Electrostatic Problems

Contents: Reading, practical work and questions concerning industrial problems caused by electrostatics.

Time: Part 1 needs 2 periods if all the demonstrations are done. Part 2 needs 1 to 2 periods, and could be set for homework.

Intended use: GCSE Physics and Science courses. Links with work on electrostatics.

Aims:

- To complement and revise prior work on electrostatics
- To develop awareness of the importance of an understanding of physics in industry
- To provide an opportunity to apply physics concepts to explain given information
- To provide an opportunity to plan investigations involving the control of variables.

Requirements: Students' worksheets No.804. The apparatus for the teacher demonstrations is given below.

Authors: Martin Brown and Tom Kempton

It is assumed that the students will already have done some work on electrostatics. The unit is in two parts which can be used independently.

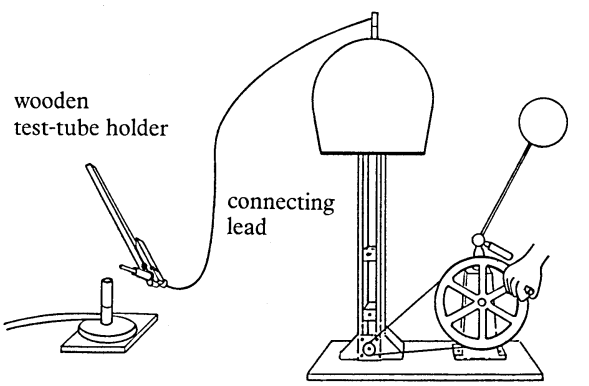
Part 1 Fire hazards

Demonstration — Sparks can start a fire

The teacher will need:

Van de Graaff generator
long connecting lead with crocodile clips
bunsen burner and mat. The bunsen burner needs to have the air-hole closed.

Assuming that the air is dry enough this is a quick and simple demonstration. Students may be surprised by the risk of fires and explosions in the food industry. They may appreciate the following extra demonstration.



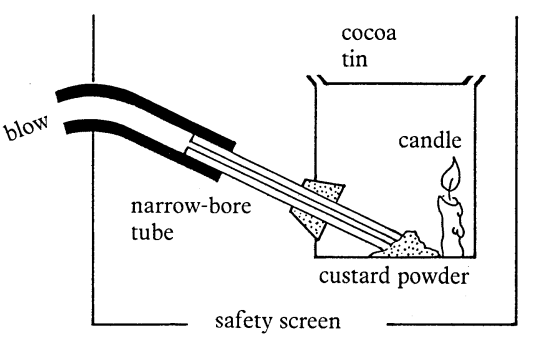
Demonstration — The custard powder bomb

(Details are not given on the students' sheets.)

The teacher will need:

the apparatus shown in the diagram
safety screen
eye protection for the teacher and students

See safety notes on next page



The explosion of a finely divided dust/air mixture can be shown by the standard 'powder bomb' experiment. Place a small piece of candle on the base of a suitable tin with a press-on lid, such as a syrup or cocoa tin. Insert a narrow-bore tube at least 30cm long through the side of the tin. Place a small amount of custard powder in front of the tube's opening. Light the candle and put the lid on the tin. Puff gently blowing down a long piece of rubber tubing from behind a safety screen. This causes the powder to spread throughout the tin as finely divided dust. The sudden expansion due to ignition of the air/dust mixture causes the lid to be blown off.

CAUTION - This demonstration must be done behind a safety screen and care must be taken not to overtighten the lid. A tin with a screw-on lid must NEVER be used.

Demonstration - Powders in pipes

The teacher will need the apparatus shown in the diagram. (The electroscope can be replaced by an electrometer)

Expandable polystyrene beads are used to represent a fluid filling a metal collecting tank (e.g. a copper or aluminium calorimeter). The beads can be discharged by warming them in a container above a bunsen flame.

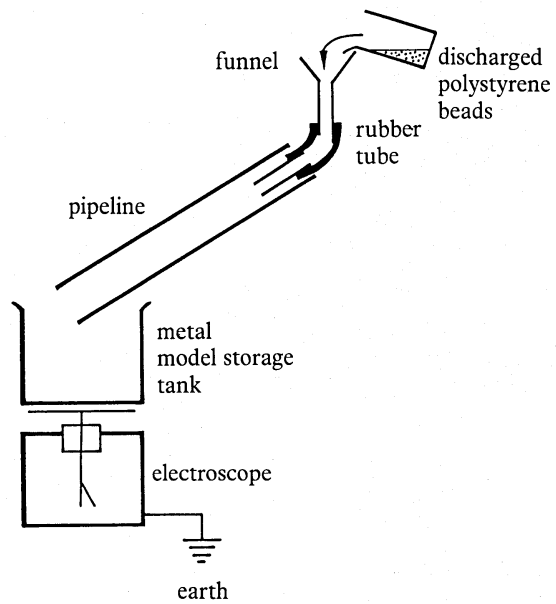
CAUTION - Great care must be taken not to ignite the beads as this produces a highly toxic gas.

All experiments involving polystyrene beads must be carried out on a tray in order to avoid spillage which would make the floor dangerously slippery.

The beads are poured into a glass funnel which can be extended using a length of glass tubing held in place by rubber tubing. The rate of filling can be altered by changing the angle of the pipeline. The height through which the beads fall freely can easily be altered. An earthed electroscope measures the static electricity generated through filling or agitating the fluid in a tank.

Pour 50 cm^3 of polystyrene beads down the pipeline. Make sure this is done over a tray. Note the deflection in the electroscope.

After seeing the initial demonstration the students can be asked to answer question 4. Each group might tackle a different variable. It is *not* intended that groups carry out the practical investigations themselves.



Discussion of results and background information for question 5.

