

Activity*	S/M/ P/Hw	Type	Reference	Time (mins)
1 Uses for perfumes (F1, F2). Students list either as many sources or as many uses as possible for perfumes	S	Group activity	Activity notes	5–10
2 Natural perfumes (F1). Identify sources of perfumes from e-learning material	S	e-learning	e-chem 6/1	5–10
3 Solvents and solutes (S1, S3). Discussion of terminology used in demonstration	S	Teacher demonstration	Activity notes	15–20
4 Solvents (F3, S3, H3). Interactive animation	S	e-learning	e-chem 6/4	5–10
5 Testing cosmetics (F4, S4). Opinions and reasons on whether animals should be used for testing cosmetics	S	Paired discussion	Activity notes	5–10
6 Making a perfume (ester) (S1). Questions for students to answer after watching a teacher demonstration	M	Teacher demonstration Question and answer	Activity notes Activity 6 (F)	20–40
7 Synthetic cosmetics (F1). Students watch 'Making perfumes' simulation	M	e-learning	e-chem 6/2	5
8 Investigating the best nail varnish removers (F3, S3, H3, HSW 2e, 3a). Can-Do Task: I can test whether a substance dissolves in a solvent.	M	Investigation	Activity 8	30–50
9 Writing conclusions. Nail varnish investigation (HSW 3a)	M	Written conclusion / self-assessment	Activity notes	10–20
10 Animal testing (F4, S4, HSW 1b). Class debate about animal testing	M	Whole class or small group debate	Activity notes; Activity 10	30–50
11 Modelling a clinical trial (F4, HSW 2d, 3a)	M	Investigation	Activity 11	30–50
12 Properties of perfumes (F2, H2). Students complete a drag and drop activity	P	e-learning	e-chem 6/3	5–10
13 Review perfumes (S1, H2). Individual written work	P	Read/answer	Chemistry pp. 161–3; SAQs 1, 2, 3; p. 166; Q 1, p. 166	10
14 Evaluating nail varnish investigation (F3, S3, H3, HSW 2d). Questions and answers on the quality of evidence obtained	P/Hw	Evaluation/thinking skills	Activity notes	10
15 Nomin8 solvents. Selected students feed back the main points from the lesson	P	Student verbal report	Activity notes	5–10
16 Cosmetics (F4). Students complete a drag and drop activity to summarise the main points	P	e-learning	e-chem 6/5	5
17 Review cosmetics (S4). Individual written work	P	Read/answer	Chemistry p. 166; Q 2, p. 166	5–10
18 Student quiz (S1–4)	P	e-learning	e-chem 6/6	5–10
19 Perfume summary (F2, S2). Students draw a spider diagram to summarise ideas about perfumes	Hw	Thinking skills activity	Chemistry pp. 161–2	15–30
20 Review solvents (F3, S3). Individual written work	Hw	Read/answer	Chemistry pp. 163–6; SAQs 4, 5 and Q 3, p. 166 (H)	15–30

* References in parentheses are to the specification (e.g. H3 refers to the Higher column, 3rd row down – including blank rows) or to the KS4 Programme of Study (e.g. HSW 2a).

1 Uses for perfumes

Set the scene by having an oil burner releasing perfume as students arrive in the classroom.

3 Solvents and solutes

Demonstrate various solvents and solutes, including nail varnish remover and nail varnish. Discuss what solvents and solutes are.

5 Testing cosmetics

'It's OK to test new drugs on animals but it isn't OK to test cosmetics on animals. What do you think and why?' Write this up as students arrive. Encourage them to come up with their own opinions and to back them up with reasons.

6 Making a perfume (ester)

Instructions for demonstration

Observe and smell the reactants (ethanol and ethanoic acid) carefully.

Add 2 cm³ of ethanol to 1 cm³ of concentrated ethanoic acid.

Add 3 drops of concentrated sulfuric acid (this acts as a catalyst to speed up this reversible reaction).

Warm the reaction mixture gently in a hot water bath for 5 minutes.

Pour the reaction mixture into a small beaker containing sodium hydrogencarbonate solution and stir well (this removes any excess acid).

Observe and smell the product carefully (goggles should be worn).

Discuss what is happening at each stage of the reaction and discuss safety issues and hazard symbols as part of the demonstration. Discuss the properties of perfumes and why they have those properties. Build up the word equation after the reaction has finished:

ethanoic acid + ethanol → ethyl ethanoate + water

9 Writing conclusions

Students write a conclusion for their investigation into the best nail varnish remover (Activity 8).

