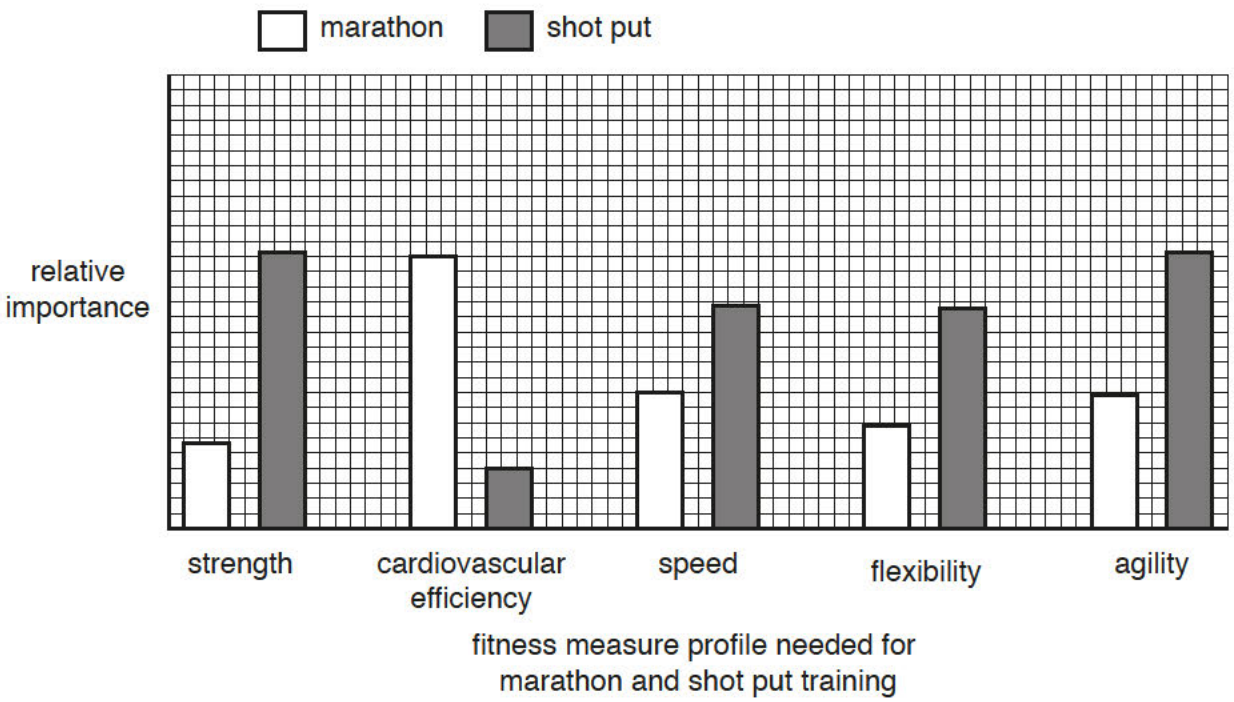
1 The marathon and the shot put are two different athletic events.
The fitness training for the marathon and shot put are very different.

Look at the graph.

It shows the fitness measure profile for the two events.



fitness measure profile needed for marathon and shot put training

(a) (i) The fitness measure profiles for strength and for cardiovascular efficiency for the two events are different.

Describe **one** difference.

.....

.....

..... **[1]**

(ii) Paula wants to train for a marathon.

She finds three different training programmes, **A**, **B** and **C**.

The table shows the levels of training for each fitness measure.

	Training programme		
Fitness measure	**A**	**B**	**C**
Strength	High	Low	Low
Cardiovascular efficiency	Medium	High	High
Speed	Low	Medium	Low
Flexibility	High	Medium	High
Agility	High	Medium	Low

Which training programme would be the best to use when training for a marathon?

Choose from **A**, **B** or **C** …….

Explain your choice.

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..... **[2]**

(b) Paula's mother is a good marathon runner but her father competes in the shot put.

Could Paula be a good marathon runner?

Explain your answer.

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..... **[2]**

2 During exercise, the rate of blood flow to different parts of the body changes.

Look at the table.

	Rate of blood flow in ml per minute	
Part of body	**At rest**	**During exercise**
digestive system	1350	600
kidneys	1100	600
muscles	1000	12500
brain	700	750
skin	300	1900
heart muscle	200	750
other	350	400
Total blood flow to the body	5000	17500

(a) Explain how the rate of blood flow changes during exercise.