1 Faster speed — more static electricity.
In practice in the oil industry a safe pumping rate is less than 1 metre per second.

2 The longer the pipeline, the higher the potential.

3 Agitation in a storage tank can cause the generation of dangerous static electricity. Storage tanks should be filled carefully to avoid turbulence.

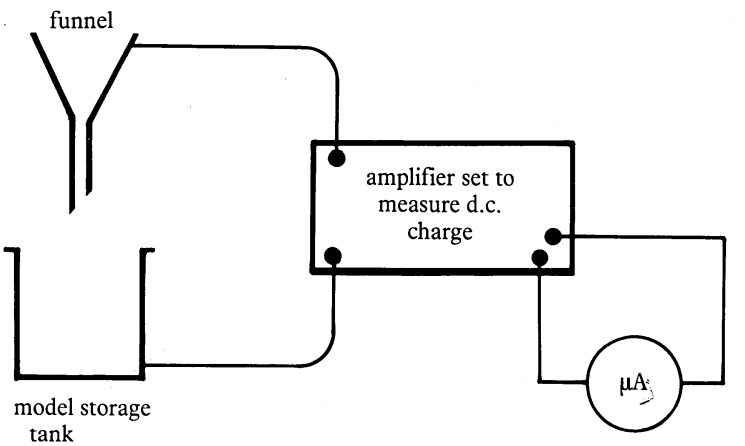
4 Additives in a liquid or powder to make it more conductive can be an effective way of reducing the build-up of charge.

Sometimes by mixing liquids a much larger potential can be produced. This can be demonstrated as follows. (Details are not given on the students' sheets.)

Demonstration - Charge due to flow

The teacher will need:

apparatus shown in the diagram
paraffin
water
beaker for pouring the liquid



When paraffin is poured into the funnel as shown in the diagram no potential difference is observed between the funnel and can. If this is repeated with a paraffin/water mixture (containing at least 50 per cent water) a large deflection on the meter is obtained.

This experiment illustrates the effect of water on the build-up of static charge in a flowing liquid. In practice, only very small quantities of water need be present as the liquid is pumped at high rates.

CAUTION - Special care is needed when handling paraffin mixtures, with regard to both their flammability and their disposal.

Part 2 Quality control

A knowledge of basic electrostatics can be used to interpret each of the rules on the warning notice. Students may like to discuss the extent to which they think that the operators in the factory need to understand the underlying physics if they are to follow the instructions.

Acknowledgements The demonstrations in Part 1 are taken from *The Science of Oil* (BP Education Service) and are reproduced in this form by courtesy of the British Petroleum Company p.l.c.. The student's writing in Part 2 is an edited version of a report by Mary Drake of Assumption Grammar School, Ballynahinch, Northern Ireland. The visit was to a Plessey factory. Figure 1 is from a photograph by Philip. C. Mitchell; Figure 4 supplied by The Plessey Company.

ELECTROSTATIC PROBLEMS

What's the problem?

Have you ever had a shock when getting out of a car? Have you ever seen sparks as you comb your hair or take off a pullover? Have you ever tried to get rid of dust on a record? If so, you have noticed some of the effects caused by static electric charges.

Figure 1

Things can become charged by friction. If you rub a plastic pen on your sleeve it becomes charged. It can be used to pick up small pieces of paper.

You only see the effect if the charge cannot leak away — if it is static (not moving). So you only notice the charge on non-conductors such as plastic and glass.

Electrostatics can be useful. Photocopiers use electrostatics to produce the black print on the paper copy. Electrostatic dust precipitators can remove almost all the dirt particles from the gases leaving a factory chimney.

This unit is about two of the **problems** caused by electrostatic charges in industry:

Part 1 investigates the way in which electrostatic charges can cause fires. Liquids and powders pumped through pipes may become charged. Sparks can then cause explosions if the material is flammable.

Part 2 explains why electronics manufacturers have to worry about electrostatics. Static charges can build up on workers and their clothing. Sensitive electronic equipment is likely to be damaged if touched by someone who has become electrically charged.

Part 1 Fire Hazards

Fires and explosions can be caused by sparks. They are a particular risk in the petroleum industry and in the food industry.

Demonstration — Sparks can start a fire

You already know that a spark can start a fire if you have ever lit a gas burner on a modern cooker. You turn on the tap and then press a button to produce a spark which ignites the gas.

This demonstration will show you that a bunsen burner can be lit with the spark from a Van de Graaff generator. Watch the demonstration. Copy the diagram in Figure 2 and label it. Describe what you see during the demonstration.

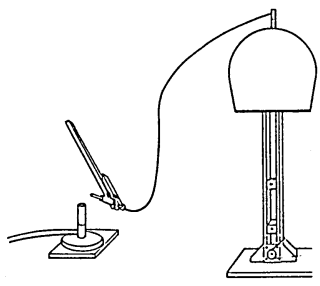


Figure 2

Now try questions 1 to 3 on the next page.

Problems in pipes

In the chemical industry and the food industry liquids and powders are moved from one place to another in pipes.

Static electricity can be generated when liquids or powders flow through pipes. This is because of the rubbing of the powder or liquid against the pipe wall. The voltages can be as high as 60 000 V. The charge on the powder or liquid has the opposite sign to that on the pipes.

Many liquids and powders are bad conductors so they stay highly charged for a long time. They slowly discharge eventually but there is always a danger of sparks if sudden discharge occurs.

Questions

1 *Workers in oil refineries and chemical works often have to wear special shoes. The shoes have soles which conduct electricity. Why do you think this is ?*

2 *In a car engine, a mixture of petrol and air burns inside the cylinders. How is the mixture ignited ?*

3 *A pile of flour is difficult to set on fire but flour dust in the air can explode if ignited by a spark. Why ?*

Demonstration — Powders in pipes

This demonstration shows the build up of charge on a powder flowing through a pipe. Watch the demonstration. Copy the diagram in Figure 3 and label it. Describe what you see during the demonstration.

