

GCSE

Edexcel GCSE in Science

Electrical and Chemical Signals

(Concept approach)

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Topic 3: Electrical and chemical Signals

Lesson 1: Reaction times							
Spec code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B1 b 3.1	None	The central nervous system lets your body respond to changes in its surroundings.	<p>Starter</p> <p>Use photos, video clips, text, etc to discuss meaning of reaction time.</p> <p>Main</p> <p>Introduce concept of a pathway through the nervous system and the effect of alcohol on the speed of transfer of information through the pathway.</p> <p>Recall the familiar ‘dropping a ruler’ method, which is very inaccurate and will have probably been used at KS3.</p> <p>Use programs for students to measure their reaction times. Use to test hypotheses such as ‘Girls have faster reaction times than boys’ or ‘Reaction times improve with practice’ Plot graphs/bar charts of change of reaction time with practise or comparison of mean times of girls/boys.</p> <p>Plenary</p> <p>Discuss results of hypothesis testing.</p>	<p>Photos, diagrams, video clips.</p> <p>Reaction timing program (several available on the internet, eg www.happyhub.com)</p>	Explore ways of measuring reaction times.	<p>C</p> <p>2.1</p> <p>N</p> <p>2.1</p> <p>2.2</p> <p>2.3</p> <p>ICT</p> <p>2.2</p> <p>2.3</p>	None
Homework: Students complete the reaction times practical as a written investigation.							

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Lesson 2: The nervous system							
Spec code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B1 b 3.2 B1 b 3.4	7A Cells.	<p>The central nervous system lets your body respond to changes in its surroundings.</p> <p>Know the location of brain and spinal cord.</p> <p>Know the nature of nerve impulses as 'electrical' messages in nerve cells.</p>	<p>Starter</p> <p>Use photos, video clips or diagrams to develop students' understanding of the structure of the central nervous system and its links with sense organs (receptors) and muscles (effectors) and to compare the structure and function of a sensory and a motor neurone.</p> <p>Main</p> <p>Demonstrate skeleton to show location of brain and spinal cord and points of emergence of spinal nerves.</p> <p>Discuss nature of nerve impulses as 'electrical' messages in nerve cells. Introduce the concept of synapses as chemical 'links' between neurones, which can be affected by drugs such as alcohol. Discuss the developments in treating mental illnesses with electric shock to modern drug therapy.</p> <p>Students work in groups to construct a model neurone. These could be mounted for class display (see Activity sheet 3.2).</p> <p>Plenary</p> <p>Peer assessment opportunity: discuss the relative merits of each model.</p>	<p>Photos, video clips, diagrams of central nervous system and sensory and motor neurone.</p> <p>Model skeleton.</p> <p>Suitable materials for model construction, such as plastic/rubber tubing, plastic drink bottle, insulated electrical cable, string, paper, card, glue, sticky tape, boards for mounting.</p> <p>Activity sheet 3.2</p>	<p>Describe the structure of the central nervous system including the structure of the brain and explain how it carries a nervous impulse from a sense organ to muscles.</p> <p>Explain that receptors in sense organs detect internal and external changes, allowing the body to respond to these stimuli.</p>	<p>C</p> <p>☒2.3</p> <p>WO</p> <p>☒2.1</p> <p>☒2.2</p> <p>☒2.3</p>	<p>Low risk, but warn about use of scissors, etc</p> <p>See Activity sheet 3.2</p>
Homework: Students research diseases of the nervous system, such as motor neurone disease and multiple sclerosis (continued in Lesson 3).							

