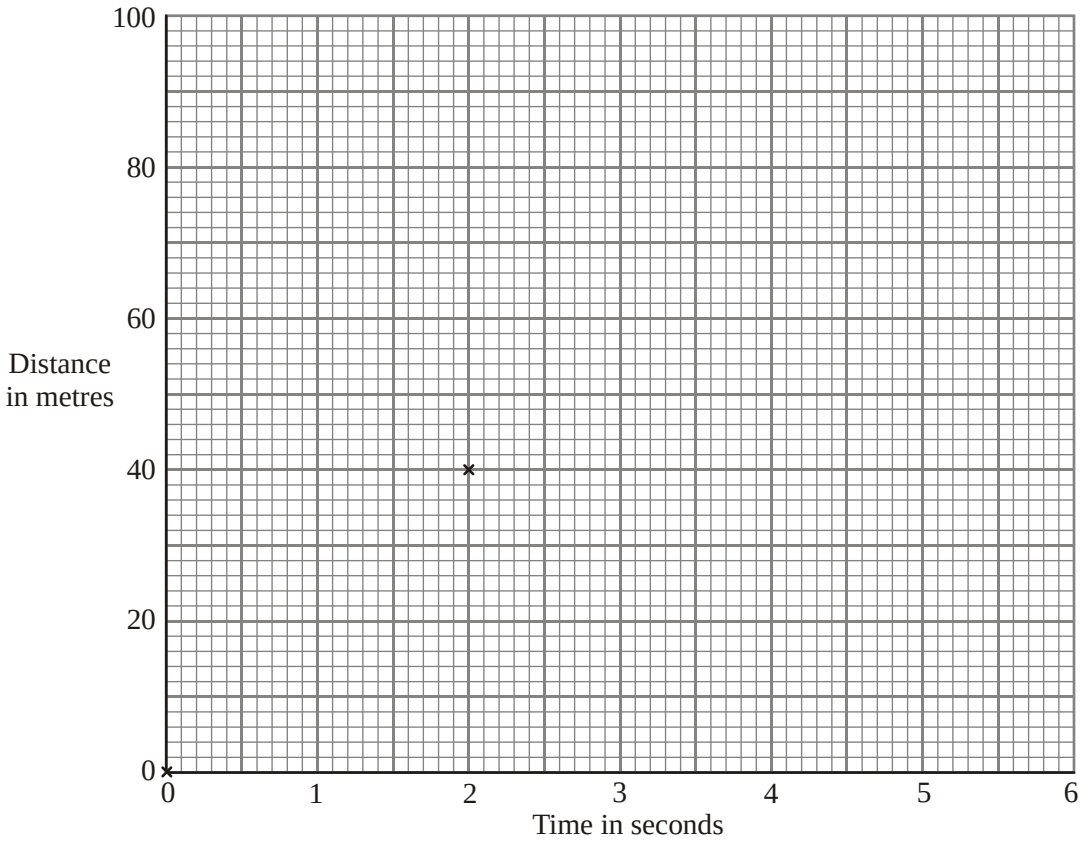
(1)
(Total 8 marks)

2. The table gives values of distance and time for a car moving along a road.

Distance in metres	0	20	40	60	80	100
Time in seconds	0	1	2	3	4	5

(a) Draw a graph of distance against time.

Two of the points have been plotted for you.



(3)

(b) Use your graph to find:

(i) the distance moved by the car in 2.5 seconds

distance =.....metres

(1)

(ii) how many seconds it takes the car to move 30 metres.

time =.....seconds

(1)

(c) Complete this sentence by crossing out the **two** lines in the box that are wrong.

The car is

slowing down
moving at a steady speed
speeding up

.

(1)

(d) Drinking alcohol makes a person's reactions slower.

Explain why it is a bad idea for people to drink alcohol before driving a car.

.....

.....

