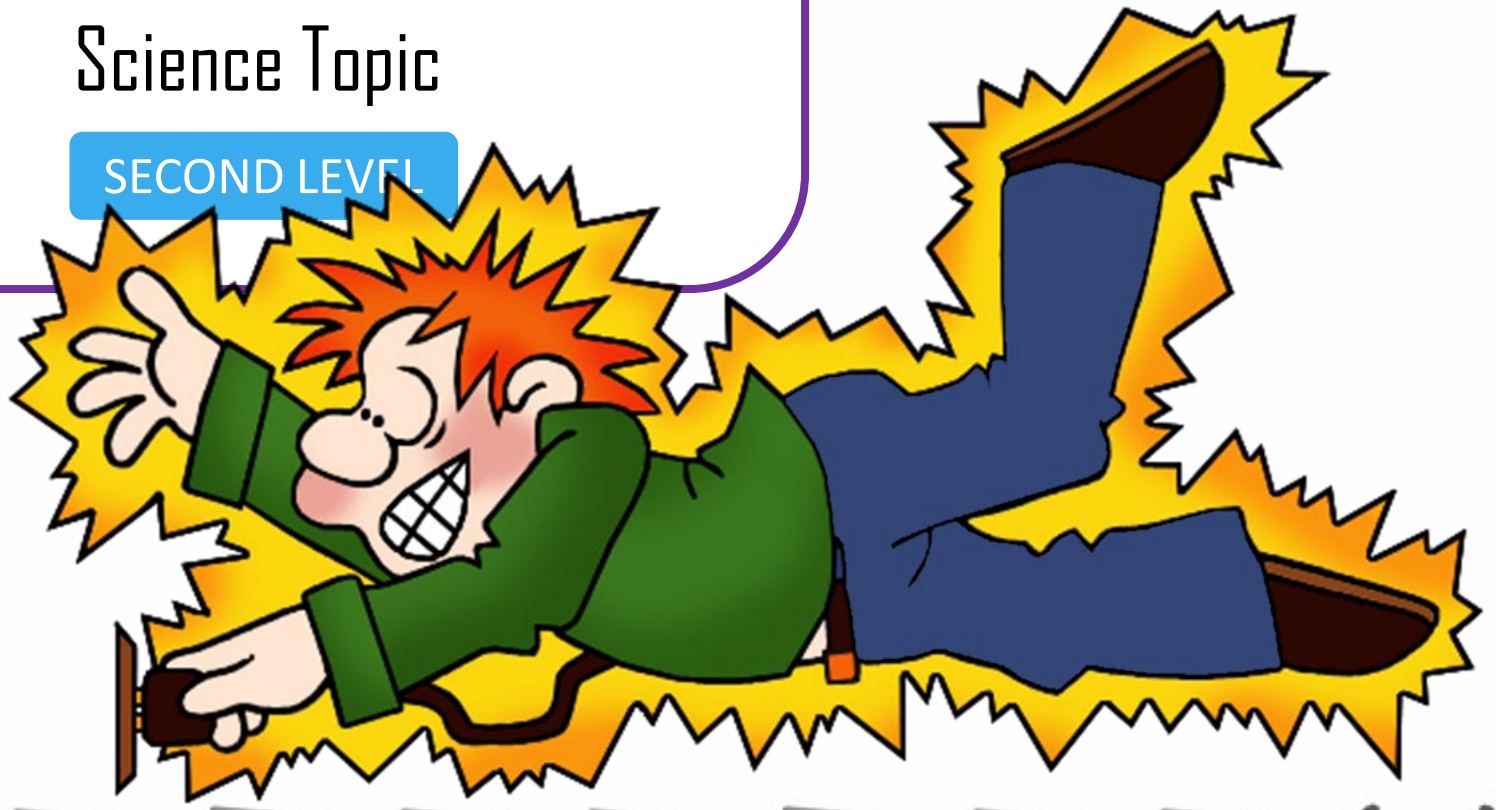
Electricity

Science Topic

SECOND LEVEL

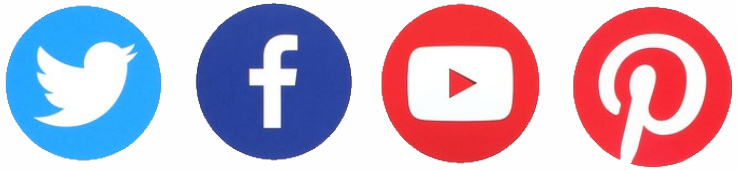


CONTENTS

BLURB

Find out about electricity! Discover the particles that make electricity work. Learn about power stations and how electricity travels. Experiment with circuits. Investigate conductors and insulators. Learn how we use electricity in our lives. Find out about the scientists that brought us electricity.