Discuss the qualities of a good conclusion before they begin or ask them to assess examples done by previous students to identify what makes a good conclusion.

10 Animal testing

Citizenship: the rights and responsibilities of ...; expressing, justifying and defending ...; consider and evaluate views that are not ...

SMESLEC: the ethical implications of ...

There are five roles for the debate: The activity sheet has a role-play card for each role, to be given to each student in that role. Students get into groups, each representing one of the roles (e.g. all vets). These are the expert groups. They discuss their arguments for or against animal testing in their role and come up with five main points to argue their case. Working in a group may help students to produce more ideas in support of their arguments. The groups then split up and one student from each group jigsaws to make new

groups that have one of each role-play group in them (one vet, one mum, etc.). Students tell each other who they are and argue their case. They may struggle with starting sentences; the resources could be used to prompt them. The activity could also run as a full-class activity or one student from each role-play group could sum up at the end.

11 Modelling a clinical trial

This activity is from the KS3 strategy Sc1 training materials with additional teacher and student worksheets.

14 Evaluating nail varnish investigation

Discuss with students the accuracy and reliability of their methods and results, and how they could be improved. Students could write this up for homework.

15 Nomin8 solvents

Give a small number of students a prepared Nomin8 card at the start of the lesson explaining that they will feed back the most important points from the lesson during the plenary. They may make brief notes to help them.

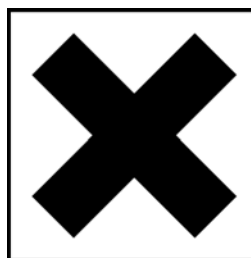
Answers to end-of-chapter questions

- 1
 - a Man-made, artificial.
 - b An alcohol and an acid (with a little bit of concentrated sulfuric acid).
 - c It must be insoluble in water, non-toxic, non-irritant, unreactive and volatile.
 - d As solvents.
- 2
 - a Many people consider animal testing cruel, so the company may refuse to test on animals for marketing or ethical reasons. The results of animal tests may not be reliable pointers to the safety of the ester for use with humans.
 - b Animal testing may be more reliable than other forms of testing. If the ester is dangerous to humans and other forms of testing fail to prove this, the company could become responsible for damage to people. Therefore the company may test on animals for ethical reasons and to avoid lawsuits.
 - c Possible reasons: A drug has to be swallowed by, or injected into, a patient. Any risk associated with such a drug is greater than that associated with a cosmetic, which is only used on the skin. Perfumes are non-essential items, which may not justify animal testing. Medicines for treating diabetes are essential, which may justify animal testing.
- 3
 - a The intermolecular forces between two water molecules and the intermolecular forces between two ink molecules are stronger than the intermolecular forces between a water molecule and an ink molecule.
 - b The intermolecular forces between two Trike molecules and the intermolecular forces between two ink molecules are similar to the intermolecular forces between a Trike molecule and an ink molecule.

Activity 6 Making a perfume (ester)

Watch the teacher demonstration and then answer the following questions.

- 1 Name the two hazard warning signs that you should see on a bottle of ethanol.



- 2 Number the following sentences in the correct order to show how to make an ester.

- Observe and smell the reactants (ethanol and ethanoic acid) carefully.
- Warm the reaction mixture gently in a hot water bath for 5 minutes.
- Add 2 cm³ of ethanol to 1 cm³ of concentrated ethanoic acid.
- Pour the reaction mixture into a small beaker containing sodium hydrogencarbonate solution and stir well.
- Observe and smell the product carefully.
- Add 3 drops of concentrated sulfuric acid.

- 3 Write two sentences to compare the original reactants with the final product.

- 4 Complete the following paragraph using the words below:

esters	sulfuric	compounds
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Alcohols react with carboxylic acids to form sweet-smelling _____ called _____ . A catalyst of concentrated _____ acid is used in the reaction.

You can write a general equation for the reaction like this:
 alcohol + carboxylic acid → ester + water

- 5 With the above equation as a starting point, complete the equation for the reaction you have seen your teacher demonstrate:

E _____ + ethanoic acid → ethyl ethanoate + w _____

- 6 Esters can be used as perfumes but what else are they used for?

Activity 8 Nail varnish removers

Are some nail varnish removers better than others?

