

Physical and Chemical Changes (Class 7)

Introduction	This project gives learners a chance to study physical and chemical changes that happen in their daily lives in Nagaland. Through hands-on experiments using locally available materials, observations, discussions, and a group exhibition, learners learn how matter changes its shape, colour, temperature, or state, and which changes create an entirely new substance. Learners think like scientists, connecting classroom concepts to everyday realities around them: fermenting axone, burning firewood, rusting farming tools, and ripening fruits. Upload a photo of the completed exhibition to the project completion form.
Lesson	Lesson 5: Changes Around Us – Physical and Chemical Changes
Leading Question	<i>Why do some changes around us stay forever, while others can be undone?</i>
Expected Time	In class: 5 days, 40 minutes per day At home: 3 to 4 days, 15 to 20 minutes per day
Materials Needed	Candle, matchbox, chalk pieces, milk, lemon juice, baking soda, iron nails, copper sulphate solution (if available, else use vinegar and baking soda), ferrous sulphate solution and sodium hydroxide (teacher demonstration only), firewood ash (collect from kitchen), axone or fermented local food, water, small clay pots or bowls Note: Inform learners one day in advance if any material needs to be brought from home (e.g., lemon, clay pot, axone).
Learning Outcomes	By the end of this project, learners will be able to: Knowledge-based Outcomes: - Distinguish between physical and chemical changes using observable signs (colour change, gas formation, temperature change, precipitate formation). - Classify changes from Nagaland daily life (making axone, burning firewood, rusting of dao) as physical or chemical. - Explain why some changes can be reversed and others cannot. - Identify real-life uses and effects of chemical changes in the local context. 21st Century Skill Outcomes: - Critical Thinking: Analyse observations from experiments and draw conclusions about the nature of change. - Collaboration: Work in mixed-ability groups to plan and carry out experiments and build the exhibition chart. - Communication: Present findings clearly during the group exhibition and respond to questions from peers. - Creativity: Design a visually engaging exhibition chart using local examples and hand-drawn illustrations.
Suggestions for Teachers	- Review each day's plan and materials before class. - Divide learners into mixed groups (gender and ability) before Day 1. - Assign roles: Leader, Recorder, Materials Manager, Reporter, Observer. - Encourage learners to ask questions and think independently rather than waiting for answers from the teacher. - Connect every activity to local Nagaland experiences: axone fermentation, Hornbill Festival fires, paddy processing, rusting of dao and sickle. - Pay attention to safety: never allow learners to taste chemicals, smell unknown gases, or touch fire without supervision. - Display the completed exhibition charts on the classroom wall at the end of Day 5.

Day 1 - Learners will classify familiar Nagaland changes as reversible or irreversible and state the Main Question in their own words.

Time	Activity and Description
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Before class	Candle (1 per 2 groups), matchbox (1), chalk pieces (1 per group), butter or chocolate scrap (small amount, optional), ice (if available) or cold water, notebooks and pens
10 min	Introduction to the Project and Safety Rules (Whole Class) Teacher says: <i>Think about your morning today. Your mother may have lit the firewood to cook rice. The firewood burned and turned to ash. Can we get that firewood back?"</i> <i>"Now think about this: she also boiled water. That water became steam. Can we get that water back?"</i> <i>"Today we begin a project where we will become scientists and ask one big question about changes happening right here in Nagaland.</i> Write the Leading Question on the board and read it aloud together: <i>Why do some changes around us stay forever, while others can be undone?</i> Teacher says: <i>By Day 5, each group will create an exhibition chart showing physical and chemical changes from your own village and daily life. You will present this to the whole school.</i> Share product criteria with learners (write on board and leave displayed throughout the project): • Chart shows at least 4 physical changes and 4 chemical changes in daily life. • Each example has a hand-drawn illustration and a 1 to 2-line explanation. • Signs of chemical change are labelled wherever applicable. • Every group member can explain at least one example during the exhibition. Safety rules (read aloud): • Listen to instructions before touching any material. • Never taste, smell, or handle chemicals without permission. • Inform the teacher immediately if anything breaks or spills. • Stay calm and alert at all times during experiments.
10 min	<u>Activity 1: Changes in Nagaland Life – Discussion (Whole Class)</u> Teacher says: <i>Think of any change you saw at home or on your way to school today. Tell me one change.</i> <i>I will write your answers on the board in two columns: 'Can go back' and 'Cannot go back'.</i> Teacher's Instructions: • Ask learners for examples. Prompt if needed: cutting bamboo, cooking rice, making axone, drying clothes, burning firewood. • Write examples in two columns on the board: Reversible and Irreversible. • Ask: "After this change, did the object remain the same or did something new form?" • Place an iron nail in a glass of water (keep until Day 2 for observation). • Take 2 to 3 minutes to revisit the leading question: "Think about the examples on the board. Which ones stay forever? Which can be undone? Keep this question in mind as we work through this week." Discussion Questions: • Are all changes the same? • Is there any change that cannot be reversed no matter what? • Do changes happen only in solid objects? (Critical Thinking)
10 min	<u>Activity 2: Hands-on Observation – Visible Changes (Group Activity)</u> Teacher says: <i>Now we will touch and change some objects. Observe carefully and record what you see. In your groups, assign roles now: Leader, Recorder, Materials Manager, Reporter, Observer.</i> Teacher's Instructions: • Distribute to each group: 1 piece of chalk, 1 small candle, butter or chocolate scrap if available. • Learners break the chalk, observe the candle flame briefly (with teacher supervision), melt the butter or chocolate using warm water. • Each learner records in their science diary: What changed? Did anything new form? Can it go back to the original? • Reporter shares observations with the class. Discussion Questions:

	• When chalk breaks, does a new substance form? • When butter melts, does its smell or taste change? • When a candle burns, does only shape change or something else too?
10 min	Activity 3: Introducing Physical and Chemical Change + Consolidation (Whole Class) Teacher says: <i>When something only changes shape or size but stays the same thing, we call it a physical change.</i> <i>When something new is formed and we cannot go back, we call it a chemical change. Making axone from soybeans is a chemical change. Once it ferments, it cannot go back to raw soybeans.</i> Teacher's Instructions: • Draw a T-chart on the board: Physical Change Chemical Change. • Ask groups to contribute one example each from their observations. • Learners write 2 examples of each type in their diary. • Close by returning to the leading question: "Today's examples help us start answering our question. Think tonight about changes you see at home." Discussion Questions: • Can all changes be reversed? • Is breaking always a physical change? • Is burning always a chemical change?
Homework	• Find 3 physical changes and 3 chemical changes at home. Write each example and explain in one line why it belongs to that type. • Bring one example related to food preparation or farming to share tomorrow.

Day 2 - Learners will identify the four signs of chemical change through experiments using local materials and connect these signs to Nagaland's daily life.

Time	Activity and Description
Before class	Materials Iron nail kept in water from Day 1 (for observation), lemon (1 per 2 groups), baking soda (small amount per group), cups or bowls, milk (100 ml per 2 groups), lemon juice, copper sulphate solution and iron nails (if available), else vinegar and baking soda, science diaries and notebooks
10 min	Recap and Signs of Chemical Change (Whole Class) Teacher's Instructions: • Hold up the iron nail kept in water since Day 1. Ask: "What has changed on this nail? Can you see anything on its surface?" • Ask learners to share homework examples. Write 3 to 4 on the board. • Revisit the leading question: "Yesterday we sorted changes into physical and chemical. Today we ask: how do we know a chemical change is happening? What signs tell us?" Write the 4 signs of chemical change on the board: • Change in colour • Release of gas (bubbles, smell) • Change in temperature (heat or cold produced) • Formation of a new solid (precipitate) Teacher says: <i>When axone is prepared, soybeans ferment. There is a strong smell. That smell is a gas being released. That is a sign of chemical change.</i>
10 min	Experiment 1: Lemon and Baking Soda (Group Activity) Teacher says: <i>Let us mix two common kitchen things and see what happens. This is like when you cook with baking soda at home.</i> <i>Squeeze the lemon juice into the cup. Slowly add a pinch of baking soda. Watch carefully.</i> Teacher's Instructions: • Distribute: half a lemon and a small amount of baking soda per group. • Learners squeeze lemon juice into a cup and add baking soda slowly.