The experiment can be extended to investigate some of the variables which affect the size of the charge. Possible variables:

- The speed of the beads
- The length of pipeline
- Stirring the beads in the storage tank
- Mixing an additive with the polystyrene beads. Choose an additive which conducts electricity
- Earthing (a) the pipe or (b) the container

Now answer questions 4 and 5.

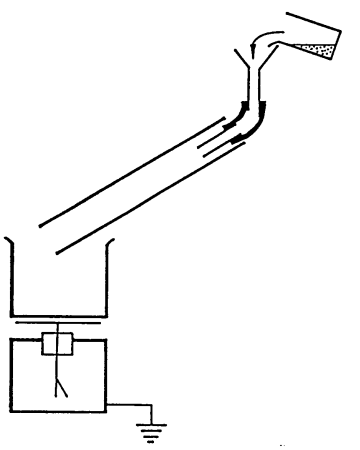


Figure 3

Earthing

When pipelines enter storage tanks there can be a large voltage between the metal pipe and the metal tank if they are not connected together. There may also be a voltage between the charged powder (or liquid) and the storage tank. These voltages mean there is a danger of sparks which may start a fire.

The problem can be overcome by connecting a metal strip from the pipe to the storage tank and then earthing the storage tank.

Questions

4 *Choose one of the listed variables. Draw up a plan of an investigation to find out how the build up of charge on the polystyrene beads is affected by changing your chosen variable.*

5 *From the results of the demonstration, suggest how you could reduce the risk of sparking from the build up of electricity in a pipe.*

Part 2 Quality control

The following paragraphs were written by a school student after visiting a factory making integrated circuits. The factory belonged to a company which makes equipment for telephone exchanges.

'Protecting electronic components from static electricity'

Electrostatic charges are often generated in everyday life, for example, when you take off a pullover. The potentials are high but the amount of charge is small. This means that only very small currents flow which are quite harmless to human beings.

In industry it is a different story. Electrical components such as integrated circuits are easily damaged even by a small current. Manufacturers cannot afford to have components damaged by such currents.

For this reason special precautions are taken by the operators when working with sensitive devices. The work surface is designed to conduct electricity. This is done using mats filled with carbon. Any electrostatic charges quickly flow to earth.

The operators are 'strapped to earth' by special wrist straps connected to the conducting work surface. Cotton overalls are recommended, and even cotton seat covers which can conduct charge to earth. Cotton conducts electricity better than artificial fibres such as nylon.

The components are protected from stray electrostatic charge. Integrated circuits, for example, are packed in special aluminium containers. Other components arrive in boxes with conducting bases. This prevents the build up of static charges.

In areas where sensitive devices are used, warning notices are placed in prominent view.

(An example of a warning notice is shown on the next page.)

In industry it is important to maintain the reliability of products. Understanding electrostatics can help to improve the quality of electronic components.

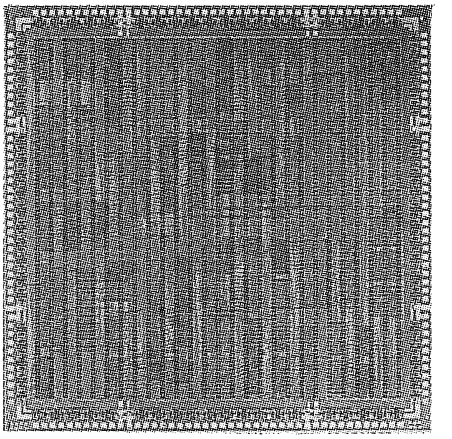


Figure 4 An integrated circuit on a silicon chip, highly magnified

STATIC SENSITIVE COMPONENTS REQUIRE PROTECTION FROM ELECTRICAL ENERGY GENERATED BY YOU

Please take the necessary precautions to minimise component failures and improve the reliability of products. Follow this code of practice before starting work in the special handling areas:

1

Make sure that the overalls provided are protecting components from your clothing.

2

Attach the wrist strap provided.

3

Handle boards and units by their edges only. Avoid touching leads and track.

4

Ensure tools, components and work are placed on the conducting work surface.

5

Avoid putting paperwork on the conducting work surfaces.

6

Do not wear gloves or fingerstalls

7

Touch the conducting surface before unpacking components.

8

Do not bring unauthorised electrical equipment into the special handling areas.

9

Keep components in their special packs as long as possible.

10

If you have to put components on the work surface make sure that the terminals are in contact with conducting surface.

11

Make sure that components and assemblies are correctly packed before they leave the special handling areas.

Question

6 *Use your knowledge of electrostatics and the writing on page 3 to explain why each of the eleven rules is necessary.*

The Search for the Magic Bullet

Contents: Reading and questions about the development of chemotherapy.

Time: 1 to 2 periods. Homework time could be used.

Intended use: GCSE Biology, Chemistry and Science syllabuses. Links with work on health, bacterial diseases, dyes, and the role of chemicals in the prevention and treatment of illness.

Aims:

- To explain what is meant by chemotherapy and show how the idea of using chemicals to cure disease arose from the work of those investigating the use of stains to distinguish bacteria
- To put some of the main events in the development of chemotherapy into their historical context
- To show that much hard work and persistence may be required prior to important scientific discoveries
- To provide opportunities to practise skills in reading and comprehension.

Requirements: Students' worksheets No.805. For practical requirements, see below.

