

# Best Evidence Science Teaching at Clayton Hall Academy



# What is 'BEST' Science Teaching?



Best Evidence Science Teaching (BEST) is a toolkit based on research carried out by the Salters Institute and the University of York Science Education Group. It allows us to:

- Identify and address any misconceptions that students might have about Science concepts through diagnostic and response questions.
- Ensure the curriculum topics are well sequenced to ensure that learning progresses in a logical way that allows students to build on and review prior learning.

How does 'BEST' help  
young people to learn  
and develop knowledge  
and skills in Science?



Education  
Endowment  
Foundation

## IMPROVING SECONDARY SCIENCE

Summary of recommendations

**1**

### **Preconceptions**

Build on the ideas that pupils bring to lessons

**2**

### **Self-regulation**

Help pupils direct their own learning

**3**

### **Modelling**

Use models to support understanding

**4**

### **Memory**

Support pupils to retain and retrieve knowledge

**5**

### **Practical work**

Use practical work purposefully as part of a learning sequence

**6**

### **Language of science**

Develop scientific vocabulary

**7**

### **Feedback**

Use structured feedback to move on pupils' thinking

1

**Preconceptions:**  
Build on the ideas that pupils bring to lessons

How  
**BEST**  
Best Evidence Science Teaching  
can help:

**Research summaries**

Research findings on common preconceptions and misunderstandings explained clearly

**Diagnostic questions**

Quickly identify the preconceptions and misunderstandings students have

**Response activities**

Adaptive teaching to meet students' learning needs and build understanding

2

**Self-regulation:**  
Help pupils direct their own learning

How  
**BEST**  
Best Evidence Science Teaching  
can help:

**Small-group discussion activities**

Engage students in metacognitive dialogue

**'Talking heads' activities**

Encourage exploratory talk

**Building explanations**

Help students to link scientific ideas through sequencing activities and explanatory stories

3

**Modelling:**  
Use models to support understanding

How  
**BEST**  
Best Evidence Science Teaching  
can help:

**Building understanding**

Explicit use of models help to explain difficult ideas and make predictions

**'Critiquing a representation' activities**

Help students to think critically about scientific models by identifying their benefits and limitations

4

**Memory:**  
Support pupils to retain and retrieve knowledge

How  
**BEST**  
Best Evidence Science Teaching  
can help:

**The 'big ideas' of science**

Developed through key concepts

**Key concepts**

Focus learning to reduce cognitive load with appropriately-sequenced learning steps

**Conceptual progression maps**

Focus teaching in students' 'zone of proximal development'

5

**Practical Work:**  
Use practical work purposefully and as part of a learning sequence

How  
**BEST**  
Best Evidence Science Teaching  
can help:

**Purposeful practical work**

Practical activities focused on developing understanding and key competencies

**'Predict-explain-observe-explain' activities**

Challenge students to apply what they know

**Cognitive conflict**

Practical activities to challenge students' misunderstandings

6

**Language of Science:**  
Develop scientific vocabulary and support pupils to read and write about science

How  
**BEST**  
Best Evidence Science Teaching  
can help:

**'Focused cloze' activities**

Consolidate understanding of key scientific terms

**'Re-phrasing' activities**

Students encouraged to express scientific ideas in their own words

**'Identifying evidence' activities**

Challenge students to identify the key ideas in passages of scientific writing

7

**Feedback:**  
Use structured feedback to move on pupils' thinking

How  
**BEST**  
Best Evidence Science Teaching  
can help:

**Progression toolkits**

All that is needed for progression without levels, including:

**Progression pathways**

Research-Informed learning steps for each key concept

**Diagnostic questions**

Provide feedback from student to teacher, to help you decide what happens next

**Response activities**

Challenge misunderstandings and build scientific thinking

# **BEST** diagnostic questions

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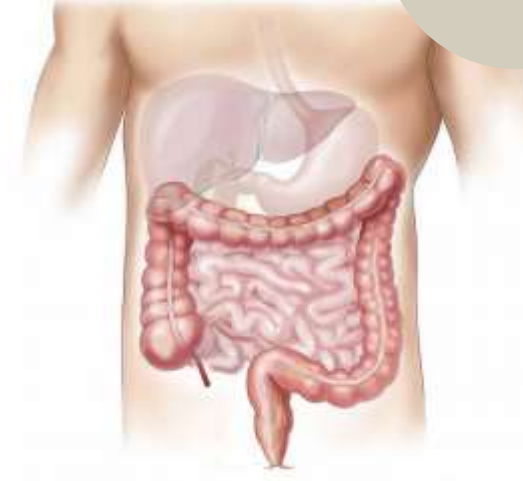
Identify the Science Misconception...