Complete the following sentences using the words in the box below.

solute	soluble	colours	insoluble	solvent
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Substances that dissolve in a liquid are _____ and those that do not are _____.

A _____ is the substance dissolved in a solution.

The _____ is the liquid that does the dissolving.

Nail varnish remover dissolves nail varnish _____ .

Investigation

You have the following apparatus:

- 4 types of solvent
- stopwatches
- 2 nail varnishes
- cotton wool
- glass slides

Plan an investigation to find out which nail varnish remover is the best.

You need to think about the following:

- What are the variables in this investigation?
- Which variable are you going to change?
- What will you measure and how?
- How will you make your test fair?
- What will you do to get a full set of results?

Results

Record your results in a table.

Conclusion

Transfer your results onto an appropriate graph.

What do your results show?

Answer the following questions

- 1 Which is the best nail varnish remover?
- 2 How do you know?
- 3 Use the textbook to find out how nail varnish remover works. Write a paragraph and draw diagrams to show how it works.

Activity 10 Animal testing

Animal activist

You are an animal activist and a vegan who refuses to eat meat and dairy products. You have always loved animals – sometimes more than humans – because they are loyal and friendly. You have always kept pets and have looked after them properly. You believe that **all** animals have the same rights as humans and that no one should harm or hurt animals. You have taken part in demonstrations all over the United Kingdom to stop the testing of drugs and cosmetics on animals. You believe that all drugs can just as easily be tested on humans, and that lots of products that are tested on animals are unnecessary anyway.

Vet

You have always loved animals – sometimes more than humans – because they are loyal and friendly. As a child you worked in a Veterinary Surgery as an animal handler. You have always kept pets and have looked after them properly. You believe that **all** animals have the same rights as humans but that some drugs need to be tested on animals so that we can treat other animals with specific diseases. How else will we know if they work?

Anaesthetist

You are an anaesthetist in a large hospital. You give patients drugs before surgery to put them to sleep. The anaesthetics used to put your patients to sleep have been trialled on animals. You believe this was essential. It helped researchers to decide on safe dosages to give patients so that they would not wake up part way through surgery or would not be given an overdose which might kill them. Without the trials, humans would have to have surgery without having anaesthetics or they would be in danger when the drugs were used. Some people would not survive without receiving surgery in hospital.

Cancer patient

You are a 30-year-old mum with two young children. You have recently discovered that you have breast cancer. Herceptin is a new drug that has been prescribed to some women who have had treatment for breast cancer. It reduces considerably the risk of further cancer. The researchers know this because of tests on animals. You are waiting to see if you can have this new drug. Without it, you will die this year. You will leave behind a 3-year-old son, an 18-month-old daughter and a loving husband. You strongly support the development of the new drug because it is your only chance of survival.

Father of a seriously ill son

You are the father of a young man with Parkinson's disease. Parkinson's disease results from the loss of function of the nervous cells in the brain which regulate movement. Typical symptoms include slowed movements, tremors, loss of movement control and rigidity. There is no cure for the disease and, as it progresses, treatments become less and less effective until the patient can no longer do things for themselves. Researchers have been carrying out trials to find out what causes Parkinson's disease and to try to find a cure for it. You are worried about your son's condition and want a cure to be found as soon as possible.

Activity 10 Animal testing

A framework to argue

- Introduction
- I am concerned that ...
- It is perfectly clear to me that ...
- I am sure you will agree with me that ...
- Although not everyone would agree, I want to argue that ...
- If you were to consider [the issue], I am sure you would agree that ...
- It is my intention to argue that ...

A framework to discuss/debate

- Introduction
- The issue we are discussing is ...
- The issue of concern is that of ...
- There are different ideas around the issues of ...
- The issue of ... raises a lot of discussion and people have very different opinions about it.
- It is my intention to provide all sides of the argument around ...
- To help you make up your mind about the issues of ... I would like to present both sides of the argument, that is ...

