Farm smells

A group of neighbours want to advise a local farmer when to spread muck on her fields to avoid bad smells making their gardens unusable. You are going to use your chemistry knowledge and skills to help them. You will also need to use your Working Scientifically and literacy skills.

Project overview

There are four parts to this project.

Part 1

You are going to read an article about farm smells and how they spread. You will be given some questions to answer. In pairs or groups, you can then discuss ideas about the science involved. You might want to think about what you have learned about diffusion. You can work together to think about how to investigate the time it takes for substances to spread out by diffusion. You could also do some research.

Part 2

You are going to plan an investigation. There are some questions to help you. Your answers will be assessed.

You will then carry out your investigation.

Part 3

You will answer some questions about your investigation. Your answers will be assessed.

Part 4

You will summarise what you have done in a Big Write. You will write a newspaper article using what you learned in your investigation.

Part 1

Read the article. Then answer the questions on the next page to show you have understood it.

The Activate Herald

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FARM SMELLS KEEP KIDS INSIDE

Residents of Hodgkin housing estate have complained about the smell as farmers spread muck on fields near their homes. The smell, claim neighbours, has been particularly bad during the recent spell of hot weather.

Father of three, Kevin King, told The Activate Herald that 'Some days the smell is unbearable. It's much worse than last year. My kids can't play in the garden. We keep the windows closed, even in this heat.' His neighbour, twelve-year-old Adam, added: 'It stinks of animal poo. Muck spreading should be banned.'

Local farmer Jill Jones told our reporter: 'Our farm supplies milk and meat to local people, as well as wheat to a breakfast cereal company. We mix our animal waste with water and store it as slurry. Twice a year, in spring and after harvest, we spread the slurry on our fields. This improves the soil and gets rid of our waste. Spreading manure is perfectly legal. People have no reason to complain.'

The Activate Herald asked farming adviser Mel Sheppard why the smell had been so bad this year. 'You smell slurry when tiny particles from the slurry enter your nose,' said Mr Sheppard. 'On windy days the particles move with the wind. On hot, still days, like those of the past few weeks, the particles spread out by diffusion. This happens because the particles move randomly all the time. They spread out and mix with air particles. Many factors affect the speed of diffusion, including temperature.'

Questions

1 Describe what diffusion is, and explain why it happens.

(3 marks)

2 Describe and explain what happens to the speed of diffusion as temperature increases.

(2 marks)

3 Suggest one factor (other than temperature) that could speed up diffusion, and explain why this happens.

(2 marks)

Group discussion and research

In your groups, discuss the science behind the article. You can use Topic C1 1.6 in your book as a start, but you can also do some research into diffusion and the factors that affect its speed. You may want to divide up the research between group members.

Here is a selection of websites that you can use:

- www.bbc.co.uk/bitesize/ks3/science/chemical_material_behaviour/behaviour_of_matter/revision/4/
- www.chm.davidson.edu/vce/kineticmoleculartheory/diffusion.html (look at the simulation)
- www.scienceisart.com/A_Diffus/DiffusMain_1.html (first section of page only)
- http://library.thinkquest.org/27819/ch2_10.shtml

While you are doing the research, think about how you can design an investigation about one of the factors affecting the speed of diffusion.

Deciding on a question

In your group, write down a list of ideas or questions that you could investigate. You need to decide on the question that you will investigate. Remember, it must be:

- a scientific question
- a question that you can answer by collecting data.

Part 2

Questions

1 a Think about your research. Name **two** sources that you used.

1 _____

2 _____ (2 marks)

b Which one of the sources helped you most with your plan? Circle 1 or 2.

1 2

Explain your answer.

_____

_____ (1 mark)

2 Write down the question that your group has decided to investigate.

_____ (1 mark)

3 Explain why your group has decided to investigate this question.

_____

_____ (2 marks)

4 Describe how you plan to carry out your investigation. You will need to make sure that you have explained everything carefully.

This is a QWC question. You will get marks for:

- organising information clearly
- spelling and grammar
- using good English
- using scientific key words. (6 marks)

Your plan should include the following:

- a prediction
- the variables that you will change, measure, and control
- what equipment you plan to use
- what you plan to do
- how you will do the investigation safely
- how you will collect data that is precise and accurate
- a table for your results.

Investigation plan

Part 3

You have now completed your investigation.

In this part you will be **working independently** to:

- answer some questions about your investigation
- answer some questions about a similar investigation.

Questions

1 Name the variables in your investigation.

The independent variable was _____

The dependent variable was _____

One variable I controlled was _____

_____ (3 marks)

2 Look at your results.

a Did you repeat any results? Circle your answer.

Yes No

b Explain why you did or did not repeat your results.

_____

_____

_____ (3 marks)

Answer question 3(a) only if you investigated how temperature affects the speed of diffusion or how particle mass affects the speed of diffusion.

3 a What was the range of the independent variable? Give the units.

From _____ to _____ units _____ (2 marks)

b Draw a graph or bar chart of your results. You should use graph paper. (3 marks)

c Look at your graph or bar chart.

Describe what your results show.

_____

_____

_____ (3 marks)

d Write down your prediction from part 2.

My prediction _____

Do your results support your prediction? Circle your answer.

Yes No Not sure

Explain your answer. You should use examples from your results.

_____

_____

_____ (3 marks)

4 A farming adviser has conducted some tests to see how temperature affects the rate of diffusion of potassium manganate(VII) through water. Here are his results.

	Time for purple colour to spread through water (minutes)		
Temperature (°C)	**Measurement 1**	**Measurement 2**	**Mean**
0	15.0	17.0	16.0
20	3.9	4.1	4.0
30	2.2	1.8	2.0
40	0.9	1.1	1.0
50	0.5	0.5	0.5

a Write a conclusion based on these results.

_____ (1 mark)

b Suggest an explanation for your conclusion.

_____ (1 mark)

5 Explain how these results link to the article about farm smells.

_____

_____ (1 mark)

6 Suggest one possible improvement for your investigation, and give a reason for your answer.

_____

_____ (2 mark)

Part 4

The task

You are going to write a newspaper article. Your newspaper article will be for the Activate Herald. It will tell the story of what you have done.

There are three steps in this task.

1 **Planning:** You should always do some planning before you start a Big Write. Choose all of the information you want to put in your article. You can use the planning grid on the next page.

2 **Big Write:** Now you are ready to write your article. Make sure you look at your plan as you write. You should check what you have written afterwards. You could also ask someone else to read it for you.

3 **Optional group work:** Work in groups to look at some newspaper articles about science. Make a list of the things you think are important for a good article.

Brief from the Editor

Hi,

Thanks for agreeing to write this article for the paper. Please include:

- *a summary of the key points from the original article about concerns over farm smells*
- *a description of what you did*
- *any important results you have that will help people understand.*

Remember, people will want to know who was involved and if it affects them. Make sure you explain all the science clearly. Most people reading the article will not be scientists.

Yours sincerely,

Angela Ashby (Editor)

Planning grid for newspaper article

Key points from original article
Who was involved in the investigation?
Summary of method
Important data
Summary of conclusions
Ideas for a headline for the article