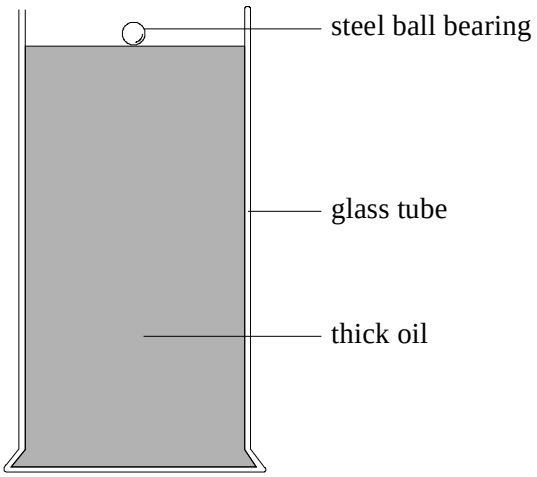
.....

.....

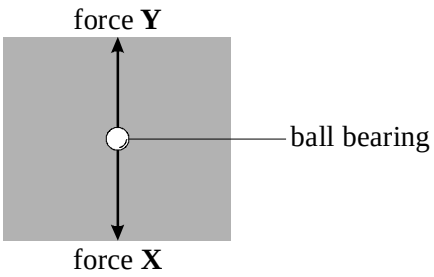
(2)

(Total 8 marks)

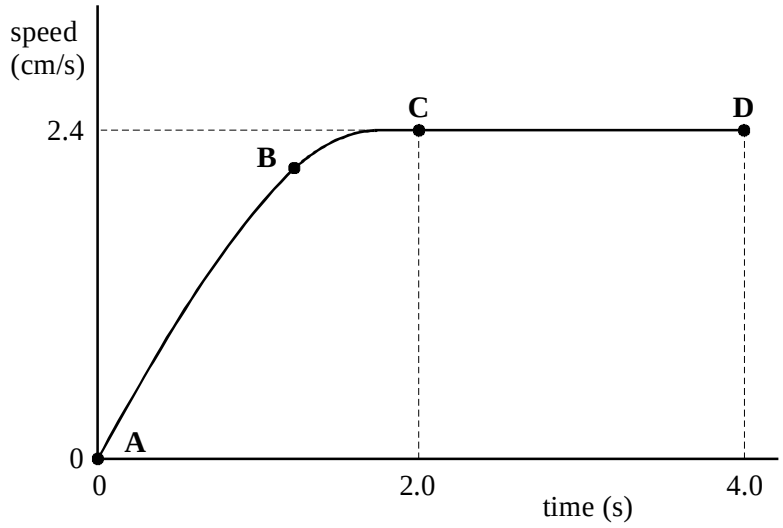
3. A student carries out an experiment with a steel ball bearing and a tube of thick oil.
The diagram shows the apparatus used.
The student releases the ball bearing and it falls through the oil.



The forces X and Y act on the ball bearing as it falls through the oil.
This is shown on the diagram.



The graph shows how the speed of the ball bearing changes as it falls through the oil.



(a) (i) What is happening to the speed of the ball bearing between points **A** and **B**?

.....
.

.....
.

(1)

Explain, in terms of forces **X** and **Y**, why this happens .....

.....
.

.....
.

.....
.

.....
.

(1)

(ii) What is happening to the speed of the ball bearing between points **C** and **D**?

.....
.

.....
.

(1)

Explain, in terms of forces **X** and **Y**, why this happens .....

.....
.

.....
.

.....
.

.....
.

(3)

(b) Use the graph to help you to calculate the distance travelled by the ball bearing between points **C** and **D**.

.....

.....

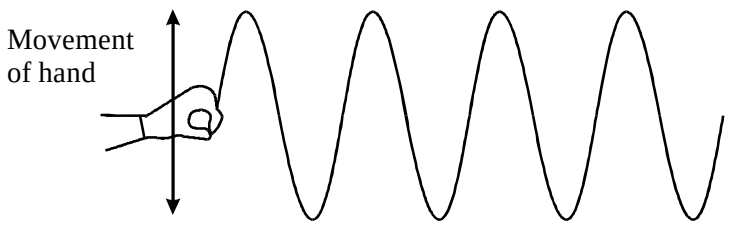
.....

Distance .....

(2)

(Total 8 marks)

4. The diagram shows a wave travelling along a rope.



(a) On the diagram:

(i) show the wavelength and label it **W**;

(ii) show the amplitude and label it **A**.