Use data from the table in your answer.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

(b) The rate of blood flow to the lungs is always the same as the total rate of blood flow shown in the table. Suggest why.

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..... **[1]**

3 Dicky is visiting the hospital to have his heart checked.

(a) Dicky runs to the hospital because he is worried about being late for his appointment.



The doctor must wait until the level of a hormone in Dicky's blood returns to normal before he checks Dicky's heart.

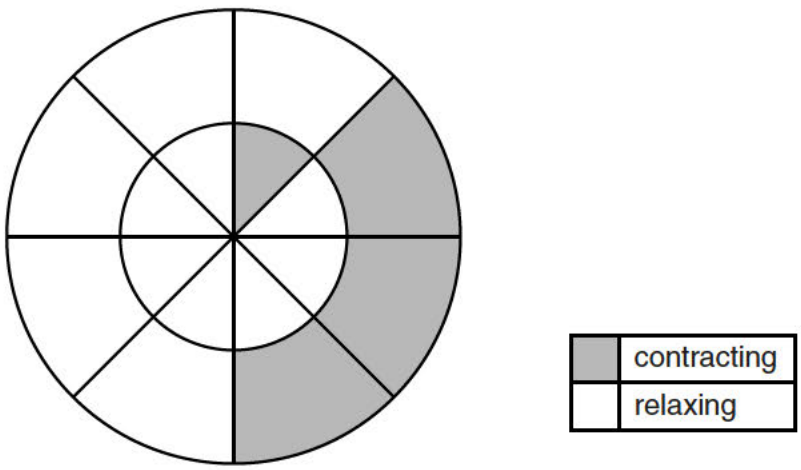
Write down the name of this hormone.

..... **[1]**

(b) The doctor produces this diagram showing one complete cycle of Dicky's heart.

The inner circle shows what is happening in the atria and the outer circle shows what is happening in the ventricles.

The whole cycle lasts for 0.64 seconds.



(i) For how long do the atria contract during one cycle of Dicky's heart?

answer ..... seconds **[1]**

(ii) The longer a contraction lasts, the greater the pressure that can be generated by the heart.

Explain how and why the contraction time of the ventricles is different from the contraction time for the atria.

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..... **[2]**

4 Jo runs in the 100 metres race at school.

At the end of the race she sits down but is still breathing much more quickly than she normally does.

(a) Explain why she needs to keep breathing much more quickly than normal.

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..... **[3]**

(b) Jo's friend Sam does **not** take part in the race.

This is because he has a 'hole in the heart'.

This means that some blood moves straight from the right side of his heart to the left.

Explain why a 'hole in the heart' would make it difficult for Sam to run in the race.

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..... **[3]**

[Total: 6]

5 Simon is going sledging with his friends.



(a) Simon's body needs to keep warm in the snow.

Why is it important that Simon's body temperature does **not** fall too low?

.....

..... **[2]**

(b) To stop him losing too much heat, **vasoconstriction** takes place.

Explain how vasoconstriction reduces heat loss.

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..... **[1]**

(c) After sledging, Simon and his friends decide to get some food.

Simon has Type 1 diabetes.

Simon needs to take insulin before he can eat.

Insulin will control Simon's blood sugar level.

Explain how insulin controls blood sugar levels.

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..... **[2]**

[Total: 5]