Author: Tony Travis

This unit focuses on one aspect of an important tradition in Western medicine. The idea that particular diseases have particular causes was very powerful in the years following the discoveries by Pasteur, Koch and the other microbe hunters. Chemotherapy was therefore an important tool for curing diseases by attacking their cause. Koch, Ehrlich and Domagk all received Nobel Prizes for their work.

We are now in an era where the theory of specific causes seems to have severe limitations when applied to conditions such as heart disease, cancer and mental illness. The unit does not raise these issues directly but teachers might like to discuss them with students, and focus on some of the limitations of Western medicine.

Suggested use

This unit will probably have more appeal to students after they have done some related practical work. In Biology/Science courses they might first have some experience of staining cells. It would be particularly appropriate to use 'Ehrlich's haematoxylin' if available. Alternatively the notes below suggest an experiment to show how plant tissues can be stained selectively.

In Chemistry/Science courses this unit might be used following practical work to investigate selective dyeing of fabrics. A possible experiment is described in section 4 of the Science at Work booklet, *Dyes and dyeing.*

The time chart exercise at the end of the unit provides an opportunity to put some of the main events in the development of chemotherapy into the context of the history of medicine. It is a text-related activity which will help consolidate the reading that students have done.

Suggested experimental work on selective staining of plant tissue

Each group of students will need:

razor blade
microscope slide
dropping pipette
blotting paper
hand lens or low-power microscope
eye protection

access to:
stem of dead nettle
safranin solution
distilled water
ethanol
light green in clove oil

Procedure

1 Use a razor blade to cut a thin, transverse section of the stem of a dead nettle.
2 Place the section on a microscope slide. Cover with a few drops of safranin solution.
3 After a minute or two, remove the excess stain with blotting paper. Add a few drops of water and then remove it with blotting paper.
4 Cover the sample with a few drops of ethanol and then leave for 2 to 3 minutes.
5 Remove the excess ethanol with blotting paper.
6 Stain with a drop or two of light green in clove oil.
7 Draw off the excess stain with blotting paper. Add a few drops of pure clove oil, then blot dry.
8 Examine the stained specimen with a hand lens or low-power microscope.

The suggested procedure is intended to show in a simple way that dyes can stain parts of living things selectively. Safranin stains lignin red.

Acknowledgements Figure 1 supplied by the Wellcome Institute Library, London; Figure 3 supplied by The Mansell Collection.

THE SEARCH FOR THE MAGIC BULLET

Paul Ehrlich (1854-1915) is often regarded as the father of modern chemotherapy. Chemotherapy involves the use of chemicals to cure disease.

Ehrlich's idea was that it might be possible to make chemicals to kill the microbes which cause disease without harming other living cells.

Disinfectants destroy microbes outside the body but they cannot be used inside the body because they are so toxic. The problem is to find chemicals which will destroy an internal infection without harming the patient too much. The trick is to find a chemical 'bullet' which will destroy the cause of disease but leave healthy tissue unharmed.

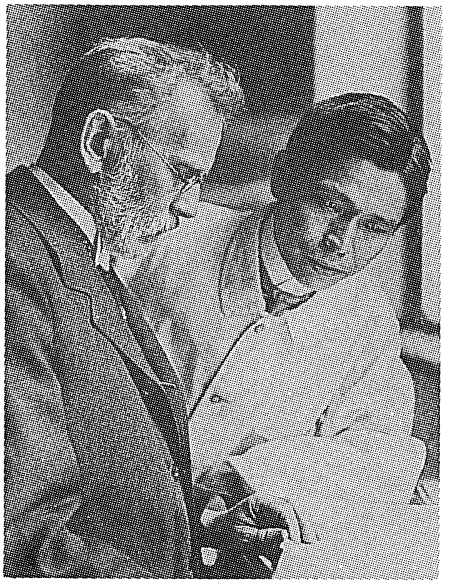


Figure 1 Paul Ehrlich and his colleague Sahachiro Hata.

How did Ehrlich get his idea?

It seems that Ehrlich's thinking was influenced by his interest in dyestuffs. He preferred to experiment with dyes in the chemistry laboratory when he should have been studying medicine at the University of Breslau. This meant that he took a long time to pass his medical exams.

The first synthetic dye was made by William Perkin in England in 1856. German chemists visited London and Manchester to learn about dye manufacture. Soon the industry began to develop rapidly in Germany. Methods were discovered of making new dyes based on chemicals from coal.

Robert Koch (1843-1910)

Among the new dyes were magenta and methylene blue. In the 1870s, Robert Koch developed the methods used to study bacteria. He used magenta and methylene blue to stain bacteria on glass slides so that they could be seen under the microscope.

With these methods Koch and his fellow workers discovered the causes of eleven diseases including anthrax (1863), tuberculosis (1882) and cholera (1883).

Answer questions 1 and 2.

Questions

1 *Why is it so difficult to find a chemical which will kill the microbes which cause disease without harming the healthy parts of the body?*

2 *How did the discovery of synthetic dyes help Koch in his research to identify the bacteria which cause disease?*

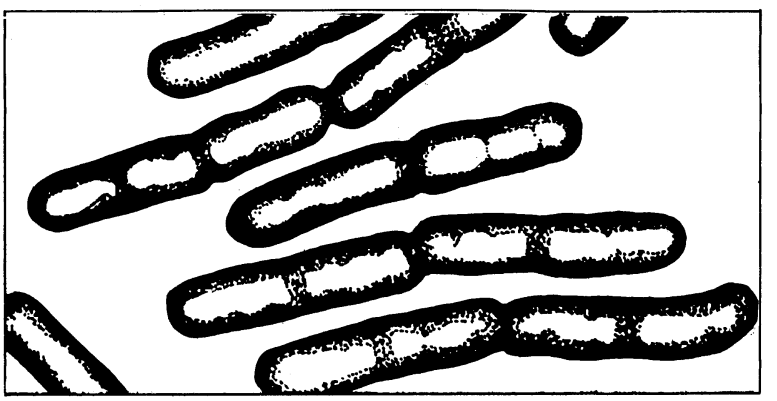


Figure 2 Bacteria magnified 5000 times. These particular bacteria are found in soil.