FOLLOW US ON SOCIAL MEDIA



OUTCOMES

TOPIC OR THEME	LEVEL	CURRICULUM AREA	TEACHERS
ELECTRICITY	2nd	Science	

CURRICULUM FOR EXCELLENCE OUTCOMES

ART AND DESIGN

I can create and present work that shows developing skill in using the visual elements and concepts.
EXA 2-03a
Through observing and recording from my experiences across the curriculum, I can create images and objects which show my awareness and recognition of detail.
EXA 2-04a

HEALTH AND WELLBEING

I make full use of and value the opportunities I am given to improve an manage my learning and, in turn, I can help to encourage learning and confidence in others.
HWB 2-11a
I value the opportunities I am given to make friends and be part of a group in a range of situations.
HWB 2-14a

HEALTH AND WELLBEING

I am learning to assess and manage risk, to protect myself and others, and to reduce the potential for harm when possible.

HWB 2-16a

Opportunities to carry out different activities and roles in a variety of settings have enabled me to identify my achievements, skills and areas for development. This will help me to prepare for the next stage in my life and learning.

HWB 2-19a

I am investigating different careers/occupations, ways of working, and learning and training paths. I am gaining experience that helps me recognise the relevance of my learning, skills and interests to my future life.

HWB 2-20a

LITERACY

When I engage with others, I can respond in ways appropriate to my role, show that value others' contributions and use these to build on thinking.

LIT 2-02a

I can select ideas and relevant information, organise these in an appropriate way for my purpose and use suitable vocabulary for my audience.

LIT 2-06a

I am developing confidence when engaging with others within and beyond my place of learning. I can communicate in a clear, expressive way and I am learning to select and organise resources independently.

LIT 2-10a

LITERACY

I can make notes, organise them under suitable headings and use them to understand information, develop my thinking, explore problems and create new texts, using my own words as appropriate.

LIT 2-15a

Throughout the writing process, I can check that my writing makes sense and meets its purpose.

LIT 2-23a

By considering the type of text I am creating, I can select ideas and relevant information, organise these in an appropriate way for my purpose and use suitable vocabulary for my audience.

LIT 2-26a

SCIENCE

Through exploring non-renewable energy sources, I can describe how they are used in Scotland today and express an informed view on the implications for their future use.

SCN 2-04a

I have collaborated in investigations to compare magnetic, electrostatic and gravitational forces and have explored their practical applications.

SCN 2-08a

I have used a range of electrical components to help to make a variety of circuits for differing purposes. I can represent my circuit using symbols and describe the transfer of energy around the circuit.

SCN 2-09a

To begin to understand how batteries work, I can help to build simple chemical cells using readily-available materials which can be used to make an appliance work.

SCN 2-10a

SCIENCE

Through research and discussion I have an appreciation of the contribution that individuals are making to scientific discovery and invention and the impact this has made on society.

SCN 2-20a

I can report and comment on current scientific news items to develop my knowledge and understanding of topical science.

SCN 2-20b

SOCIAL STUDIES

I can discuss why people and events from a particular time in the past were important, placing them within a historical sequence.

SOC 2-06a

I can discuss the environmental impact of human activity and suggest ways in which we can live in a more environmentally-responsible way.

SOC 2-08a

To extend my mental map and sense of place, I can interpret information from different types of maps and am beginning to locate key features within Scotland, UK, Europe or the wider world.

SOC 2-14a

I can identify essential goods and services, discuss the different ways to pay for them, considering the benefits and risks of each method.

SOC 2-21a

TECHNOLOGIES

I can investigate the use and development of renewable and sustainable energy to gain an awareness of their growing importance in Scotland or beyond.