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Lesson 3: Structure and function of the brain							
Spec code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key Skills	Safety issues
B1 b 3.2 B1b 3.3	None.	The central nervous system lets your body respond to changes in its surroundings	<p>Starter</p> <p>Discuss the statement: Animals with bigger brains are more intelligent</p> <p>Main</p> <p>Describe the structure of the CNS to include receptor, sensory neurone, relay neurone, spinal cord, spinal nerves, motor neurone, effector. Nervous impulses travel as an electrical signal. Synapses release chemical transmitters.</p> <p>Discuss the structure of the brain and the location and functions of the cerebrum, cerebellum, hypothalamus and medulla (brain stem). Summarise functions.</p> <p>Discuss how strokes, brain tumours, Parkinson's disease and grand mal epilepsy disrupt the functioning of the brain.</p> <p>Plenary</p> <p>Review learning with a quiz.</p>	<p>Diagrams, posters, model of the brain.</p> <p>Case studies of effects of strokes, brain tumours, Parkinson's disease and grand mal epilepsy on the functioning of the brain.</p>	<p>Describe the structure of the central nervous system including the structure of the brain and explain how it carries an electrical impulse from a sense organ to muscles.</p> <p>Discuss how strokes, brain tumours, Parkinson's disease and grand mal epilepsy disrupt the functioning of the brain.</p>	<p>C</p> <p>☐1.1</p> <p>☐2.1</p> <p>☐3.1</p>	None.
Homework: Students research one of the brain disorders to find out about recent improvements in understanding of causes and treatments.							

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Lesson 4: Sense organs

Spec code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B1 b 3.4	8L Sound and hearing. 8K Light.	The central nervous system lets your body respond to changes in its surroundings.	<p>Starter</p> <p>Use photos, video clips, text, etc to discuss sensitivity of different senses in different animals.</p> <p>Main</p> <p>Students work in pairs to carry out a ‘circus’ of different demonstrations/experiments designed to make them think about their senses, the different qualities that each sense responds to, and some senses that humans lack but may be present in other animals (see Demonstration sheet 3.4).</p> <p>Plenary</p> <p>Students share ideas from activity:</p> <p>what are the human senses? What information does each sense give us about the internal/external environment? Are there any changes in the external environment that can be detected by other animals but not by humans?</p>	<p>Photos, diagrams, video clips</p> <p>A series of workstations with a simple demonstration at each, along with a laminated instruction card.</p> <p>Demonstration sheet 3.4</p>	Explain that receptors in sense organs detect internal and external changes, allowing the body to respond to these stimuli.	C 2.3 WO 2.2	<p>Teachers should carry out a full risk assessment. Students are effectively ‘subjects’ in some of the activities. Some activities involve students tasting harmless substances. These should not be supplied in laboratory vessels.</p> <p>If properly organised, all activities should be low risk.</p>
<p>Homework: Students write a summary of what has been learnt from the ‘circus’. Find out about the causes and effects of faults with our senses, eg deafness and colour blindness.</p>							

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Lesson 5: The eye

Spec code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B1 b 3.4 B1 b 3.5	8K Light.	<p>The central nervous system lets your body respond to changes in its surroundings.</p> <p>Know the structure and functions of parts of the eye.</p>	<p>Starter</p> <p>What are the similarities between an eye and a camera?</p> <p>Main</p> <p>Students observe each other's eyes and note the iris and pupil. Discuss the role of these structures.</p> <p>Demonstrate a model of the eye, and if available a model to show the focussing of light on the back of the eye (retina).</p> <p>Dissection of cow's eye to show the position, size and texture of different parts of the eye, or use photos, video clips, CD ROM or diagrams of section through the eye; discuss functions of the cornea, lens, iris, pupil, retina and optic nerve.</p> <p>Students label a diagram of the eye.</p> <p>Plenary</p> <p>Recap starter question in the light of the learning in this lesson.</p>	<p>Model eye.</p> <p>Model to show focussing of light on retina of the eye.</p> <p>Eye for dissection, dissecting equipment.</p> <p>Photos, video clips, CD ROMS, diagrams of section through the eye.</p>	<p>Explain that receptors in sense organs detect internal and external changes, allowing the body to respond to these stimuli.</p> <p>Describe the difference between voluntary and reflex responses and the advantages of reflex responses to help safeguard the body: — the iris reflex.</p>	C 2.3	<p>Care with scissors and scalpels when dissecting the eye.</p> <p>Wash hands thoroughly afterwards.</p>
<p>Homework: Students describe the functions of the cornea, lens, iris, pupil, retina and optic nerve.</p>							