Activity 11 Modelling a clinical trial

How to run a clinical trial	
<p>Objectives</p> <p>1 To know how contemporary scientists work</p> <p>2 To be able to explain how a model of a clinical trial links to real life situations</p>	
<p>Outcomes</p> <p>All students will:</p> <ul style="list-style-type: none"> • take part in a model of a clinical trial • be able to explain how the model links to modern clinical trials. <p>Most students will:</p> <ul style="list-style-type: none"> • write 2 sentences showing what the model trial showed. <p>Some students may:</p> <ul style="list-style-type: none"> • write a paragraph explaining what a clinical trial is. 	
<p>Resources</p> <p>Cups labelled A, B, C, D with food in (strawberry, raspberry, peach, lemon-flavoured yoghurt), plastic spoons, 5 headbands in envelopes, 5 nose clips in envelopes, Clinical Trial record sheet.</p>	
<p>Starter (5 mins)</p> <p>Paired question – When you don't feel so good and you take a tablet to make you feel better:</p> <ul style="list-style-type: none"> a Do you always know it will work? b How do you know that it might work? c How do you know that it won't hurt you in any way? d If someone invented a new medicine, would you want them to do anything with it before you take it? 	
<p>Main</p> <p>1 Explain how the clinical trial works, get into groups of 3 (one doctor, one researcher and one patient) + a couple of volunteers to help run the trial if available (10 mins)</p> <p>2 Run the trial in silence (15mins)</p> <p>3 Give out the answers and groups add up how many they got correct</p> <p>4 Discuss the results (e.g. did the nose clips not recognise the foods as well as the headbands? THIS IS WHAT SHOULD HAVE HAPPENED!).</p> <p>5 Complete activity sheet</p> <p>6 In groups write 2 sentences explaining what the class found out</p>	
<p>Plenary Q/A about clinical trial simulation. Discuss how we could have done it better, e.g. larger sample size would be more convincing. Explain a couple of examples from real life (e.g. cervical cancer on news, trials for drugs to cure Parkinson's disease) or write a paragraph (in groups) explaining what a clinical trial is and why they are important.</p>	
<p>Sc1 How contemporary scientists work (ideas and evidence), modelling a real life situation. Analysis and evaluation.</p>	<p>Assessment</p> <p>Of ability to identify parts of a model and how they link to everyday life. Ability to analyse results.</p>
<p>Differentiation By outcome. Students work in groups using their thinking skills.</p>	<p>Literacy/Numeracy/ICT</p> <p>Key words: clinical trial, placebo, symptoms, cure, patient.</p>
<p>Risk Assessment All food must be fresh and not come into contact with the lab benches etc. All spoons are new and discarded after the trial.</p>	

Clinical trial teacher instruction notes

- 1 Groups of 3 (doctor, patient, researcher).
- 2 Doctor and patient sit back to back.
- 3 Helpers give out treatments in envelopes. Same amount of headbands and nose clips.
- 4 Helpers give doctors record sheet.
- 5 Doctors fill in A, B, C, D in random order (can be different amounts of each).
- 6 Patients write lemon, raspberry, strawberry and peach on small pieces of paper.
- 7 Patients put on treatment explaining that headband and nose clip are the two treatments.
- 8 Researcher feeds patient what doctor shows them.
- 9 Patient shows researcher the card showing which one they think it is (i.e. peach etc).
- 10 Researcher shows doctor.
- 11 Doctor records result.

This is repeated 20 times. Doctor is then told which is which and he/she can add up how many they got correct.

Activity 11 Modelling a clinical trial

Clinical trial record sheet

Insert here at the end of the trial the treatment the patient received.	
Insert in this column 20 letters which must be A,B,C,D in random order (there need not be equal numbers of each). The sheet for each doctor should be different.	The doctors record in this column the name of the food written on the card the patient chooses each time.
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Clinical trials

1 Use the words in the box below to complete the paragraph.

expected safe trial placebo researchers drugs control effective protocols

A clinical _____ is a research study used to test vaccines and new _____. They tell us if new drugs and treatments are _____ and _____. Ideas for clinical trials come from _____.

The sets of rules that researchers have to follow when carrying out clinical trials are called _____. These will tell the researcher which types of people can take part and what they are _____ to do.

During the trial, there will be a group of people who take the new drug and a group of people who take a pill or powder that does not work. The one that doesn't work is called the _____. The group of people who take it are called the _____ group.

2 Match the key terms on the left with the meanings on the right.

Placebo	A trial where the patient does not know if they are taking the new treatment or not
Double-blind trial	A group of people who take the usual treatment or a placebo so the results can be compared to the new treatment
Control group	A medical research study
Blind trial	A drug or vaccine that does not work
Clinical trial	A trial where the patient and the doctor don't know if the patient is taking the new treatment or not