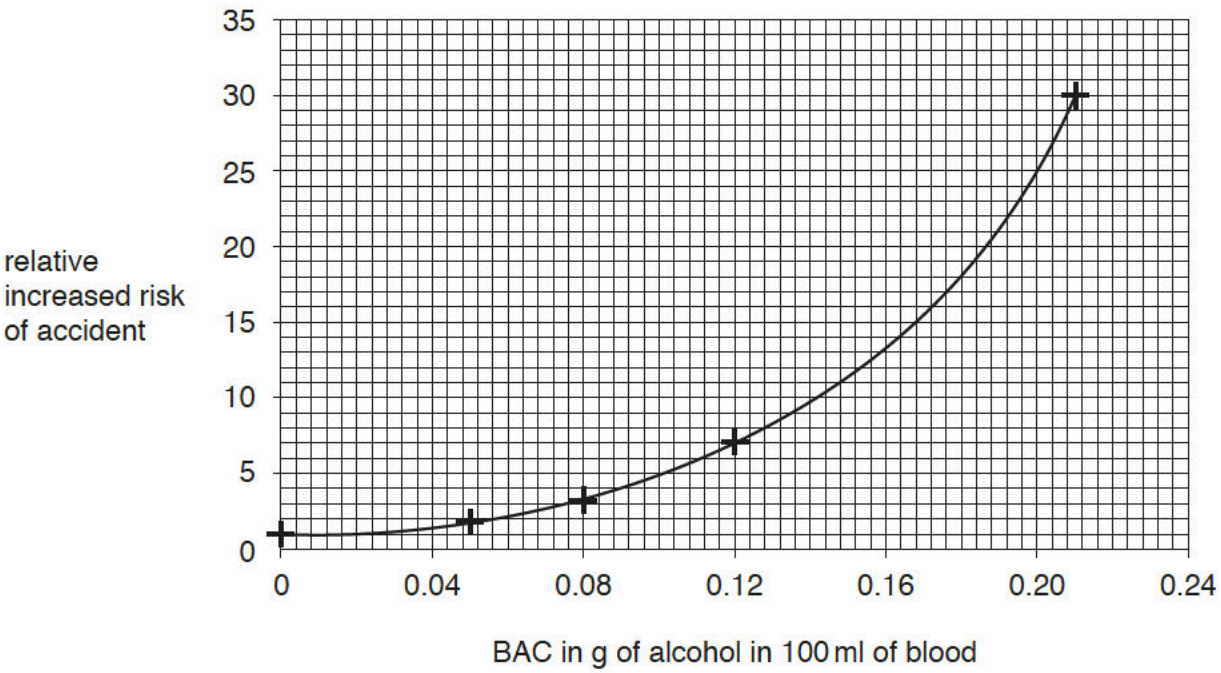
6 When someone drinks alcohol, it is absorbed into the bloodstream.

The amount of alcohol in the blood is shown by the blood alcohol concentration (BAC).

This is measured as the number of grams (g) of alcohol in 100 millilitres (ml) of blood.

Look at the graph.

It shows the relative increased risk of an accident based on BAC levels.



Read the information below.

> All the alcohol consumed is absorbed into the bloodstream.
>
> There are 4000 ml of blood in the body of an adult.

(a) John is a healthy adult.

A healthy adult's liver can break down 10 g of alcohol per hour.

John has a drink that contains 28 g of alcohol.

Calculate his BAC after **two hours** and use the graph to identify John's relative increased risk of an accident.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

(b) Drinking large amounts of alcohol daily can cause liver damage.

Describe how.

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..... **[2]**

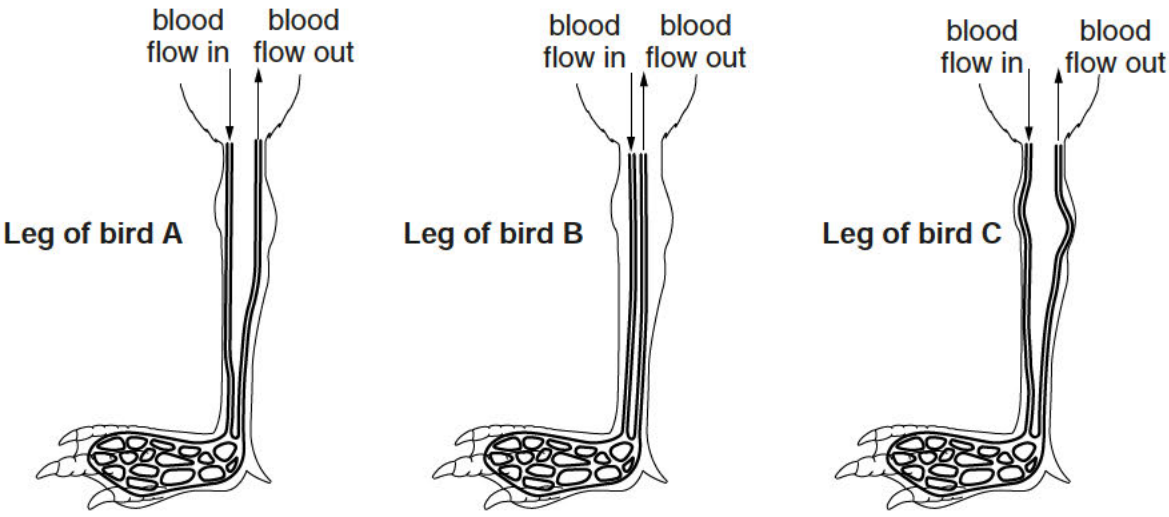
7 Penguins can live in very cold conditions.