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Lesson 6: Reflexes

Spec code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B1 b 3.5	None.	<p>The body needs to be maintained at an optimum state.</p> <p>The central nervous system lets your body respond to changes in its surroundings.</p>	<p>Starter</p> <p>Discuss the differences between voluntary and reflex responses, and the advantages of a reflex action such as the ducking reflex, illustrated by photos, video clips, or diagrams.</p> <p>Main</p> <p>Students should understand that reflex responses are rapid, automatic or involuntary (not initiated by the brain) and are often (but not always) protective, preventing damage to the body.</p> <p>Students work in pairs carry out a circus of simple activities to illustrate reflex actions (Experiment sheet 3.6).</p> <p>Plenary</p> <p>Summarise results as a table, with columns for description and advantages of each reflex.</p>	<p>Photos, video clips or diagrams of reflex actions.</p> <p>Reflex action circus (Experiment sheet 3.6).</p>	<p>Describe the differences between voluntary and reflex responses and the advantages of reflex responses in helping to safeguard the body:</p> <ul style="list-style-type: none"> • the iris reflex • accommodation • ‘ducking’ reaction to objects travelling close to the head. 	<p>C</p> <p>2.1</p> <p>2.3</p> <p>WO</p> <p>2.2</p>	<p>Teachers should carry out a full risk assessment. Students are effectively ‘subjects’ in some of the activities.</p> <p>Some activities involve students tasting harmless substances. These should not be supplied in laboratory vessels.</p> <p>If properly organised, all activities should be low risk.</p>
<p>Homework: Babies show a number of reflexes, some of which are illustrated in the circus. Students to find out more about these. What are they for? How does a doctor test the reflexes of a newborn baby?</p>							

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Lesson 7: The reflex arc

Spec code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B1 b 3.4 B1 b 3.5	None.	<p>The body needs to be maintained at an optimum state.</p> <p>The central nervous system lets your body respond to changes in its surroundings.</p>	<p>Starter</p> <p>Use photos, video clips or diagrams to develop students' understanding of the path of electrical impulses in a simple reflex arc between sensory receptor, central nervous system and effector (muscle).</p> <p>Main</p> <p>Recall structure of CNS (lesson 3).</p> <p>Discuss spinal and cranial reflexes, and the iris reflex as an example of a cranial reflex.</p> <p>Students work in pairs to test the hypothesis that a light shone in one eye will only produce an iris reflex in that eye.</p> <p>Plenary</p> <p>Construct a flow chart for the iris reflex, starting from the point when a light is shone in the eyes.</p>	<p>Photos, video clips or diagrams of reflex arcs.</p> <p>Card to hold against face to block light to one eye, torches or low wattage bench lamps (turn off room lights).</p>	<p>Explain that receptors in sense organs detect internal and external changes, allowing the body to respond to these stimuli.</p> <p>Describe the differences between voluntary and reflex responses and the advantages of reflex responses in helping to safeguard the body:</p> <ul style="list-style-type: none"> • the iris reflex • accommodation • 'ducking' reaction to objects travelling close to the head. 	<p>C</p> <p>2.3</p> <p>WO</p> <p>2.2</p>	<p>Take care when handling bench lamps.</p> <p>Use low wattage bulbs (or torches) to avoid burns from hot bulbs.</p>
<p>Homework: Many years ago, a Russian scientist called Pavlov found that reflexes could be learned. Students to find out about Pavlov by doing an internet search. What animals did he use in his experiments? What did the animals do? Do you think that nowadays we would think it was ethically right to use animals in experiments like this?</p>							