	- Recorder writes: What did you see? Was there a sound? Did temperature change? Any smell? - Reporter shares with the class. Teacher connects observation to signs on the board. Discussion Questions: - Which sign did we observe? (gas formation – bubbles) - Can we get baking soda and lemon juice back separately? Why or why not? - Where else have you seen this kind of bubbling at home?
10 min	Experiment 2: Milk and Lemon Juice – Solid Formation (Group Activity) Teacher says: <i>Now we will make something you eat at home. When we add lemon juice to milk, what do we get? Let us see it as a chemical change.</i> Teacher’s Instructions: - Give each group: a cup of milk and lemon juice (already squeezed). - Learners add lemon juice slowly into the milk and observe. - Learners record: colour change, solid forming, smell change. Teacher says that <i>the white solid formed is called a precipitate and is a new substance formed due to a chemical change.</i> In some places this solid is used to make paneer or curdled milk products. Note: Since some learners may not be familiar with paneer, the focus should remain on observing the formation of a new substance rather than recognising the food item itself. Discussion Questions: - Is the precipitate the same as milk? (No, it is a new substance.) - Can we get the original milk back? (No.) - Which sign of chemical change appeared here? (Precipitate formation.) - How is this similar to making traditional local foods?
10 min	Teacher Demonstration: Copper Sulphate and Iron Nail (Whole Class) Note: This activity is done by the teacher. Keep chemicals away from learners. Teacher’s Instructions: - Place an iron nail in a cup of copper sulphate solution (blue). Learners observe from their seats. - After 5 minutes, lift the nail. Ask learners what they see on the nail’s surface. - Explain: the iron has displaced copper. A reddish copper layer has formed on the nail. The blue colour of the solution fades. - Learners draw a before-and-after diagram in their diary. - Revisit the leading question: “This change cannot be reversed. This is a permanent chemical change. Is that like the burning firewood or like cutting bamboo?” <i>If copper sulphate is unavailable, place the Day 1 rusted nail under discussion and observe the rust as the colour change sign.</i> Discussion Questions: - Which sign was visible in this experiment? - Why do the tools used in paddy farming (dao, sickle) rust? Is that a physical or chemical change? - Can rusting be reversed?
Homework	- Find 3 chemical changes at home. Write each one and identify the sign (gas, colour, solid, temperature). - Optional: Ask an elder at home what happens when axone is prepared. Write 2 to 3 sentences.

Day 3 - Learners will sort Nagaland daily-life examples into physical and chemical changes, build their exhibition chart, and give structured peer feedback to another group.

Time	Activity and Description
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Before class	Materials Change cards (teacher-written on small paper scraps, see list below), chart paper (1 per group), coloured sketch pens, glue, scissors, science diaries
5 min	<u>Recap (Whole Class)</u> Teacher's Instructions: - Ask: "Tell me one sign of chemical change from your homework examples." Take 3 to 4 quick responses. - Write the 4 signs back on the board. - Briefly revisit the leading question: "Today we compare both types of changes. This comparison will go directly onto your exhibition chart."
10 min	<u>Activity 1: Change Card Sorting (Group Activity)</u> Teacher's Instructions: Prepare change cards in advance (write examples on small paper pieces, one example per card). Change Card Examples: - Cutting bamboo into strips - Folding banana leaves for serving food - Preparing axone (fermented soybean) - Ripening of fruit on the tree - Drying clothes in the sun - Breaking firewood into smaller pieces - Milk turning sour overnight - Burning candle - Preparing smoked bamboo shoots - Smoking of fish and meat - Drying chillies in the sun for storage - Fermenting vegetables for later use - Grinding rice into flour - Rusting of dao or sickle left in rain - Burning firewood for cooking - Cooking rice in a pot Teacher says: <i>Each group gets 6 change cards. Read each card. Decide together: is this a physical change or a chemical change? Sort them into two groups on your table.</i> - Give each group 6 to 8 cards. Groups sort cards into Physical and Chemical piles. - Leader explains reasoning. Teacher circulates and asks probing questions. - Groups share one disagreement: which card was hardest to sort and why? (Collaboration, Critical Thinking)
15 min	<u>Activity 2: Building the Exhibition Chart (Group Activity)</u> Teacher says: <i>Now we turn your sorted cards into a chart that the whole school will see. This chart must show physical and chemical changes from your life, with drawings and labels.</i> Teacher's Instructions: - Give each group one sheet of chart paper. - Groups create a two-column chart: Physical Changes Chemical Changes. - Each group selects at least 4 examples per column (using their sorted cards and homework examples). - For each example, learners draw a simple illustration and write 1 line of explanation. - For chemical change examples, learners label the sign (colour, gas, solid, or temperature). - Materials Manager distributes sketch pens and ensures all group members contribute. (Creativity, Collaboration)
10 min	<u>Peer Feedback and Revision (Group Activity)</u> Teacher says: <i>Swap your chart with the group next to you. You will give them honest, helpful feedback. Think: Is the chart clear? Are the examples correct? What one thing would you change?</i>