TCH 2-02b

As I extend and enhance my knowledge of features of various types of software including those which help find, organise manage and access information, I can apply what I learn in different situations.

TCH 2-03a

Throughout all my learning I can use search facilities of electronic sources to access and retrieve information, recognising the importance this has in my place of learning, at home and in the workplace.

TCH 2-03b

I explore and experiment with the features and functions of computer technology and I can use what I learn to support and enhance my learning in different contexts.

TCH 2-04a

PURPOSE	ACTIVITIES	CRITERIA	EVIDENCE
• I am learning how electricity works. • I am developing my understanding of electrons and protons. • I am learning about jobs associated with electricity. • I am expanding my knowledge of power stations and how they work. • I am learning about renewable and non-renewable energy. • I am learning about the parts of a circuit and circuit symbols. • I am learning how circuits bring us electricity. • I am learning about conductors and insulators and how they work with electricity. • I am learning about origins of electricity. • I am learning about electrical components. • I am learning about safety. • I am learning about physicists that made important discoveries. • I am learning that experiments can prove or disprove a hypothesis. • I am learning how to record the results of an experiment. • I am expanding the way in which I carry out my research. • I am learning to speak clearly when reporting my findings.	1. Organise appliances by power. 2. Complete a worksheet on electricity. 3. EXPERIMENT: make water bend. 4. Complete a worksheet on power stations. 5. Research a renewable power station. 6. EXPERIMENT: test places for wind power. 7. Complete a worksheet on circuits. 8. Draw diagrams of open and closed circuits. 9. EXPERIMENT: build a circuit with a switch. 10. Complete a worksheet on conductors and insulators. 11. Draw a conductor and an insulator. 12. Wire a plug. 13. Complete a WHAT AM I? worksheet. 14. Research electrical items used in various places. 15. Compare activities with and without electricity. 16. Complete a worksheet on significant scientists. 17. Complete a scientists timeline. 18. EXPERIMENT: build a lemon battery.	• I can explain how electricity works and name electrical particles. • I can explain different jobs in electricity. • I can talk about the processes of a power plant. • I can differentiate between renewable and non-renewable energy sources. • I can talk about a circuit and explain how it works. • I can differentiate between a conductor and an insulator. • I can explain and give examples of how we use electricity in our lives. • I explain the importance of safety when using electricity. • I can talk about physicists who have made important scientific discoveries. • I can work in a group to carry our experiments. • I can participate in the completion of a lab report. • I can explain what hypothesis means.	**MAKE** Draw open and closed circuit diagrams. Draw a conductor and an insulator. **SAY** Verbally present information on renewable power stations. Report findings from various experiments. Talk about life before electricity. **DO** Organise appliances by power. Carry out research using a variety of resources. Carry out experiments and record results in a lab report. Create a timeline. **WRITE** Complete worksheets on electricity, power stations, circuits, conductors and insulators and significant scientists.

Electricity – Introductory Lesson

The purpose of this lesson is to get an idea of what the children already know about the subject. It is a co-operative lesson for the whole class to get involved. Spelling and handwriting are not important.

At the end of the topic it will be useful to re-visit the results of this lesson and hold a class Q&A to discuss what they have found out and any unanswered questions they still have. The Q&A could be part of an ICT lesson where the children research their unanswered questions.

SPLIT THE GROUPS

In order to get randomly selected groups ask the children to sort themselves into date of birth order. Then split the children into groups of 4 i.e. the first 4 children are one group etc.

Once in their groups the following jobs should be randomly allocated:

1. Group Leader (who likes flowers?)
2. Writer (who has the next birthday?)
3. Reporter (who has the longest name?)
4. Timer (who is wearing red?)

Sheets of A2 paper are laid out on the desks each sheet should be labelled with one of these titles:

1. What is Electricity?
2. Power Stations
3. Circuits
4. Conductors and Insulators
5. Using Electricity
6. Significant Scientists

Then split the sheet into two columns:

1. What do I know?
2. What do I want to find out?

The groups then rotate around each sheet. A time limit should be given.

PART ONE

What is Electricity?

What is Electricity? TEACHER'S NOTES

Electricity is all around us. It is used to power many items that we use every day like lights, computers, cookers and cars. In this pack we will investigate how electricity occurs and how it works.