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Lesson 8: Hormones

Spec code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B1 b 3.6 B1 b 3.7 B1 b 3.12 B1 b 3.13	None.	Hormones regulate the functions of cells and organs. Understanding the function of insulin and the effects of diabetes.	Starter Video clip of athletes mentally preparing before a 100m race. Discussion to lead to build up of adrenaline in body. Main Describe composition and transport function of the blood. Introduce the topic of hormones and the endocrine system. Discuss the hormone adrenaline as a familiar example. Define hormone/gland/target organ. Compare these chemical messages with nerve impulses as electrical messages in the body. Use diagram of main endocrine organs. Video clip or photos of person with diabetes preparing insulin injection. A case study of a young diabetic person could be used here for discussion, to lead to background theory of how insulin regulates blood glucose concentration, and the use of human insulin produced by genetically modified bacteria. Interpret graph of blood glucose levels in diabetic and non-diabetic after a meal. Plenary Compare the transport of nerves with the transport of hormones.	Video clip of 100m race. Diagrams, posters or video clips of main endocrine glands. Case study of young person with diabetes: how it affects their life, why insulin must be injected, use of human insulin, etc. Resources and information available from the British Diabetic Association www.diabetes.org.uk	Describe the composition and transport function of the blood. Explain how hormones act as chemical messages affecting target organs and/or cells. Explain how insulin produced by the pancreas regulates glucose concentrations in the blood. Explain the advantages to diabetics of the use of human insulin produced by genetically modified bacteria.	C 2.1 N 2.1	None.
Homework: Students to annotate diagram of endocrine organs with hormone(s) produced and their effects.							

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Lesson 9: Hormones and reproduction							
Spec code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B1 b 3.8 B1 b 3.9	7B Reproduction.	Hormones regulate the functions of cells and organs.	<p>Starter</p> <p>Write a list of FAQs that students would put on a website about pregnancy. Collect suggestions and highlight the questions they will need to answer by the end of the lesson.</p> <p>Main</p> <p>Revise structure of the female human reproductive system.</p> <p>Outline diagram of the menstrual cycle for labelling and annotation, indicating the roles of oestrogen and progesterone.</p> <p>Outline diagram of events during pregnancy, for labelling and annotation.</p> <p>Produce a flow chart outlining the events leading to pregnancy.</p> <p>Plenary</p> <p>Review the FAQs posed at start of lesson.</p>	<p>Diagram of the female human reproductive system.</p> <p>Diagram of the menstrual cycle.</p> <p>Diagram of events during pregnancy.</p>	<p>Interpret data to explain that oestrogen causes the lining of the uterus to thicken during the early part of the menstrual cycle.</p> <p>Interpret data to explain that progesterone maintains the lining of the uterus during the middle part of the menstrual cycle and during pregnancy.</p>	C 2.3	None.
Homework: Students research acne, one of the problems associated with puberty. What are its causes and effects? How can it be treated? Does diet help?							

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Lesson 10: Using artificial hormones to control human reproduction							
Spec code	Links and concept building from KS3	Learning objectives	Teaching activities	Resources	Learning outcomes	Key skills	Safety issues
B2.3.10 B2.3.11	7B Reproduction.	Artificial hormones can be used to control reproduction and alter body functions. Understand the social and ethical implications of IVF treatment.	<p>Starter</p> <p>Present two case studies for discussion, using written material, photos, video clips, etc.</p> <p>Main</p> <p>Case study 1: A family where the parents have decided to use the contraceptive pill for contraception. Study should develop</p> <ul style="list-style-type: none"> • reasons for using the pill (as opposed to other means of contraception) • way the pill works • medical problems associated with its use. <p>Case study 2: A couple who are having problems conceiving and are taking part in fertility treatment using artificial hormones, and IVF.</p> <p>Plenary</p> <p>Discussion of the social and ethical implications of IVF treatment, including use in mature clients.</p>	Written material, video clips, photos, etc.	<p>Explain how manufactured sex hormones can be used for contraception and to treat infertility in women.</p> <p>Discuss the social and ethical implications of IVF treatment, including use in mature clients.</p>	C ☒1.1 ☒2.1 ☒3.1	None.
Homework: Students do a differentiated structured worksheet summarising the key facts to be gained from the case studies.							

Activity 3.2: Making a model motor neurone

What you will learn from this activity

In this activity you will use your knowledge of the structure of neurones to make a model neurone.

