The Activity:
There are three activities that look at the three aspects of negative feedback in the GCSE specification.

This activity offers an opportunity for English skills development.

Associated materials:
Student Task Sheets 1 and 2, extension questions sheet.
Activity 1

Introduces the idea of negative feedback and exemplifies it using temperature control in mammals and birds. It is a literacy based activity where students have to extract information from text to complete the feedback diagram on Student Task Sheet 1.

Activity 2

Picture relay, from Maps from memory based on water balance in the body. The students are provided with a blank outline of the human body showing the brain and urinary system such as the one on Student Task Sheet 2. The teacher has an A3 copy of the full diagram including the annotation. Students should be in groups of 3 or 4. The first student from each group looks at the teacher copy for about 1 minute and then goes back to their group and tells them what to add to the outline. After 2 minutes the next student from each group is allowed to view the teacher copy for 45 seconds and returns to the group to add to the diagram. The final member of the group is allowed to view the teacher copy for 30 seconds and the diagram should be completed. The completed diagram could then be used as the basis for further questioning.

Extension ideas

This is a more challenging worksheet and looks at blood sugar level with reference to diabetes. Prior teaching about the control of blood sugar levels and diabetes is required.
Suggested answers to Student Task Sheet 1

Negative feedback is the process where a change in a condition from a set level causes a series of actions that return the condition to the set level. It is how the body keeps conditions within it constant at the optimum level (homeostasis).

Body temperature in birds and mammals is kept constant by a negative feedback system. Read the passage below and on the following page and use the information to complete the blank negative feedback diagram.

Core body temperature remains constant no matter what the temperature of the surroundings or the activity level of the individual. This is important so that enzymes have optimum conditions to work in and so the reactions that they control can be carried out efficiently.

Changes in the temperature of the blood are detected by receptors in a part of the brain called the hypothalamus and there are receptors in the skin which also send information to the hypothalamus about the temperature of the skin surface.
If receptors in the hypothalamus detect that the temperature has fallen then impulses are sent to different effectors.

- The muscles at the bottom of the skin hairs or feathers are raised by small muscles to trap a layer of air near the. Air is an insulator so this helps to keep heat in.
- Involuntarily muscle contraction starts, called shivering. This produces more heat due to an increase in the rate of respiration, which warms the surrounding tissues.
- The blood vessels leading to the skin constrict (get smaller) so that less blood then flows through these capillaries reducing heat loss from the skin. This is called vasoconstriction.

These changes cause the body temperature to rise and return to the optimum level.

Now complete the diagram below

Diagram:

- Increase in temperature
- Decrease in temperature
- Optimum level
- Body temperature decreases
- Body temperature increases
- Receptors are in the skin and hypothalamus
- Responses are: Increased sweating, Vasodilation, Hairs lie flat
- Responses are: Decreased sweating, Vasoconstriction, Hairs raised, Shivering
Blood too dilute

Blood concentration is detected by receptors in the brain

Less ADH released into the blood from the pituitary gland

Less ADH carried in blood to the kidneys

Kidneys absorb more water from the filtrate

Large volume of dilute urine is produced

Blood too concentrated

Hormone called ADH released into the blood from the pituitary gland

ADH carried in blood to the kidneys

Kidneys absorb more water from the filtrate

Small volume of concentrated urine is produced
Suggested answers to the extension activity

Diabetes is becoming more common. It is caused when the pancreas makes too little insulin. Insulin increases the uptake of glucose from the blood into the cells of the muscles and liver where it is converted into glycogen for storage.

The graph shows the blood glucose concentration for two people both given a high glucose meal.

One person suffers from diabetes.

Which person is it?

**Person A**

Explain why you have selected that person.

*They have higher level of glucose in their blood plasma after the meal*

*Their blood glucose level only slowly goes down and does not return to the original level*

Use the graph to explain why blood glucose concentration is an example of negative feedback.

*The level of blood sugar goes up and then returns to the same level as before the meal*
Draw a line on the graph showing the concentration of insulin for person A.

*Credit as long as it is:

- Significantly below the level of person B
- It does not go up substantially

Explain why you have put it in that position.

Someone with diabetes does not increase the amount of insulin produced when blood sugar goes up and/or the blood sugar does not go down very much so there can’t be a lot of insulin produced.

Using information from both graphs explain why the blood glucose level fell in person B.

- As the blood glucose level increased in Person B so did the amount of insulin produced
- Insulin promotes the uptake of glucose by liver and muscle cells
- Where it is converted into glycogen
- Hence the reduction in blood glucose level
Another hormone called glucagon has the opposite effect to insulin in that it changes glycogen into glucose. Produce a diagram to show how insulin and glucagon work to maintain a constant blood glucose level by negative feedback.

**Further Extension Activities**

**TES site**

For middle ability:

http://www.tes.co.uk/teaching-resource/BINGO-starter-plenary-3002695/  

For lower ability:

http://www.tes.co.uk/teaching-resource/Homeostasis-worksheet-6013583/  

Revision sheet:

http://www.tes.co.uk/teaching-resource/Summary-notes-for-homeostasis-6055725/
Abpi has some interesting resources both at 14-16 and some for 16-18 which might be useful as extension work.

Blood sugar

http://www.abpischools.org.uk/page/modules/hormones/horm6.cfm?coSiteNavigation_allTopic=1

Water balance

http://www.abpischools.org.uk/page/modules/homeostasis_kidneys/kidneys6.cfm?coSiteNavigation_allTopic=1

To give us feedback on, or ideas about the OCR resources you have used, email resourcesfeedback@ocr.org.uk