PARTICLES

Everything in the universe is made from tiny particles with a positive, negative or neutral charge. Particles with a positive charge are called protons and particles with a negative charge are called electrons. These are called subatomic particles because they are smaller than atoms.

IMPORTANT INFORMATION
Particles with the same charge repel and particles with a different charge attract. Electrons are lighter than protons which means they move about.

ELECTRIC CURRENT

An electric current happens when electrons move to find protons. This example might help explain this further. Say there were ten protons and fifteen electrons. Ten electrons would be attracted by the ten protons, the remaining five electrons would travel to find more protons. This movement creates an electric current.

WHERE IS IT FROM?

Electricity can occur naturally or can be produced. Lightning is a form of natural electricity. Static electricity builds up in clouds, this causes an electric current to appear in the form of lightning. Produced electricity comes from power stations and is routed to our homes by overhead and underground wires.

STATIC ELECTRICITY

Static electricity is the increase of electric charge on the surface of an object. A static charge is built when two items rub against each other. The static electricity discharges by a flow of charges to or from surrounding objects. An example is walking across a carpet and then touching a metal door handle, you feel a small shock and might see a spark but it won't cause you harm.

DID YOU KNOW?
Things with equal numbers of protons and electrons are neutral (have no electric charge). The human body has perfectly balanced protons and electrons which is why we don't have an electrical charge.

MEASURING ELECTRICITY

Measuring electricity can be a complicated business. In this part we are going to find out about the simplest measurements and equations that are used to measure electricity.

RESISTANCE

Wire that is used to carry electricity can slow the flow of electrons. This is called resistance. The smaller the diameter of the wire the higher the resistance and vice versa. Resistance is measured in ohms (Ω). We will find out more about resistance in the *Conductors and Insulators* part of this pack.

CURRENT

The electrical current is the amount of electric charge that flows through a wire. It is measured in amperes (A).

VOLTAGE

Voltage is the force required to push the electrons through a wire. It is measured in volts (V).

POWER

The power of an electrical item is measured in watts (W). You find the power by multiplying the volts and the amperes.

Watt = Amp x Volt

EXAMPLE OF CALCULATING POWER

A battery generating 1.5V and producing a current flow of 1A through a flashlight bulb delivers 1.5V x 1A = 1.5W of electrical power.

WORKING WITH ELECTRICITY

ELECTRICIAN

A person who specialises in the electrical wiring of buildings, machines and equipment. They repair, build and maintain.

ELECTRICAL ENGINEER

People who develop new ways to make electricity work for us. They might work in fields like power generation, electronics and infrastructure.

PHYSICIST

A physicist is a scientist. There are many areas of physics but some physicists study and carry out experiments to better understand electricity.

What is Electricity?
ACTIVITY 1

Can you organise these appliances by power?

The table show some devices and appliances that we use in our homes.

REMEMBER: the wattage tells us the amount of power an appliance needs to work.

Working with a partner:

1. Discuss each of the appliances.
2. Rewrite the list in your jotter in order of power.
3. Answer the additional questions.
4. Report to the class.

APPLIANCE	ROOM	WATTAGE
dishwasher	KITCHEN	1400W
hairdryer	BEDROOM	1500W
TV	LIVING ROOM	200W
internet hub	LIVING ROOM	7W
game console	BEDROOM	150W
kettle	KITCHEN	1200W
curling tongs	BEDROOM	150W
TV receiver	LIVING ROOM	35W
microwave	KITCHEN	850W
vacuum	VARIOUS	1000W
alarm clock	BEDROOM	6W
toaster	KITCHEN	800W
laptop	VARIOUS	100W
tablet	VARIOUS	8W
tumble dryer	KITCHEN	3000W

EXTRA QUESTIONS

- What is the most powerful item in the bedroom?
- Which appliance uses the least power?
- Which room uses the most power?
- What is the combined power of all the bedroom items?
- Name two items with a lower wattage than a TV.
- Which room is missing from the list? Explain why.

SWITCH OFF
We can save power and the environment by switching OFF appliances we are not using!

What is Electricity?
ACTIVITY 1 - ANSWERS

Can you organise these appliances by power?

The table show some devices and appliances that we use in our homes.