(2)

(b) The wavelength of the wave is 0. I m. Its frequency is 2 Hz.

Calculate the speed of the wave. Show clearly how you work out your answer and give the unit.

.....

.....

.....

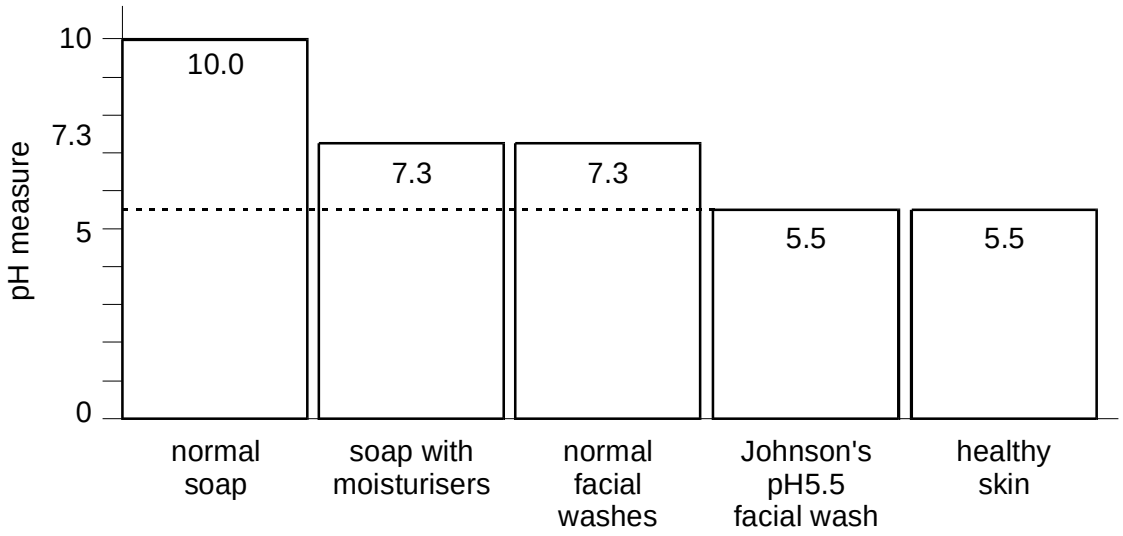
Speed of wave .....

(3)

(Total 5 marks)

CHEMISTRY

1. The chart is taken from a bottle of *Johnson's pH5.5 Facial Wash*.



(a) From the information in the chart give:

(i) a substance which is almost neutral.

.....

1 mark

(ii) the substance which is most alkaline.

.....

1 mark

(b) Tick **one** box to describe Johnson's facial wash.

It is very alkaline. ☐

It is slightly alkaline. ☐

It is neutral. ☐

It is slightly acidic. ☐

1 mark

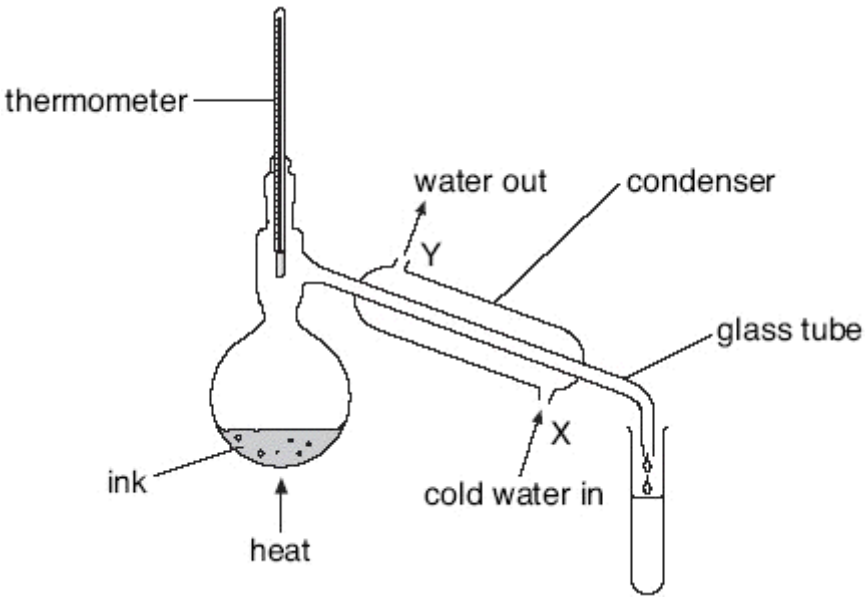
(c) A bee sting is acidic. Which **one** of the substances given in the chart would be best to neutralise the sting?