	Peer Feedback Questions (write on board for reference): - Is the chart easy to read and understand at a glance? - Are the examples sorted correctly into physical and chemical? - Are the signs of chemical change correctly labelled? - What is one specific thing this group could improve? Teacher's Instructions: - Pair groups together (Group 1 reviews Group 2 and vice versa). - Reporter from each group shares one piece of feedback aloud. - Groups receive their chart back and make 1 to 2 revisions based on feedback. - Each learner answers in diary: What is one thing I would change or improve in our chart? (Communication, Critique and Revision)
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Day 4 - Learners will revise their exhibition chart based on feedback, practise their group presentation, and reflect on their process.

Time	Activity and Description
Before class	Materials Group exhibition charts from Day 3, sketch pens, additional chart paper scraps for corrections, science diaries
5 min	Recap (Whole Class) Teacher's Instructions: - Return charts to groups. Ask each group to read the feedback they received yesterday. - Ask: "What one change will you make today based on the feedback?" - Revisit the leading question: "Your chart is almost ready to answer our big question for the school. Does your chart show both types of changes clearly?"
10 min	Activity 1: Melting vs. Burning – A Candle Comparison (Whole Class Demonstration) Teacher says: <i>Before we finalise the charts, let us do one final experiment that shows both types of change in the same object. Watch carefully.</i> <i>"First, I will heat the candle slightly, without lighting it, to melt it. Then I will light it. What is different?"</i> Teacher's Instructions: - Heat the candle base slightly (using warm water or a warm surface) to show melting. Ask: Does a new substance form? Can the wax go back? (Physical change.) - Light the candle. Learners observe: smoke, gas, smell, black residue. Ask: Is this reversible? Does a new substance form? (Chemical change.) - Learners write one sentence each for melting and burning in their diary: type of change and reason. Discussion Questions: - Can both physical and chemical changes happen to the same object? - When firewood burns at home during winter, which type of change is that? - Which sign of chemical change did we see when the candle burned?
15 min	Activity 2: Chart Revision and Finalisation (Group Activity) Teacher says: <i>Now use the next 15 minutes to finalise your chart. Every group member should be able to explain at least one example on the chart tomorrow.</i> Teacher's Instructions: - Groups revise their charts based on peer feedback from Day 3. - Reporter assigns each member one example to own and explain for the presentation. - Observer checks: Is the chart readable from a distance? Are labels clear? - Recorder writes a short group summary (5 sentences) in the diary: What is physical change? What is chemical change? Give one example of each from Nagaland life. (Collaboration, Learner Voice and Choice)

10 min	<u>Reflection (Individual Activity)</u> Learners answer the following in their science diary: • What is the most important thing I learned this week about changes? • Which experiment helped me understand best, and why? • How does what I learned connect to something in my home or village? • What is one thing I would change or improve in our exhibition chart? • Do I feel ready to explain our chart to someone outside the class tomorrow? What do I still want to practise? Ask 2 to 3 learners to share one reflection aloud. (Reflection)
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Day 5 - Learners will present their exhibition charts to the school community, respond to questions, and reflect on the full project experience.

Time	Activity and Description
Before class	Materials Completed exhibition charts from all groups, tape or string to display charts on the wall or board, science diaries for reflection Note: Invite another class, the school head, or any available community member to attend the exhibition. Displaying charts on the classroom wall is sufficient if no external audience is available.
5 min	<u>Setting Up the Exhibition (Whole Class)</u> Teacher's Instructions: • Ask each group to display their chart on the wall or board. • Each group stands near their chart. • Briefly revisit the leading question one final time: "Today you will answer the big question through your charts. After all presentations, we will answer it together as a class."
25 min	<u>Group Presentations and Q&A (Public Product)</u> Teacher says: <i>Each group will get 3 minutes to present their chart. Point to each example as you explain it. After every presentation, the audience can ask one question. Speak clearly. Use what you have learned all week. You are scientists presenting real science today.</i> Teacher's Instructions: • Each group presents for 3 minutes. Reporter leads; each member explains their own example. • After each presentation, allow 1 minute for audience questions. • Teacher gives brief positive feedback after each group: acknowledge one strong point. • After all groups, ask the class: "Which group showed a change from Nagaland life that surprised you?" (Communication, Public Product, Learner Voice and Choice)
10 min	<u>Final Reflection and Closing (Whole Class)</u> Teacher says: <i>Let us now answer our big question together: Why do some changes around us stay forever, while others can be undone?</i> <i>Turn to your partner: Give one example of each type from your chart and explain the reason in one sentence.</i> Take 2 to 3 pairs to share their answers aloud. Closing reflection in diary (learners write 2 sentences): • What was the most interesting moment for me across all 5 days? • What will I look at differently in my kitchen or village after this project? Teacher's Instructions: • Leave all charts displayed on the classroom wall. • Please scan the QR code in the handbook and fill the project completion form. Upload a photo of the exhibition. • Remind learners that the chapter will now be read in the textbook to deepen their understanding.