REMEMBER: the wattage tells us the amount of power an appliance needs to work.

Working with a partner:

1. Discuss each of the appliances.
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4. Report to the class.

APPLIANCE	ROOM	WATTAGE
tumble dryer	KITCHEN	3000W
hairdryer	BEDROOM	1500W
dishwasher	KITCHEN	1400W
kettle	KITCHEN	1200W
vacuum	VARIOUS	1000W
microwave	KITCHEN	850W
toaster	KITCHEN	800W
TV	LIVING ROOM	200W
game console	BEDROOM	150W
curling tongs	BEDROOM	150W
laptop	VARIOUS	100W
TV receiver	LIVING ROOM	35W
tablet	VARIOUS	8W
internet hub	LIVING ROOM	7W
alarm clock	BEDROOM	6W

EXTRA QUESTIONS
hairdryer
alarm clock
kitchen
1806W
see list
The bathroom. Water and electricity don't mix, most bathrooms have very few electrical items.

SWITCH OFF
We can save power and the environment by switching OFF appliances we are not using!

What is Electricity?
ACTIVITY 2

Can you complete this electricity worksheet?

Read each sentence and write TRUE or FALSE in the box.	
An electric current happens when electrons move.	
Electrons and protons are large particles.	
Voltage is the force used to push electrons through a wire.	
The power of an electrical appliance is measure in Amps.	
The power of an electrical appliance is measured in Watts.	
Positive and negative particles attract each other.	

PARTICLES

_____ in the _____ is made from tiny _____ with a _____, negative or neutral _____. Particles with a positive charge are called _____ and particles with a _____ charge are called electrons. These are called _____ particles _____ they are _____ than atoms.

MISSING WORDS	
positive	particles
universe	subatomic
because	Everything
protons	negative
smaller	charge

Describe the job of an electrician.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

What is Electricity?
ACTIVITY 2 - ANSWERS

Can you complete this electricity worksheet?

Read each sentence and write TRUE or FALSE in the box.	
An electric current happens when electrons move.	TRUE
Electrons and protons are large particles.	FALSE
Voltage is the force used to push electrons through a wire.	TRUE
The power of an electrical appliance is measure in Amps.	FALSE
The power of an electrical appliance is measured in Watts.	TRUE
Positive and negative particles attract each other.	TRUE

PARTICLES

Everything in the universe is made from tiny particles with a positive, negative or neutral charge. Particles with a positive charge are called protons and particles with a negative charge are called electrons. These are called subatomic particles because they are smaller than atoms.

MISSING WORDS	
positive	particles
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protons	negative
smaller	charge

Describe the job of an electrician.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

What is Electricity? EXPERIMENT

EQUIPMENT		
	comb	pencil and paper
	hair	stream of water

Can you make water bend?

The purpose of this experiment is to find out if an electrically charged comb can make water bend.

Organise yourselves into groups of four using MAKE A WORD.

Allocate these jobs.

1. The person without a jumper on is the **team leader**.
2. The person with the longest name is the **charger**.
3. The person with a watch on is the **recorder**.
4. The person who is having a packed lunch is the **reporter.**

INSTRUCTIONS

1. In your group, discuss the experiment.
2. Write your hypothesis (prediction) before you begin the experiment.
3. Gather your equipment.
4. Use a sink where you can have a long stream of water, not a small bathroom sink.
5. Turn on the tap.
6. The charger should run the comb through their hair five times, this gives the comb a static electricity charge.
7. Put the comb near the stream of water.
8. Observe what happens.
9. Note anything important from the experiment.
10. Complete your lab report.
11. Report and discuss with the class.

TEAM LEADER	RECORDER	CHARGER	REPORTER
Keeps everyone on task.	Takes notes. Completes the lab report.	Runs the comb through their hair.	Tells the class what you have found out.

Bending Water Experiment LAB REPORT

EQUIPMENT

HYPOTHESIS

(What you think will happen?)

_____

_____

_____

_____

PICTURE OF YOUR EXPERIMENT

WHAT YOU DID

_____

_____

_____

_____

_____

_____

_____

_____

Was your hypothesis correct?	YES	NO

IMPROVEMENTS?_____

_____

_____

RECORD A VIDEO OF YOUR EXPERIMENT AND TWEET US @LittleMooseEd

ACTIVITY HINTS AND TIPS

ACTIVITY 1

Reading / Research

CO-OPERATIVE LEARNING

The children could work with partners or larger groups for this activity.