.....

1 mark

Maximum 4 marks

2. Rema used the apparatus below to distil 100 cm^3 of water-soluble ink.



apparatus A

not to scale

(a) Which processes occur during distillation?
Tick the correct box.

condensation then evaporation	☐
evaporation then condensation	☐
melting then boiling	☐
melting then evaporation	☐

1 mark

(b) Give the name of the colourless liquid that collects in the test-tube.

.....

1 mark

(c) What would the temperature reading be on the thermometer when the ink has been boiling for two minutes?

.....°C

1 mark

(d) (i) Water at 15°C enters the condenser at X.
Predict the temperature of the water when it leaves the condenser at Y.

.....°C

Explain this change of temperature.

.....

.....

1 mark

(ii) Give **two** ways in which the water vapour changes as it passes down the glass tube in the condenser.

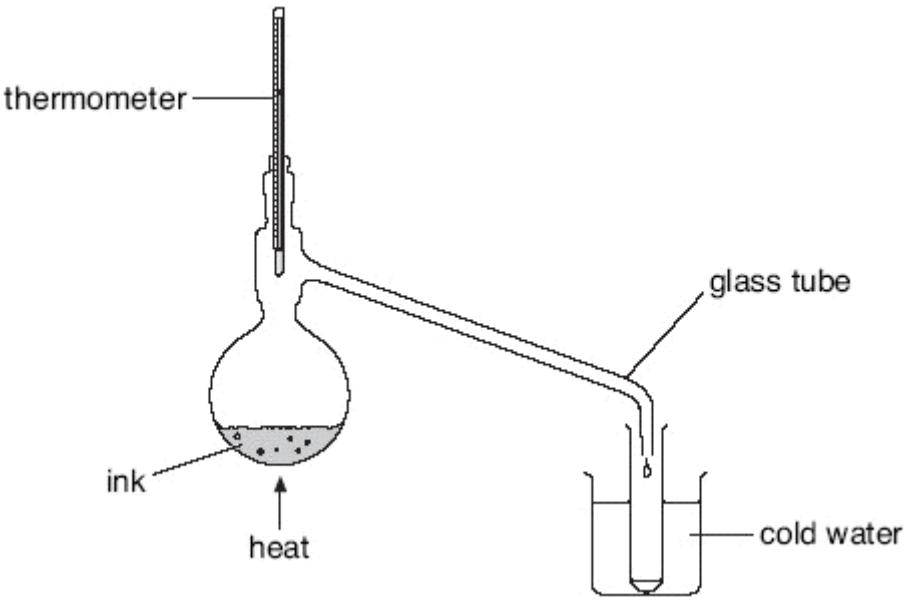
1. .....

1 mark

2. .....

1 mark

(e) Peter used the apparatus below to distil 100 cm^3 of water-soluble ink.



apparatus B

not to scale

Why is the condenser in **apparatus A** better than the glass tube and beaker of water in **apparatus B**?

.....

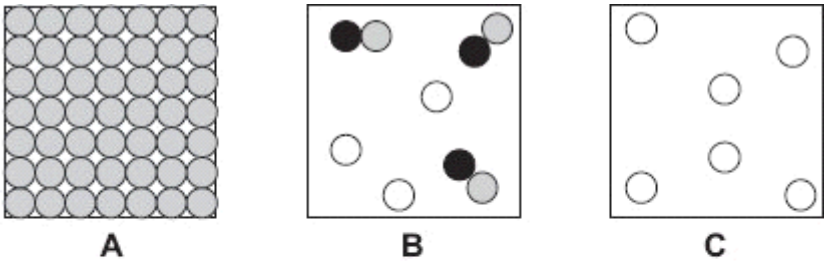
.....