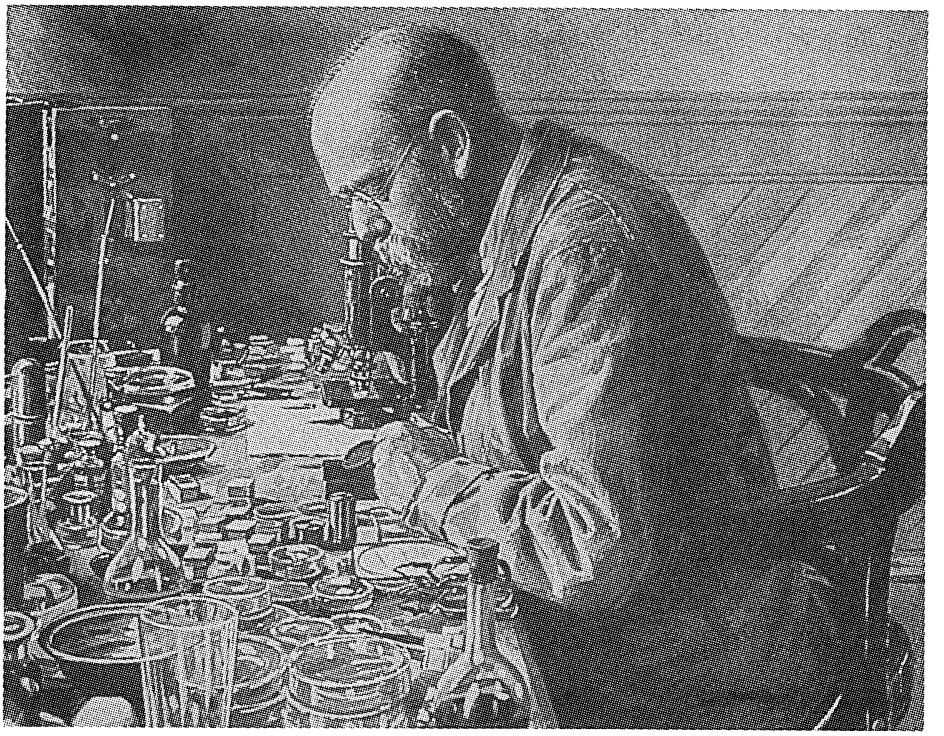


Figure 3 Robert Koch in his laboratory.

Paul Ehrlich was one of Koch's best assistants. He was particularly interested in the idea that dyes can be used *selectively.* Some dyes will take well on wool but not on cotton. Certain dyes will stain some animal cells but not others.

Ehrlich showed that selective dyes could be used to classify blood cells. He also showed that if methylene blue is injected into an animal it will dye nerve cells but not other parts of the body.

The first search

Ehrlich began a hunt for 'magic bullets'. He thought it might be possible to inject dyes into a patient which would kill microbes but leave healthy parts unharmed.

During a long period of research he investigated the effect of azo dyes on blood parasites called trypanosomes. Sleeping sickness is one of the diseases caused by these parasites.

Ehrlich showed that the dyes were effective in killing the parasites in infected mice. Unfortunately he had not found a 'magic bullet' because they also poisoned the animals.

After his lack of success with azo dyes Ehrlich decided to study arsenic compounds. Azo dyes are nitrogen compounds. Arsenic is in the same group of the Periodic Table as nitrogen so Ehrlich thought that arsenic compounds might be worth investigating.

If at first you don't succeed ...

Over six hundred arsenic compounds were made and tested with no positive results. Ehrlich decided to try every one again. In 1909 he was working with a Japanese colleague, Sahachiro Hata. Together they found that the six hundred and sixth compound hit the target. Its effectiveness had been missed by a technician during the first series of trials.

The 'magic bullet' was found to be effective against trypanosomes in mice. Unfortunately it had no effect on the parasites which cause sleeping sickness in human beings.

Ehrlich now decided to try it on other microbes. He used it with the treponeme which causes syphilis.

Ehrlich found his arsenic compound cured syphilis in rabbits. He later found it cured the disease in humans too. He had discovered the first synthetic chemical to control a parasitic disease. He called the new drug 'Ehrlich 606' after the long struggle for success. It was patented in Germany and sold as 'Salvarsan'.

Answer questions 3 to 5.

Questions

3 *How did Ehrlich's work with dyes help him to think of the idea of 'magic bullets' to treat illnesses?*

4 *For what chemical reason did Ehrlich decide to investigate arsenic compounds after his lack of success with azo dyes?*

5 *Why was the first 'magic bullet' called 'Ehrlich 606'?*

Prontosil

Another drug was discovered as a result of research into dyes in the 1930s. A new red azo dye had been made and a sample was passed to Gerhard Domagk. Domagk was director of a laboratory investigating the value of dyes as drugs.

Domagk was interested in the new dye because it stuck strongly to wool. Wool is a protein, and this suggested to him that the dye might stick strongly to the proteins of bacteria. When tested on mice the dye was found to be very effective against a variety of bacterial diseases.

The first person to be treated with the new drug was Domagk's daughter, Hildegarde. She picked up a serious infection by accident in his laboratory. Her life was in danger. As a last resort Domagk suggested treatment with the red dye. It was successful and her life was saved.

The red dye was the first of the sulphonamide drugs. It was called 'Prontosil'. It became famous when it was used to fight an outbreak of child-bed fever at Queen Charlotte's Hospital in London.