# Moving through the digestive system

Simple  
multiple  
choice

Food we swallow moves through the digestive system.

What is the main thing that causes food to move through the digestive system?



A Gravity

B Contraction of muscles in the digestive system

C Vibrations from body movements such as walking

D Swallowing more food pushes it along

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## Feedback

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4

## Memory

Support pupils to retain and retrieve knowledge



# Respiration and breathing

Focused  
cloze

Respiration is one of the processes carried out by living things.

Complete the sentences in the box.

You should only use **respiration** or **breathing** to fill each gap.



Moving air into and out of your lungs is called .....

Using food as fuel to provide energy is called .....

..... happens in all living things.

..... only happens in some living things.

..... does not happen in plants.

..... provides living things with oxygen for .....

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# **BEST** response activities

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Address the Science Misconception  
and develop understanding...

# What does C represent?

Small  
group  
discussion

Some children talk about the C in CO<sub>2</sub>.

**Alex**

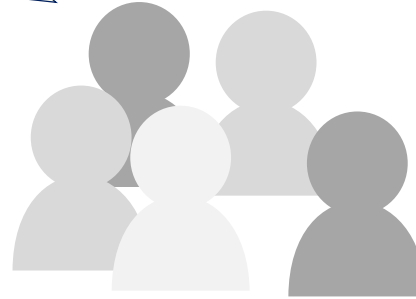
C is short for the  
element name carbon.

**Arjun**

C stands for the  
substance carbon.

**Zara**

C means one  
atom of carbon.



**Kyle**

C makes me picture a  
lump of black coal.

**Poppy**

C is the symbol for the  
element carbon.

**To talk about in your group:**

- 1 Who do you **agree** with?
- 2 Who do you **disagree** with, and why?
- 3 How would you explain the right ideas to these children?

# Cell drawings

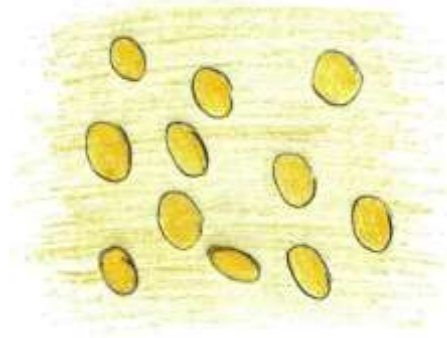
Critiquing a  
representation

Some children were asked to draw what they think **bacteria** cells look like.

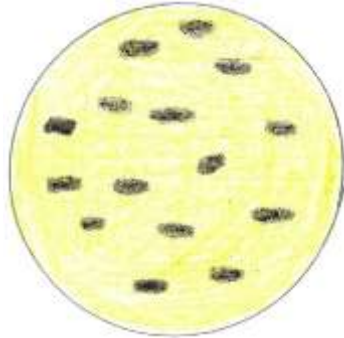
A



B



C



D



**To talk about in your group:**

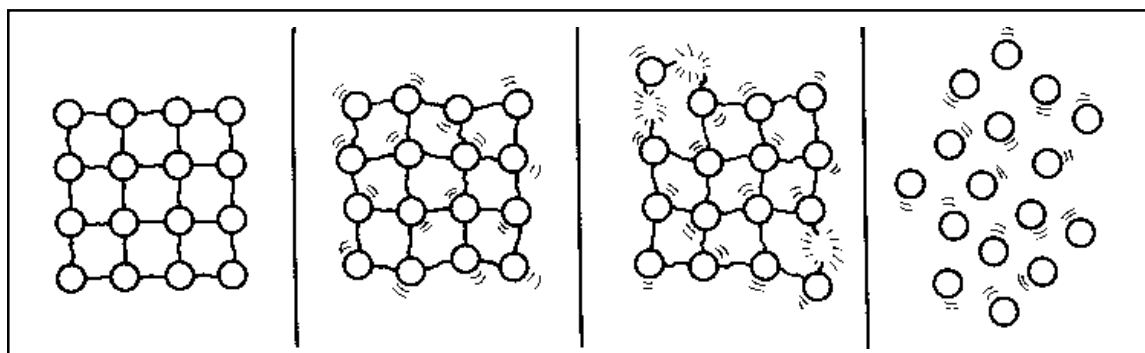
- 1 Which is the **best** drawing of bacteria cells?
- 2 Why do you think it's the best?
- 3 What is **wrong** with the other three drawings?

# Particle model - melting

Critiquing a  
model

The diagram is from a textbook.

It shows the **particle model** of a substance in the solid state melting so that the sample is in the liquid state.



## To talk about in your group

State three ways in which you think the diagram is a **good representation** of a substance melting.

State three ways in which you think the diagram is **not an accurate representation** of a substance melting.