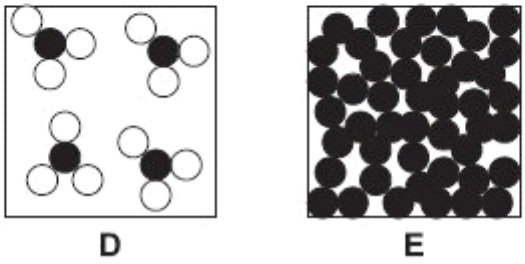
1 mark

maximum 7 marks

3. (a) The diagrams below show the arrangement of atoms or molecules in five different substances A, B, C, D and E.

Each of the circles ○, ○ and ● represents an atom of a different element.





Give the letter of the diagram which represents:

(i) a mixture of gases;

.....

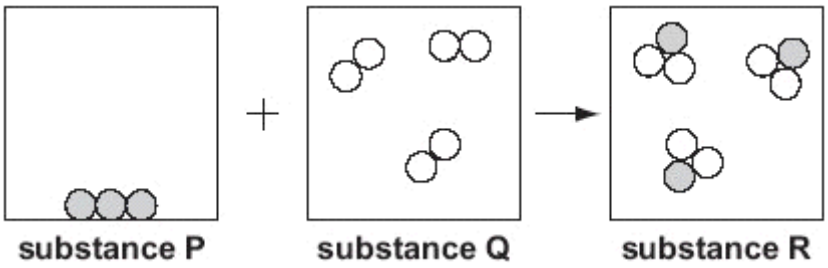
1 mark

(ii) a single compound.

.....

1 mark

(b) The diagram below shows a model of a chemical reaction between two substances.



(i) How can you tell from the diagram that a chemical reaction took place between substance P and substance Q?

.....

.....

1 mark

(ii) Substance P is carbon.

Suggest what substances Q and R could be.

substance Q .....

substance R .....

1 mark

(iii) How does the diagram show that mass has been conserved in this reaction?

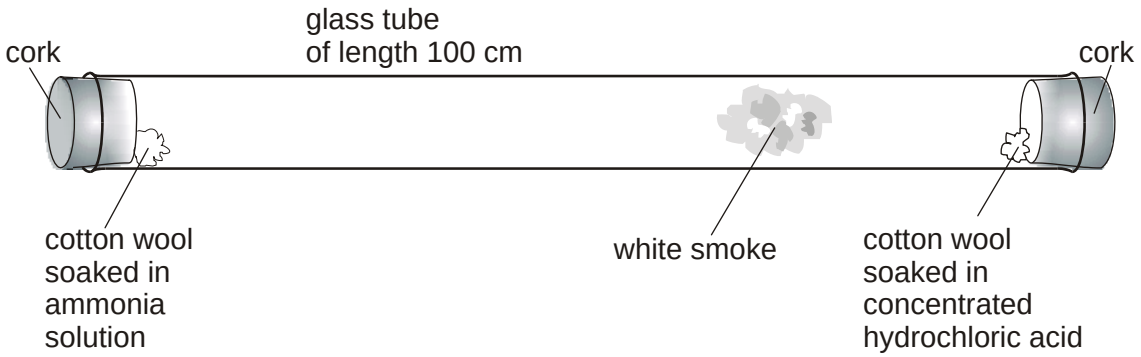
.....

.....

1 mark

maximum 5 marks

4. An experiment was set up as shown in the drawing. After several minutes white smoke of ammonium chloride, NH_4Cl, appeared as shown.



-

solution	gas given off	relative molecular mass
ammonia	ammonia	17
hydrochloric acid	hydrogen chloride	36.5

(a) Write a balanced equation for the reaction which produced the white smoke.

.....

1 mark

(b) (i) Explain why the smoke formed after several minutes, rather than immediately.

.....

.....

1 mark

(ii) Explain why the smoke formed nearer to the hydrochloric acid end of the tube than to the ammonia end.

.....

.....

.....

.....