What you will know when you finish this activity

- 1 The structure of a motor or sensory neurone and how the structure relates to its function.
- 2 How to plan work with others.
- 3 How to work cooperatively towards achieving identified objectives.

How you may be assessed

There is no formal assessment associated with this activity, although well-constructed models may be used for classroom display.

What you do

- 1 In your group, examine the materials available for making the model. Discuss which model you will make (motor neurone or sensory neurone).
- 2 Decide how you could use the materials to make a model. You should refer to the neurone structure in your textbook. You could make a sketch of the model.
- 3 You can use cola bottles for the myelin sheath and electrical cable for the axon (separate the wires for the axon branches).
- 4 When the model is complete, lay it out on a board. You could attach labels to the various parts of the model.

Suggestions for further work/homework

- 1 Find out about diseases that affect the nerves, such as motor neurone disease and multiple sclerosis. Which parts of neurones are affected, and how?

Activity 3.2: Making a model motor neurone

Notes for teachers and technicians

Aim

In this activity students make a model of a neurone to reinforce their understanding of the structure of neurones and the relationship of structure to function.

Skills, knowledge and understanding

This activity will enable students to gain the following skills and/or knowledge and understanding:

- 1 Knowledge of the structure of a motor or sensory neurone and how the structure relates to its function
- 2 How to plan work with others
- 3 How to work cooperatively towards achieving identified objectives.

Previous skills, knowledge and understanding required

Structure of neurones.

Materials required

There is no definitive list of materials, but a wide range is needed to allow for groups to select their own choices. Suggestions include:

- 1 Plastic cola/lemonade bottles to make the myelin sheath (collect a large number in advance)
- 2 Electrical cable for the axon, or thick cord. These can be separated at the ends to make the terminal branches of the axons
- 3 Coloured card, paper, pens, sticky labels, glue
- 4 Boards for mounting models
- 5 Wrapping material
- 6 Any old pieces of wood/rubber/plastic material lying about in the prep. room can be supplied.

Health and safety issues

There are no major health and safety issues associated with this activity. Warn about the use of sharps (scissors etc).

Delivery strategies

Introduce the activity by reminding students about the structure of neurones. Tell them that you want them to work in groups to build model neurones, and demonstrate some of the materials available. Question them about the possible uses of the materials.

It is important that the students work in their groups to plan the model first. Encourage working together to achieve the objective, and circulate around the groups to discuss their models and encourage students of weaker ability. The composition of the groups should be carefully decided in advance.

The activity should be ended in good time for clearing up. This activity may take longer than one lesson! The homework project should allow the more-able students to achieve their full potential.

Activity 3.2: Making a model motor neurone

Assessment strategies

There is no formal assessment for this activity, but completed models can be used for display.

Links with KS3

This activity builds on the following skills, knowledge and understanding from KS3:

- to relate ideas about cells and cell structure.

Resources

- www.mndassociation.org (Motor Neurone Disease Association)
- www.mssociety.org.uk (Multiple Sclerosis Society)

Demonstration 3.4: Our senses

What you will learn from this demonstration

In this demonstration you will carry out a series of simple experiments to find out about the human senses. You will learn about the different types of information our senses can detect about our external and internal environment.

What you will know when you finish this demonstration

- 1 The nature of our five senses.
- 2 The types of information that each sense can detect.
- 3 That there are some changes in the environment that human senses cannot detect, but may be detected by the senses of other animals.

How you may be assessed

From your written account of the demonstrations, carried out for homework (see below)

What you do

- 1 Work in pairs. There are a number of simple demonstrations/experiments set out around the room, in a 'circus'.
- 2 Read the instructions with the first demonstration. Try out the activity and answer the questions with it. Write down your answers on the recording sheet provided.
- 3 Replace the apparatus as you found it: for example if you had to place objects in an order, mix them up again for the next people to try!
- 4 Move on to the next demonstration that is free, and repeat (although they are numbered, you don't have to do these in any particular order).