EXTENSION TASK

The children could discuss the items in the classroom and what wattage they might have. The wattage might be listed on some items or could be found out using the internet.

ACTIVITY 2

Reading

CO-OPERATIVE LEARNING

The children could work in pairs or as a class to complete this task and encourage discussion about the topic.

EXTENSION TASK

The children could make their own true or false statements to test their classmates.

EXPERIMENT

Bendy Water

CO-OPERATIVE LEARNING

The children could spend some time discussing how well they worked in their groups. Is there anything they could have done differently? Would they have preferred a different role?

EXPERIMENT EXPLANATION

Electrons move from hair to the comb to give the comb a negative electrical charge.

Water contains negatively charged oxygen and positively charged hydrogen. The negative charge of the comb attracts the positive hydrogen and causes the water to bend.

MAKE A WORD

To make matching easier you could mark the pieces 1-4 so the children know if they have the first, second, third or fourth piece.

EL	ECT	RIC	ITY	ELECTRICITY
PO	SI	TI	VE	POSITIVE
NE	GAT	IV	E	NEGATIVE
VO	LT	A	GE	VOLTAGE
CU	RR	EN	T	CURRENT
AM	PE	RE	S	AMPERES
PA	RT	IC	LES	PARTICLES
ELE	CTR	IC	IAN	ELECTRICIAN

Assessment 1

By completing these tasks your teacher can see how much you have learned about electricity. You can look back in your jotter to help you answer the questions.

Answer these questions in sentences.

1. Do protons have a positive or negative electrical charge?
2. What type of electricity is created by rubbing two items together?
3. Particles with the same charge attract each other. TRUE or FALSE?
4. What unit is used to measure the power of an appliance?
5. Name one job related to electricity.
6. Human bodies have a neutral electric charge. TRUE or FALSE?
7. What unit is used to measure voltage?
8. Amperes are used to measure electrical CURRENT or POWER?
9. Which has the highest wattage – LAPTOP or DISHWASHER?
10. Name one type of natural electricity.

Write a paragraph explaining why you would or would not like to be an electrical engineer.

Draw a picture of any household appliance.

Assessment 1 - ANSWERS

Answer these questions in sentences.

1. Do protons have a positive or negative electrical charge?
2. What type of electricity is created by rubbing two items together?
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9. Which has the highest wattage – LAPTOP or DISHWASHER?
10. Name one type of natural electricity.

1. Positive. Electrons have a negative charge.
2. Static electricity.
3. FALSE, opposites attract and same repel.
4. Watt.
5. Electrician, electrical engineer, physicist.
6. TRUE, we have an equal number of protons and electrons.
7. Volts.
8. CURRENT.
9. DISHWASHER.
10. Lightning.

Extension Tasks 1

These are internet based tasks for early finishers. They can be done on an iPad or a computer.

Find out the Wattage of these electrical appliances. Type into Google 'what is the wattage of a…'	
fridge	
iPad	
bluetooth speaker	
home printer	
electric cooker	
freezer	
personal computer	
steam cleaner	

Tweet us your work @LittleMooseEd

O	V	O	L	T	A	G	E	E	S
P	T	P	P	Z	Y	R	R	L	W
P	N	E	O	Y	Y	J	M	E	R
H	E	L	W	S	M	E	T	C	T
Y	R	C	E	C	M	Q	B	T	N
S	R	I	R	K	H	G	N	R	O
I	U	T	H	N	E	E	G	I	R
C	C	R	E	T	G	O	S	C	T
I	G	A	G	A	O	P	A	I	C
S	A	P	T	F	W	Y	S	T	E
T	J	I	A	V	H	T	M	Y	L
K	V	L	L	J	A	Y	Y	J	E
E	E	V	I	T	I	S	O	P	H
K	Q	S	I	K	E	Y	N	S	S
G	X	C	J	S	K	A	T	F	B

FIND THESE WORDS IN THE WORD SEARCH.

- voltage
- power
- current
- electron
- particle
- static
- electricity
- negative
- positive
- physicist

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