2 marks

(c) The formula of the gas ethylamine is $C_2H_5NH_2$. Its relative molecular mass is 45.
If the experiment were repeated using ethylamine solution instead of ammonia solution, white smoke of ethylamine hydrochloride, $C_2H_5NH_3Cl$, would form.

Draw a cross (X) on the drawing to show where the smoke would form and explain your answer.

.....

.....

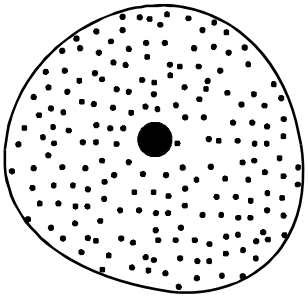
.....

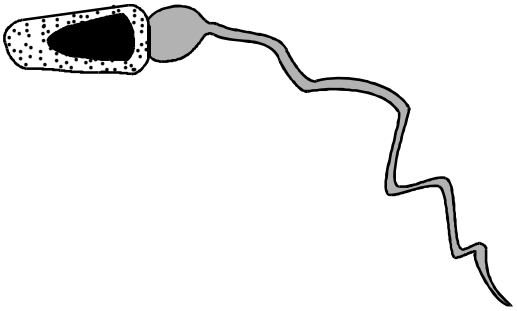
2 marks

Maximum 6 marks

BIOLOGY

1. Men and women produce different gametes (sex cells).





Female gamete Male gamete

Not to scale

(a) In sexual reproduction the male and female gametes join together.

What is the name for this process?

.....

(1)

(b) Complete the sentences about sex cells.

(i) Male gametes are called .....

They are produced in the

.....

(2)

(ii) Female gametes are called .....

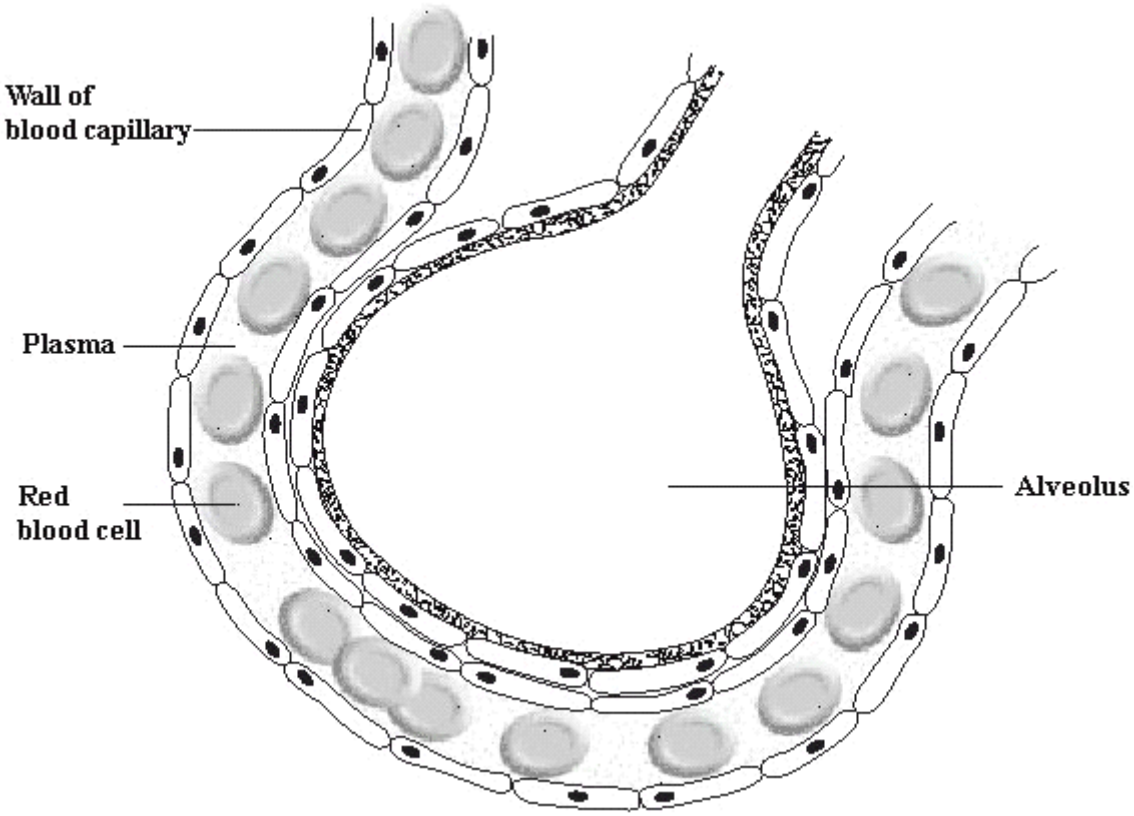
They are produced in the

.....