Answer questions 6 to 8.

Questions

6 *Why did Domagk decide that a dye which was fast on wool might also be attracted to the proteins of bacteria?*

7 *The 'magic bullets' such as Prontosil became less important in the treatment of bacterial disease after the 1940s. Suggest a reason for this.*

8 *All chemotherapy is likely to have some unpleasant side-effects. Suggest a reason why.*

TIME CHART

On the left-hand side of this chart are some of the important events in the history of the discovery of medicines.

- On the right-hand side, fill in the important events in this unit. Put each event in the right position for its date.

Important events in the history of the discovery of medicines		Important events in this unit
• Edward Stone reported the use of extracts of willow bark to treat fevers in 1763.	1760	
	1770	
• Digitalis from foxgloves used to treat heart disease for the first time in 1785.	1780	
	1790	
	1800	
	1810	
• Quinine isolated from cinchona bark used to treat malaria, 1820.	1820	
• Agostino Bassi showed that a fatal disease of silkworms was spread by the spores produced by the fungus which causes the disease (1835).	1830	
	1840	
	1850	
• Salicylic acid made synthetically in 1852.	1860	
• Compounds of salicylic acid used to treat rheumatism from 1876.	1870	
• Louis Pasteur showed the use of a vaccine to prevent anthrax in 1881.	1880	
	1890	
• Acetyl salicylic acid made by Felix Hofmann in 1893 and sold as aspirin from 1899.	1900	
• Frederick Banting and Charles Best discovered the connection between diabetes and the hormone insulin (1921).	1910	
	1920	
• Penicillin discovered by Alexander Fleming in 1928.	1930	
• Professor Florey and Dr Chain developed the use of penicillin as an antibiotic from 1939—1940.	1940	
	1950	
	1960	
	1970	
• Milstein announced the production of monoclonal antibodies in 1975.	1980	

Stress

Contents: A series of activities concerning mental stress.

Time: 1 to 2 periods or more, depending on number of parts used. Some parts could be done for homework.

Intended use: GCSE Biology, Human Biology and Integrated Science. Links with work on hormomes and response to stimulus, respiration and circulation of the blood.

Aims:

- To complement work on hormones, response to stimulus, respiration and circulation of the blood
- To develop awareness of the causes, symptoms and prevention of stress and stress-related disorders
- To provide opportunities to practise skills in oral communication within a group.

Requirements: Students' worksheets No.806

Authors: Sarah Berry, Julian Cohen, Ann Stillings

The unit includes a number of activities, not all of which need be tackled.

Activity 1 can be done individually, but may be better handled by students talking to each other in small groups.

Activity 2 In small groups students discuss the stresses which might act on the people in the pictures.

Activity 3 can be done individually but may go better in groups.

Activity 4 begins with outline information on pulse-taking. The main part of the activity, observing a volunteer under artificial stress, can be tackled in small groups or with the whole of the class observing 'guinea pigs'. It needs careful handling because of the artificial nature of the stressful situation but will work where the students understand the objective and are interested in the results.

Activity 5 links with Activity 3, covering in a short exercise the danger to health of chronic tension and anxiety. Students might discuss the suggestions given for tackling stress, and share their own experiences of coping with tension or anxiety.

Further activity

After drawing together students' responses, if time permits, the teacher might introduce the idea of life events — events which occur in most people's lives and necessitate coping with some degree of change or loss and hence some degree of stress. These are *normal* events in a person's life from the cradle to the grave — going to school for the first time, examinations, childbirth, moving home, bereavement, etc. Life events can be pleasurable or painful but some people cope with change or loss better than others.

Further resources

Useful information leaflets can be obtained from: MIND (National Association for Mental Health), 22 Harley Street, London W1N 2ED.

Acknowledgements Figure 3 from photograph by E.D. Lacey, Figure 4 from Barnaby's Picture Library photograph, Figure 5 from photograph by Wilf Woodhead.

STRESS

Mental stress is something we all experience at times. There are times when stress can be positive and spur us on to achieve a particular goal. But problems and anxieties can build up so we seem to be constantly under stress.

There is a direct link between stress and mental health, but it is not the whole answer. No one has a life free from stress — but not everyone becomes mentally ill.

So what is stress? Why do you feel it? What does it do to you?

Activity 1

Think of a situation which has made you feel tense, worried, frightened or uncomfortable. For example:

- Exams
- First meeting with boy/girlfriend
- Interview

Answer questions 1 and 2. You may like to discuss them with members of your group.

Questions

1 *How did you feel in this situation?*

2 *What happened to the parts of your body shown in Figure 1?*

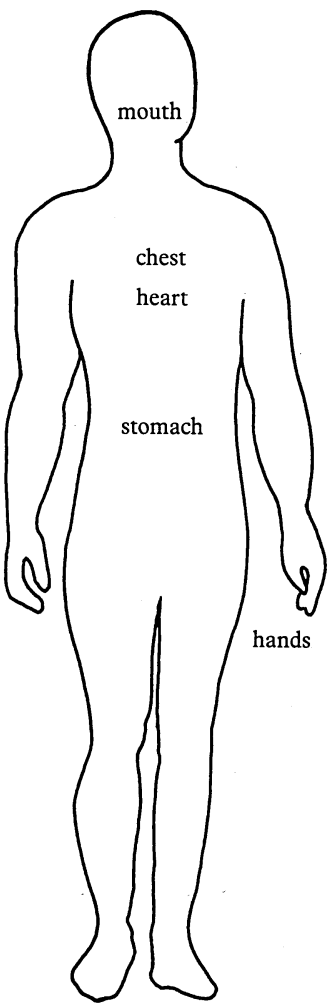


Figure 1

Activity 2

Look at the pictures on this sheet.

