

Lesson Plan:

This plan is based on Chapter 'Physical and chemical changes' NCERT textbook.

It is written to help develop critical thinking in students.

Class- 7

Subject: Science

Time: 9-10 days

Day 1: Demonstration and discussion (Introducing the topic)

Day 2: Group Activities, discussion (Hands-on experience/using Google docs and figuring out themselves)

Day 3: Demonstration (Activities given in textbook)

Day 4: Power point presentation, Role of physical/chemical changes, problem solving.

Chapter: 6	Science: Physical and Chemical Changes
Class Transaction (9-10 days)	Total : 4 periods (approx. 35 min each) Sub topic: Introduction to changes, understanding physical and chemical changes. Sub topic: Analysing evidences for physical/chemical changes Sub topic: Understanding chemical changes Subtopic: Role of physical and chemical changes, consequences and implications.
Learning Objective:	• To appreciate that changes are constantly taking place in the world around us. • To understand that these changes can be broadly grouped into two categories- physical and chemical changes. In a physical change, the external appearance changes, while in a chemical change, a new substance is formed. • To develop critical thinking skills. • To develop observational skills and attitude of inquiry.
Learning outcome (Cognitive, behavioural and attitudinal)	Students will be able to : • Observe the process, maintain record of the changes. (behavioural) • Differentiate, between physical and chemical changes and give reasons with evidence. (cognitive) • Understand the implications and consequences of such changes. (attitudinal)

Common Misconceptions:	- Mixing colours is a chemical change. - Physical changes are slow and chemical changes are fast. - Physical changes are reversible but all chemical changes are irreversible. - Man- made changes are physical changes while natural changes are chemical changes.
Pre-requisite knowledge	Knowledge about changes.
Transaction Methodology	
Introduction: (to make students curious/wonder about the topic)	Teacher introduces the topic with questions: (Brainstorming) ➤ What is the meaning of ‘change?’ ➤ Why does iron rust but not stainless steel? ➤ When we eat a pizza, what are the changes taking place?
Day 1 Learning Objective	To understand that changes are of two types – Physical change and Chemical change.
Demonstration by teacher Guided inquiry	<u>Changes to a sheet of paper-</u> Activity I: Bend, fold, tear, shred, wet it. - Ask: ‘Did the paper change? What is left behind? Can it be put back, sort of?’ - Ans. : The size and shape of the paper has changed. It can be put back. It is still paper. Activity II: Burn a very small piece, water cup nearby. Put the burning paper into the water immediately. Safety rules to be explained- (Not to be tried at home. Not all things are to be tasted). - Ask: ‘What is left after the paper burns? How is it different from the previous changes?’ - Ans.: The ash remaining has different colour, texture. It cannot be put back into paper. - Ask : If it cannot be put back, what inference can I draw? - Ans: A new substance has been formed, which is not the original paper.
Recording observations	To demonstrate how to record observations- Draw three columns on blackboard with headings

Drawing inferences based on evidences	Table I		
	Observations	Activity I	Activity II
	Change in 1.Colour 2.texture 3. taste 4.shape 5. size 6. smell 7 .Temperature change 8. Speed of the change 9. Any other		
	Can it be put back?	Yes,	No
	What changes are common in the above two activities?		
	What changes are different in the above two activities?		
	What can you infer from the above facts/ evidences? Inference:	The paper has changed in appearance but it still remains as paper. No new substance is formed.	Paper has become ash. A new substance is formed.
	Conclusion	Physical change	Chemical change
Demonstrate how to reason with evidence	Explain : 1. Based on the evidences (observations), we can infer that two different changes have occurred. 2. In Activity I, change the shape, size, appearance has changed. The ‘form’ of the substance has changed. 3. It can be put back easily (a wet paper can be dried, torn bits can be stuck again). Conclusion: Such changes are ‘Physical changes’; ‘physical’ meaning the ‘looks’ of it have changed. No new substance has formed.		

	4. In Activity II, the shape, size, colour, texture, etc. have changed. Heat is needed to bring this change. 5. The original substance (paper) cannot be brought back. 6. A new and different substance has formed. Conclusion: It is a chemical change.
Home work	Work sheet 1: Write down the changes you will observe in the following: Bending a wire, crushing a piece of chalk, squeezing a lime, curdling the milk. Use Table II given in the appendix. 1. Give reasons for your inferences. 2. What are your conclusions about the type of change they are?
Day 2 Learning Objective	To analyse the evidences for a chemical change.
Group Activity (As group activities may not be possible due to Covid lockdown, teacher may demonstrate and discuss with students. Observations may be noted down in their notebooks/ Google docs).	Group Activity: 4 groups. Activity A: Purpose: To understand the difference between ‘mixing’ and ‘reacting’ 1. Add red colour (rangoli powder) to water. Predict: What will happen when the powder is added to water? Procedure: Add ½ tsp of red powder to 100 ml water. Stir well with a stirrer. Observation: Record your observations. What properties have changed? Can we get back the substances?  (Ans: the powder has partly mixed with water. We can separate them by filtration and evaporation.) Inference: based on ----- evidence----- I infer, that -----. Critical thinking: Can you think of another example of <i>mixing</i>?  Ans (different coloured balls mixed in a ‘ball pit’ in a play area; salt in water.) Conclusion: ____ substance has been formed, so it is a