Assessment Criteria

A majority of my learners were able to:

- ☐ Classify at least 4 examples from Nagaland daily life correctly as physical or chemical change.
- ☐ Identify at least 2 signs of chemical change during or after the experiments.
- ☐ Explain in their own words why some changes cannot be reversed, using at least one local example.
- ☐ Contribute meaningfully to their group's exhibition chart and presentation.

Public Product Criteria

Each group's exhibition chart must meet the following criteria:

- Shows at least 4 physical changes and 4 chemical changes, all drawn from Nagaland daily life.
- Each example includes a hand-drawn illustration and a 1 to 2 line explanation.
- Signs of chemical change (colour, gas, solid, temperature) are correctly labelled.
- Every group member can explain at least one example clearly during the presentation.
- The chart is legible and visually organised when viewed from a distance of 2 metres.

Additional Enrichment Activities

For learners who complete the core tasks early or want to go deeper:

- Investigate and write: Is the preparation of rice beer (zutho) in Nagaland a physical or chemical change? List all signs that support your answer.
- Design a simple test: How would you prove to a younger learner that rusting is a chemical change and not just dirt? Write a 5-step plan.
- Extend the chart: Add a third column titled 'Useful or Harmful?' and mark each example. Be prepared to justify your choice during the exhibition.

Modifications for Simplification

Constraint	Modification
Limited time (fewer than 40 minutes available)	Combine Days 3 and 4: skip the candle comparison demonstration on Day 4 and use the time saved to complete chart revision. The peer feedback and exhibition remain unchanged.
Limited materials (no copper sulphate, lemon, or baking soda)	Replace chemical experiments with observation-based activities: observe the rusted nail from Day 1, observe a piece of dry and cooked rice, and discuss axone preparation from memory. The 4 signs of chemical change can still be identified and recorded.
Mixed ability levels	Ensure groups are mixed by ability. Assign the Recorder role to a stronger learner initially, but rotate roles on Day 3 so every learner has a speaking or writing task. Provide simpler change card examples (cutting bamboo, drying clothes) to groups that need more support.

Chapter-Project Mapping

Corresponding SCERT Chapter: Chapter 5 – Physical and Chemical Changes

Chapter Topic	Chapter Sub-Topic	Coverage	Day(s)
Physical Changes	Reversible changes, change in shape/state	Yes	Day 1, Day 3
Chemical Changes	Formation of new substance, irreversibility	Yes	Day 2, Day 3
Signs of Chemical Change	Colour, gas, temperature, precipitate	Yes	Day 2, Day 3
Examples from Daily Life	Rusting, cooking, fermentation	Yes	All Days

Burning of Magnesium Ribbon	Demonstration of chemical change with light	Partial – chemical change covered; magnesium ribbon demo not done due to safety and resource constraints	Day 2 (teacher demo adapted)
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Appendix 1: Peer Feedback Form

Group giving feedback: _____ Group being reviewed: _____

No.	Question	Our Observation	Score (1–3)
1.	Is the chart easy to read and understand at a glance?		
1.	Is the chart easy to read and understand at a glance?		
2.	Are the examples sorted correctly into physical and chemical change?		
3.	Are the signs of chemical change correctly labelled?		
4.	Are the illustrations clear and connected to the examples?		
5.	One specific thing this group could improve:		

Score guide: 1 = Needs more work 2 = Good 3 = Excellent

Appendix 2: Learner Observation Table (Days 1 to 3)

Name: _____ Group: _____

Example	What changed?	New substance formed? (Yes/No)	Reversible? (Yes/No)	Physical or Chemical?
Chalk breaking				
Butter melting				
Candle burning				
Lemon + baking soda				
Milk + lemon juice				
Iron nail in water				
My own example: _____				