Discuss with your group what might be the stresses on the people involved in each picture.

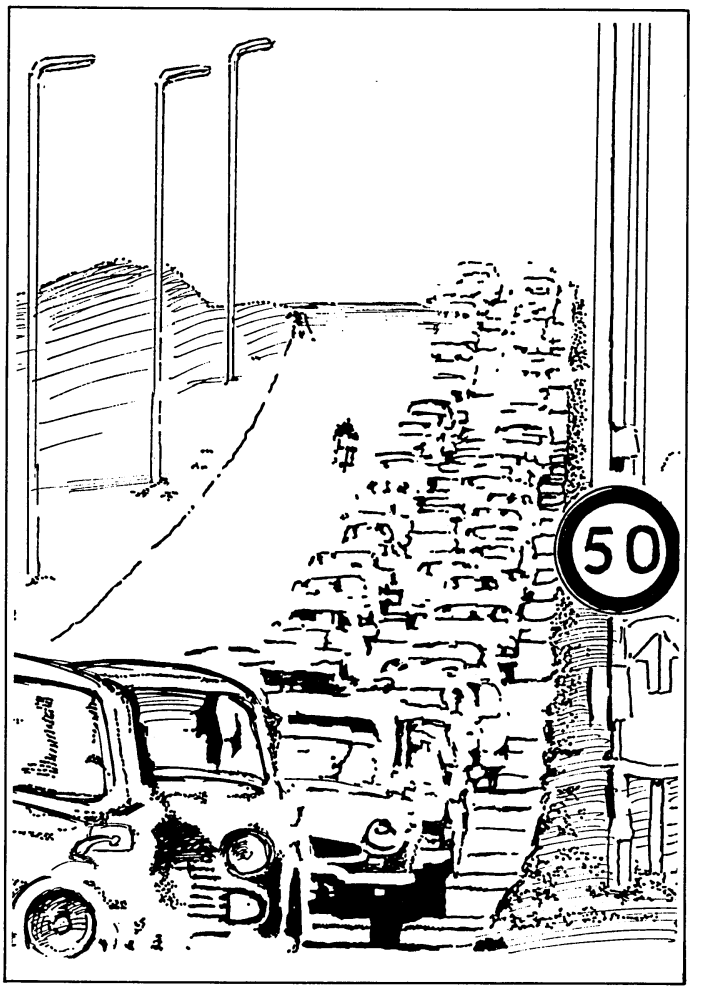


Figure 2

Figure 3

Figure 4

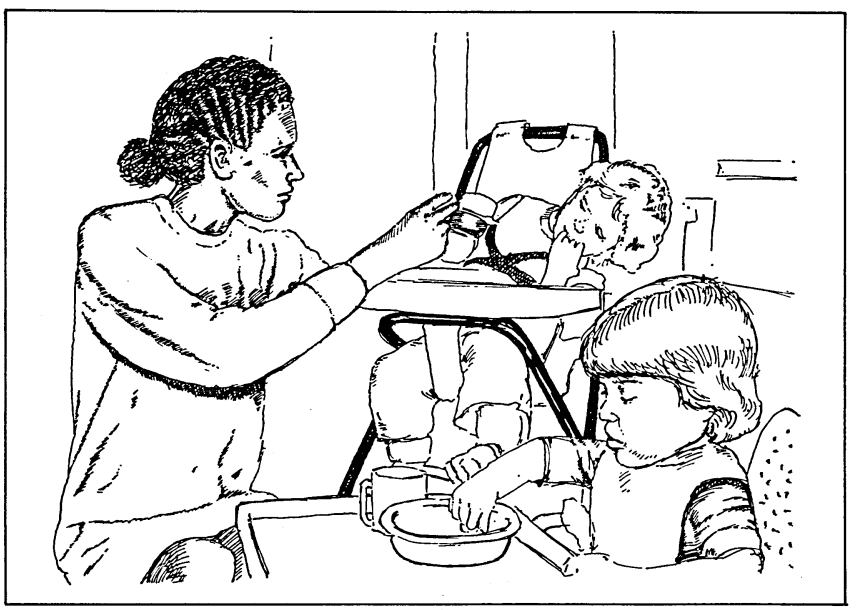


Figure 5

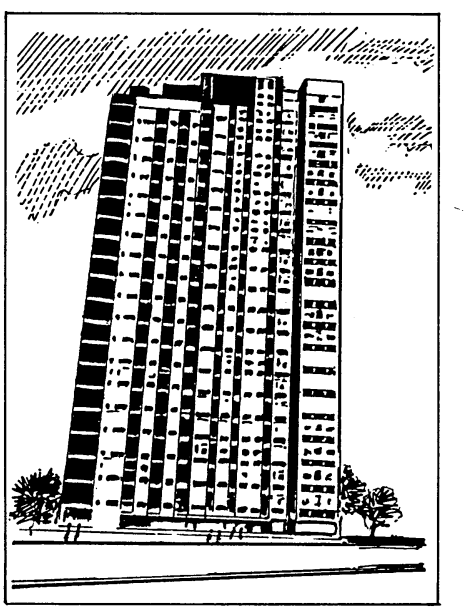


Figure 6

Activity 3 Flight or fight?

Let's look in more detail at what happens in our bodies when we are under stress. The changes which happen have been called the 'flight or fight' syndrome. Under stress our bodies prepare to react to a threat or danger. Our early ancestors met dangers frequently in their lives — a dangerous animal perhaps. They could react by fleeing or fighting this animal. Those who could respond to danger quickly survived.

Figure 7

This physical reaction was a response to immediate physical danger. Although we are not likely to meet many wild animals today, our bodies still react in the same way to a stressful situation.

The feelings you have in a stressful situation all relate to this flight or fight reaction. Can you see the link? Your body is expecting you to flee or fight. It prepares you for action.