Suggestions for further work/homework

- 1 Write a summary of what has been learnt from the 'circus'. What are the human senses? What information does each sense give us about the internal/external environment?
- 2 Are there any changes in the external environment that can be detected by other animals but not by humans?
- 3 Find out about the causes and effects of faults with our senses, eg deafness and colour blindness.

Demonstration 3.4: Our senses

Notes for teachers and technicians

Aim

In this demonstration students will find out about the five human senses, what types of information our senses can detect about our external and internal environment, and that there are some changes in the environment that we cannot detect, but make be sensed by other animals.

Skills, knowledge and understanding

This demonstration will enable students to gain the following skills, and/or knowledge and understanding:

- 1 There are five senses: sight, hearing, touch, smell and taste.
- 2 Each sense detects more than one type of information, eg the eyes detect light, but can differentiate images, colour, movement. The ears detect different frequencies and loudness of sound, etc.
- 3 Some animals can detect other stimuli, eg bees see UV light and pigeons can detect magnetic fields.

Previous skills, knowledge and understanding required

Structure of the nervous system (Lesson 3.1).

Materials required

The demonstration consists of a 'circus' of simple demonstrations and experiments laid out at stations around the room. There are many possibilities, but the following are suggestions that have been used successfully. The 'aspect' of the sense that is illustrated is shown in brackets.

- 1 Five coloured cards (red, green, blue, yellow, orange) to identify, and colour blindness test book (sight: colour vision).
- 2 Five cards to put in order of darkness, from white through grey to black (sight: brightness of light).
- 3 A mark made with a UV pen on card and a UV lamp (sight: humans can't see UV).
- 4 Regular and abstract pattern on cards (sight: image formation).
- 5 Two sealed glass tubes, one contains moveable cotton wool ball, the other a fixed ball (sight: movement).
- 6 Two sealed matchboxes. One with moveable marble inside, one with fixed marble (hearing and touch).
- 7 Three tuning forks to put in order of pitch (hearing: frequencies).
- 8 Beakers of salt solution, sugar solution, coffee solution, vinegar (four main tastes: salt, sweet, bitter, sour).
- 9 Five beakers with different concentrations of sugar solution (strength of taste).
- 10 Five different weights in sealed matchboxes (touch: stretch receptors in muscles).
- 11 Three flasks with water at different temperatures (touch: temperature receptors in skin).
- 12 Three stoppered flasks containing cotton wool soaked in different chemicals: ammonia, perfume, air freshener (receptors for smell).
- 13 Two big nails: one magnetised, the other isn't (humans can't detect magnetic fields).
- 14 Five bags containing wooden blocks with sandpaper of different roughness attached (touch receptors in skin).
- 15 Sample of Braille.

Demonstration 3.4: Our senses

There are many other possibilities that teachers/technicians may like to experiment with. The activities take some time to prepare, but once prepared they can be used again, with minor repairs and renovations.

Each 'station' in the circus must have a laminated, numbered card, carrying instructions for the students. A recording sheet should be prepared as shown on the next page.

Demonstration 3.4: Our senses

Recording sheet for 'Senses Circus'

(The first one has been completed for you as an example)

Experiment number	Answer	Which sense or senses did you use?	What does this experiment tell you about the information your sense can detect?
1	A=red, B=green, C=blue, D=yellow, E=orange	Sight	We can detect different frequencies (wavelengths) of light, ie colours
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Demonstration 3.4: Our senses

Health and safety issues

Teachers should carry out a full risk assessment. Some activities involve students tasting harmless substances. These should not be supplied in laboratory vessels. The students can be given short drinking straws to taste the solutions, and the straws placed in disinfectant afterwards. A safe UV lamp must be used for experiment 3. If properly organised, all activities are low risk.

Delivery strategies

Introduce the activity as a sort of ‘quiz’ about the senses. Tell the students that the main thing is to think about what information the senses are allowing us to receive.

The stations in the circus should be laid out around the room to allow students easy access in pairs. Each experiment must have an instruction card.

The experiments are very simple and will be accessible to all abilities. There will be differentiation by outcome. More able students will be able to develop the explanations further.