	Inference: What can you infer from the evidences? Are the two cases similar, if not, why? ✚ Ans: Agarbatti , like a bottle of scent smelt sweet even before it was lighted. It is a physical change, particles of perfume evaporating and spreading through air. (similarity) When lighted, the agarbatti burns with a dull red light, smoke and leaves a residue. These indicate that a new substance has formed. (differences) Analysis: What are the clues to tell you that physical/ chemical changes have taken place? Ans: Burning (energy change), formation of smoke, a residue indicate chemical change. Conclusions: What do you conclude? Burning indicates a chemical change. Evaporation indicates a physical change. Consequences: If a substance evaporates when exposed, what precautions have to be taken? Activity C: Bubble carbon dioxide through a solution of lime water (calcium hydroxide). Predict the changes. Observation: Limewater turns milky. Inference: the precipitate is formed from reaction of the gas with calcium hydroxide. Formation of a precipitate indicates a new substance has formed. Conclusion: Chemical change.
Teacher summarises with discussions: Concept building: Linking all the individual ideas and establishing the common principle.	1. From the above activities can we list down indicators that tell us that a chemical change has possible occurred? ✚ Ans: Change in colour (sometimes), temperature , formation of gas, odour(eggs rotting), formation of a precipitate indicate chemical change. 2. Which properties of a substance can change in a physical change? ✚ Ans: All physical properties including density, mass, texture,

Seeing patterns----->	2. What do the evidences indicate? • Which other examples can you think of where a substance burns with a bright light and smoke? Activity 6.7 To acidified Copper sulphate solution drop a blade or nail. Wait for half hour and observe. Observation: the colour of the solution changes to green with red deposits on the blade.
Analysis----->	Questions: i) What does the deposit and change of colour of the solution indicate? ii) How do we know that the deposit is copper? (Ans: the colour of copper). iii) Can we get back the original substances? iv) What are the evidences that tell us, it is a chemical change? Inference: Word equation : Copper Sulphate solution (blue) + Iron → Iron Sulphate solution (green) + Copper (brown deposit) Conclusion: Chemical change.
Analysis----->	Activity 6.8: Demonstrate: Vinegar and Baking Soda: Observation: What is the hissing sound due to ? Why is lime water used in the activity? Why do we need to find out which gas has evolved? What other changes do we see? Inference: Vinegar (Acetic acid) + Baking soda (Sodium hydrogencarbonate) → Carbon dioxide + other substances Conclusion: Chemical change

Concept Building			
		Chemical change	Physical change
	Main idea	A New substance(s) is formed.	Substance remains the same.
	Subsidiary ideas 1.Evidences	-Light -Heat -Gas evolving -Sound -Smell change -Temperature change -Colour change -Precipitate -Residue	-Change in form- gas to liquid to solid or the other way round. -Expansion/contraction -Change in appearance.
	2.Testing the evidence (Why it is needed)	To ascertain if a chemical change has occurred.	To confirm that the change is physical.
	3.Reversibility	Mostly not reversible, original substance cannot be regained.	Mostly reversible, original substance can be regained.
	4.Speed	Can be fast or slow.	Can be fast or slow.
Home work	Draw a concept map on changes- Physical and chemical. Indicate the main idea, supporting ideas and how they connect with one another.		
Day 4 Learning objective	To understand the consequences and implications of physical and chemical changes.		
Explanation with power point presentation.	Rusting 1. What is rusting? Ans: the reddish brown powder that forms on iron surfaces that are exposed to weather- air and rain. 2. Why does iron rust? Iron (Fe) + Oxygen (O₂, from the air) + water (H₂O) → rust (iron oxide Fe₂O₃) It is a chemical change. It spontaneously combines with oxygen in the		

Implication----->	presence of water to form iron oxide. • What happens to the iron on rusting? + Ans: Iron becomes powdery (new substance) and loses the strength. • What will happen to iron articles, bridges if left unattended? + Ans: they will corrode. ➤ How to prevent rusting? Painting Galvanisation Alloying
Consequences: ----->	• Why is it important to understand rusting and prevention of rusting? + Ans: Shipping industry, bridges etc. suffer due to rusting. It leads to a lot of monetary loses. Critical thinking: • Can you suggest any other method of preventing rusting of your iron 'tava'? • Why does iron rust but not stainless steel or gold?
Explanation	Crystallisation: - Formation of crystals of salt from sea water. - Formation of copper sulphate crystals from a saturated solution of copper sulphate.
Implications----->	➤ What does the word 'crystal' make us think of? + Ans: Something shiny, and pure. ➤ What kind of a solution are crystals formed from? + Ans: From a concentrated (saturated) solution of the same salt or a mixture of salts. ➤ Why do these crystals separate? + Ans: There is too much of salt and that cannot dissolve any more in the solution. ➤ Where can we see crystallisation in nature? + In caves, we see stalactities and stalagmites.
Consequences----->	▪ What is the use of crystallisation? + From an impure solution (sea water) pure salt crystals can

	be obtained. - We can use it to separate a substance from a solution containing a mixture of substances.
Home work	Iodised salt is widely used these days. Research on how salt is manufactured from seas water and from rocks in mountain caves and purified for human consumption.

Appendix

Worksheet 1

Observations	Bending a wire	Crushing a piece of chalk	Curdling milk	Squeezing a lime	Bursting a cracker
Change in 1.Colour					
2.Size					
3.Shape					
4.Texture					
5.Smell					
6.Temperature					
7.Speed of the change					
8. Can it be put back?					
9.Inference					
10. Conclusion					