Table 1

What happens	*How this makes you feel*	*How this prepares for 'flight or fight'*
The *heart* beats faster, blood pressure rises, more blood is sent to muscles therefore the blood vessels have to dilate (widen). The blood carries the oxygen and glucose needed to produce energy		
The *lungs* work faster so that more oxygen goes into the blood		
The *muscles* become tense		
The *stomach* has blood diverted away from it to the arms and legs		
The *salivary glands* dry up as the digestive system slows down		
As your heart is pumping the blood more quickly, your temperature increases, so you sweat to cool your body down.		

Question

3 *Table 1 shows some of the things that happen in your body under stress. Make a copy of the table and fill in the blanks in the second and third columns.*

As well as all this, there are other bodily changes which you do not feel directly:

The *liver* converts glycogen to glucose, to help produce energy
The *pancreas* releases extra insulin to deal with the extra glucose
The *adrenal glands* produce adrenalin, a hormone which tells the body to do all these things.

All these changes are getting you ready for the fight or flight. But in most modern stressful situations you can neither fight nor run away.

Activity 4 Putting on the pressure

During this activity you will need to know how to take your pulse.

Usually the pulse is taken at the wrist as shown in Figure 8.

Slip your fingers into the hollow at the side of the wrist and press your fingertips lightly over the artery. Do not use your thumb because it has a pulse of its own.

To take the pulse, use a watch with a second hand. Count the number of beats in a minute. The average pulse rate in an adult is 72 beats per minute but it can vary between 60 and 80. In elderly people it is between 50 and 60. In young babies it is about 120.

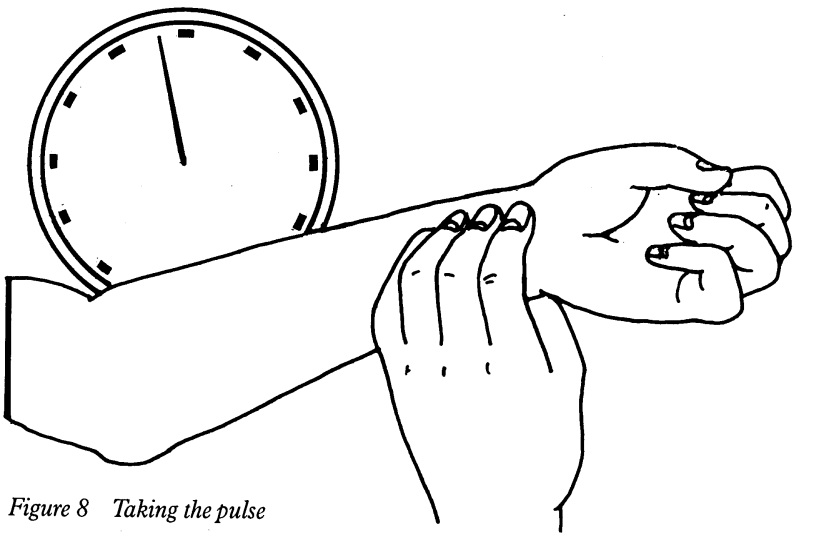


Figure 8 Taking the pulse

Creating a stressful situation

You are going to put a volunteer member of your group in a stressful situation. You will take their pulse before and after the stress and note any changes. You will have to decide how to create an artificially stressful situation. You could:

- Ask the volunteer to give a five-minute talk
- Use role-play to create a stressful situation (for example, an interview, examination, etc.)

A Measure the volunteer's pulse rate before and after the stressful situation has been created.

B While the volunteer is in the stressful situation, notice his/her posture, expression etc.

C Ask the volunteer how they felt. What did they notice about their:

hands? heart? mouth? skin? chest? stomach?

Question

4 What were your observations in A, B and C?

Activity 5 Stress and health

Imagine living with the physical symptoms of stress day in and day out. This may give you some understanding of how people feel who experience chronic tension and anxiety.

Sometimes the tension and anxiety become so great that they interfere with people's ability to cope with their everyday lives. This can lead to mental health problems such as **phobias** and **depression**. The first signs people get that they are under pressure are minor physical ailments. These might be headaches, stomach and digestive troubles, aches and pains or problems with sleeping.

Mix and Match — Join the Matching Boxes

Long periods of muscle tension may lead to:	rashes or allergies
If blood presssure stays high for long periods of time it may contribute to:	digestive disorders — ulcers — constipation — diarrhoea
If the skin is sweating a lot it may lead to:	overbreathing with giddiness, fainting, increase in asthma attacks
If the lungs are working faster for long periods it may lead to:	heart and circulation disease leading to heart attacks and strokes
If the stomach has a restricted blood supply for long periods of time it may lead to:	headaches, backache, aches and pains in muscles, especially in the neck and shoulders

How can we tackle stress and anxiety?

One way to reduce stress is to change your life to remove whatever is causing the stress. This is not always easy.

There are many other ways people can try to tackle stress and anxiety. Some examples are:

- *Relaxation techniques* Relaxation is a skill that can be learnt. Evening classes, books and tapes use a variety of methods such as physical exercise, meditation and yoga.
- *Keeping healthy* Regular exercise, a sensible balanced diet and getting away for a break or holiday help beat the effects of stress.
- *Assertion training* Many people who lack confidence suffer stress. Assertion training tries to give people more confidence and a more positive attitude to themselves and their life.
- *Medical help* Doctors often prescribe minor tranquillisers for people who are under stress. They can be a useful way to help someone over a crisis. But tranquillisers may not help people to deal with the *cause* of stress. They can also have unpleasant side effects.
- *Talking therapies* Talking about problems with a friend, a counsellor or in a group can often help people to understand their stress and do something about it.