(a) Penguin eggs will not freeze until the temperature is well below 0 °C.

Suggest what prevents the eggs from freezing.

..... **[1]**

(b) Look at the diagrams showing blood flow in the legs of three different birds.



Which diagram shows the best blood flow for a penguin? .....

Explain your answer.

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..... **[3]**

[Total: 4]

8 During war time, some emergency transfusions were made using the watery juice from coconuts.

This was done to raise the blood pressure of wounded soldiers who had lost a lot of blood.

Coconut juice was used because it is at the right concentration and is sterile.

(a) Why is it important to raise the blood pressure of patients who have lost a lot of blood?

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..... **[2]**

(b) You might expect lactic acid to build up more quickly in patients who have had transfusions with coconut juice than in patients who have had transfusions with blood.

Explain why.

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..... **[2]**

[Total: 4]

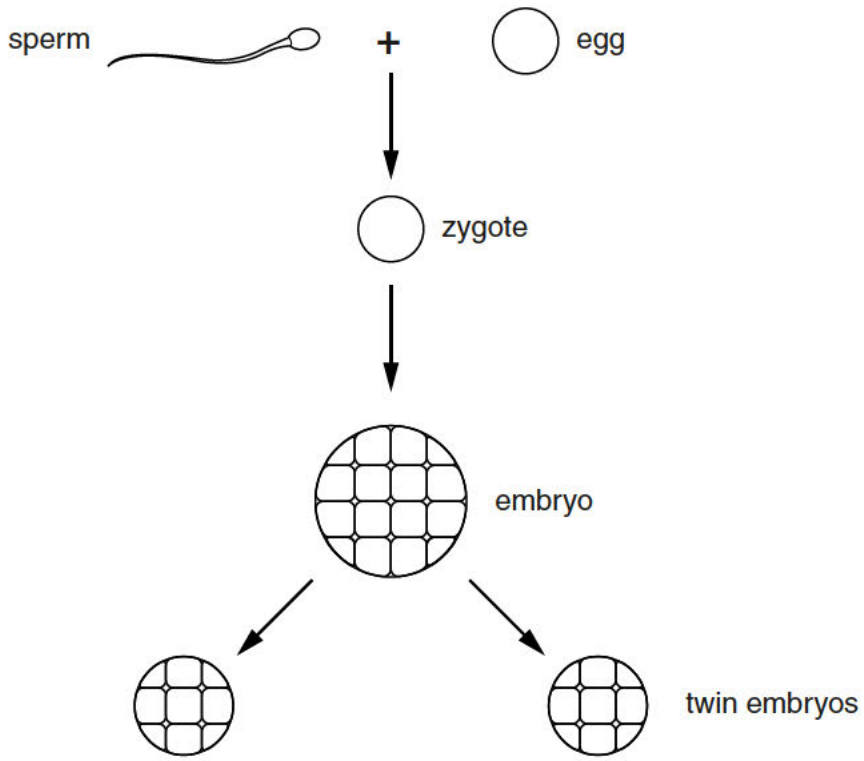
9 Amy and Sarah are identical twins.

Their development began when an egg cell and sperm cell joined to form a zygote.

The zygote developed into an embryo made of many cells.

After about a week the embryo split into the two twin embryos.

The two embryos grew to become Amy and Sarah.



(a) Put **one** tick (✓) in **each** row of the table to show which cells are haploid and which are diploid.

	Haploid	**Diploid**
egg cell		
sperm cell		
zygote		
cells in embryo		
cells in twin embryos		

[2]

(b) What type of cell division happens to the zygote to form the embryo?

.....

[1]

(c) As an embryo grows into a foetus (developing baby), one of the first organ systems that develops is the blood circulatory system.

(i) A human foetus has a double circulatory system.

Describe one advantage of a double circulatory system compared with a single circulatory system.

.....

..... [1]

(ii) The haemoglobin of a human foetus more readily combines with oxygen than the mother's haemoglobin combines with oxygen.

Suggest why this is important.

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..... [2]

(iii) During growth, the foetus uses oxygen to produce ATP.

Why does the foetus need ATP?

..... [1]

[Total: 7]