Stop the activity about 15 minutes before the end of the lesson, for a discussion with the class of their observations. They will be keen to know the ‘correct’ answers to the experiments, but the main thing is what it tells us about the senses.

Assessment strategies

The activity can be assessed by the written outcome (see suggested homework).

Links with other GCSE Science topics

This activity is related to:

- P2.11.1 and P2.11.2 (Waves)
- P2.11.6 (The electromagnetic spectrum).

Links with KS3

This activity builds on the following skills, knowledge and understanding from KS3:

- how are different sounds made
- how we hear sounds
- how we see things.

Resources

- <http://www.toledo-bend.com/colorblind/Ishihara.html> (Deals with all aspects of colour blindness, including on-line Ishihara colour blindness tests)
- <http://colorvisiontesting.com> (More on colour blindness)

Experiment 3.6: Investigating reflexes

What you will learn from this experiment

In this experiment you will investigate some simple reflexes.

What you will know when you finish this experiment

- 1 A variety of reflex responses.
- 2 How a reflex response differs from a voluntary response.
- 3 The advantages of reflex responses and how they help to safeguard the body.

How you may be assessed

By the presentation and contents of a summary table on reflexes.

What you do

- 1 Work in pairs.
- 2 Instructions for carrying out or observing a number of reflex responses are given on numbered cards around the room.
- 3 At each card, read the instructions carefully and carry out the exercise. Note your results in a table like this:

Number	Name of reflex	How it works: Describe the stimulus, sense organ(s) involved and response	Advantage of reflex
1			
2			
3			
4			

- 4 Replace any apparatus as you found it, for the next people to use.

Suggestions for further work/homework

- 1 Babies show a number of reflexes, some of which are illustrated in the activity. Find out more about these. What are they for? How does a doctor test the reflexes of a newborn baby?

Experiment 3.6: Investigating reflexes

Notes for teachers and technicians

Aim

In this experiment students carry out a series of simple activities to illustrate reflex responses.

Skills, knowledge and understanding

This experiment will enable students to gain the following skills, and/or knowledge and understanding:

- 1 knowledge of a variety of reflex responses
- 2 how a reflex response differs from a voluntary response
- 3 the advantages of reflex responses and how they help to safeguard the body.

Previous skills, knowledge and understanding required

- 1 Structure of the nervous system.
- 2 Sense organs.

Materials required

Set up a series of demonstrations of reflexes, with instructions on laminated cards. The following are suggestions, but teachers could probably devise others:

- 1 The knee-jerk reflex.
- 2 The ankle reflex (tap on Achilles tendon).
- 3 Rapidly move a hand in front of the partner's face (blinking reflex).
- 4 The iris reflex (use a torch or low wattage lamp).
- 5 Open a sealed tub of onions and sniff (tear reflex).
- 6 Place a crisp on the tongue (salivation reflex).
- 7 Photo of sneeze reflex.
- 8 Photo of baby suckling reflex.

Health and safety issues

Teachers should carry out a full risk assessment. Students are effectively 'subjects' in some of the activities. Crisps should not be supplied in laboratory vessels.

If properly organised, all activities should be low risk

Delivery strategies

- Introduce the activity by asking students what would happen if they put their hand onto a hot kettle/drawing pin. Discuss the reflex that occurs. What happens and why? What is the advantage of this response?
- Discuss the headings on the worksheet. Details for the withdrawal reflex could be entered onto the sheet as an example.
- Students work in pairs/threes to carry out the demonstrations.
- The activity should be ended in time for class discussion. The homework project should allow the more-able students to achieve their full potential.

Experiment 3.6: Investigating reflexes

Assessment strategies

- By the presentation and contents of the summary table on reflexes.
- From the written homework exercise.

Resources

- www.happyhub.com has a 'reflex' tester that is really a tester of response times (voluntary, not reflex). This would make a good discussion point.
- <http://faculty.washington.edu/chudler/chreflex.html> has some more reflexes that can be tested, with diagrams and questions.

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