(2)

(Total 5 marks)

2. The diagram shows an alveolus and a blood capillary in the lung.



(i) During gaseous exchange, oxygen and carbon dioxide are exchanged across the wall of the alveolus. **On the diagram**, carefully draw **two** arrows to show the paths taken by oxygen and by carbon dioxide during this process. **Label each arrow**.

(3)

(ii) Name the process by which oxygen moves across the wall of the alveolus.

.....

.....

(1)

(iii) Each lung contains about 350 million alveoli. How does this help gaseous exchange?

.....

.....

(1)

(Total 5 marks)

3. (i) What is the name of the process which takes place in living cells in your body and which releases energy from oxygen and glucose?

.....

(1)

(ii) Name the **two** products of the process in part (i).

..... and .....

(1)

(Total 2 marks)

4. In the eighteenth century, surgeons did not wear special clothing or wash their hands before operations. Many of their patients died from infections.

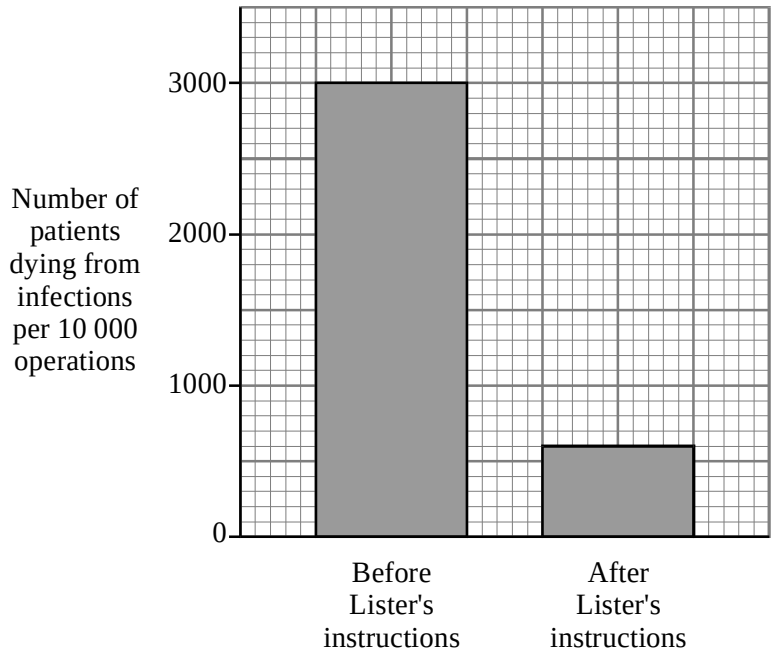
(a) Suggest why patients often died from infections after operations.

.....

(1)

(b) In the nineteenth century, Joseph Lister told surgeons to use sprays of carbolic acid in operating theatres and to wash their hands.

The graph shows the effect that using Lister's instructions had on the number of patients who died from infections after surgery.



Describe how Lister's instructions affected the number of patients dying from infections after surgery.

.....

.....

(2)

(Total 3 marks)

5. The table compares some features of a polar bear and the Malayan sun bear. The polar bear lives in the Arctic where the climate is cold. The Malayan sun bear lives in warm tropical forests.

	Polar bear	**Malayan sun bear**
Colour of fur	White	Black
Thickness of fur in cm	5	2
Thickness of fat layer under skin in cm	11	1
Surface area compared to body size	Low	High

Use information from the table to explain how the polar bear is better adapted than the Malayan sun bear for survival in arctic conditions.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

……

……

……

……

……

……

(Total 5 marks)

END OF BIOLOGY QUESTIONS