**ACTIVITY ORIENTED LESSON PLAN 1T**

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| **I Preliminary Details**  Name of the Teacher : SHANAVAS K E Standard : XI Plus One Name of the Institution : JHSS Thandekkad Time : 45 Minutes Subject : Chemistry Unit : VI Chapter : THERMODYNAMICS Topic : Introduction to Thermodynamics T D ,T D Terms, T D Process , State and Path function |

**II Types of Knowledge**  **A** **Factual Knowledge:** Terms: System, Surroundings ; Open, Closed and Isolated System; Isothermal, Adiabatic , Isochoric, Cyclic, Reversible and Irreversible Process. State and Path function Facts : i) System and Surroundings together constitute the Universe ii) Thermodynamics deals with matter in bulk and the properties arise due to bulk behaviour of matter are called Macroscopic properties of the System

**B Conceptual Knowledge: Concepts:** System , Surroundings; Types of Systems; Thermodynamic Process; State and Path function Definitions: i) A System is a part of universe which is under investigation ii) Surrounding is the part of Universe other than the system. iii) A System which can exchange matter as well as energy with the surroundings is called Open System iv) A System which can exchange energy but no matter with the surroundings is called Closed System v) A System which can neither exchange energy nor any matter with the surroundings is called Isolated System vi) State function is a Property of the system whose values depends upon the initial and final states of the system vii) Path function is a property of the System whose values depend on the Path followed

**C Procedural Knowledge: (**i) and (ii) System and Surroundings Steps : Ask the Student group 1 a) To do an Experiment between AgNO3 and NaCl b) Given apparatus and chemicals: Test tube, AgNO3, NaCl c) Student group1 doing experiment. Add AgNO3 solution to NaCI solution taken in a test tube to form white curdy ppt of AgCl d) What is System, Boundary and Surroundings?

e) Chemical reaction take place inside the test tube is the System. Test tube is Boundary. Outside the Test tube is the Surroundings

(iii) – (v) Types of System: Open, Closed and Isolated System Steps: a) Giving Examples of Types of System b) Hot tea in a Cup c) Hot tea in a Closed jar d) Hot tea in a Thermoflask e) Students identify the types of the system (vi) – (vii) State and Path function a) Giving Examples of State and Path function. b) Select State and Path function: Internal energy U, Enthalpy H, Gibbs free energy, Pressure, Volume, Temperature, Work, Heat c) Which functions depends on Initial and final state of the system? d) Which functions depends on Path followed? e) Student identifies the State and Path function? f) Path function is Heat q and Work w g) State function is Internal energy U, Enthalpy H, Gibbs free energy G, Pressure, Volume, Temperature

**D Meta Cognitive Knowledge**  T12he Student can evaluate their own Knowledge about Factual, Conceptual and Procedural Knowledge

**Type of Reflection**

**Awareness of Knowledge** a)The Students can acquire the Awareness of Knowledge in System and Surroundings ; Types of System: Open, Closed and Isolated System ; Thermodynamic Process like Isothermal, Adiabatic , Isochoric, Cyclic, Reversible and Irreversible Process ; State and Path function b) The students can identify by themselves the steps involved in the task of above mentioned Procedural Knowledge

**Types of Reflection: Awareness of Thinking**

The students can acquire the awareness of Thinking in System, Surrounding and Types of System. Thermodynamic process, State and Path function c) The students can use the above mentioned Factual, Conceptual and Procedural Knowledge to learn the different types of Knowledge

**Types of Reflection: Awareness of Learning Strategies**

The students can acquire the awareness of Awareness of Learning Strategies in types of System. Thermodynamic process, State and Path function

**III Instructional objectives and Learning Outcomes**

1. The students will be able to Recall information about the mentioned terms and facts in terms of

(a) Familiarise and list the above-mentioned Terms

(b) State and define the above-mentioned concepts

(c) Recognize the relevant knowledge in above mentioned concepts

1. The students will be able to understand the above-mentioned concepts in terms of

(a) Explain the terms: System, Surrounding and Types of System, Thermodynamics process, State and path functions.

(b)Discriminate between closed, opened and isolated systems.

(c) Classify the different types of Thermodynamics process in thermodynamics

(d)Identify the above-mentioned concepts.

1. The students will be to apply above mentioned concepts on the terms of

(a) Use the different types of Thermodynamics process in the system

(b)Solve and compute the different types of Thermodynamics process

(c) Interpret the different types of Thermodynamics process.

1. The students will be able to analyse the above-mentioned concepts in the terms of

(a)Distinguish and Differentiate the above-mentioned concepts

(b)Compare and Contrast the above-mentioned concepts

1. The students will be to evaluate the above-mentioned concepts in terms of

(a) Checking the types of Thermodynamics process in the different types of system.

1. The students will be able to create the above-mentioned concepts in the terms of Predict the outcomes of Thermodynamics process, State function and Path function using more examples.

**(IV) PREVIOUS KNOWLEDGE**

The students have the knowledge about the various forms of energy are interrelated and be transformed from one form into another.

**(V) LEARNING AIDS**

Test Tubes, AgNO3, NaCl, Cup, Closed Jar, Thermoflask **Constructivist Learning Design**

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| **Phase** | **Student response with Assessment** |
| Can the Energy changes have involved in a chemical reaction is concerned with Thermodynamics?  Yes The chemical energy is converted into Heat or Thermal energy or some other forms of energy.  Is it Thermodynamics? | Student share their experiences.  Reactants is converted to product is concerned with energy changes  Yes, Energy conversions is Thermodynamics |

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| **Phase I Situation**  What are Thermodynamics? What does it indicate?  **Phase II Grouping**  The students aregrouped into different Terms in Thermodynamics  Group 1 System  Group 2 Surroundings  Group 3 Universe  Ask each Group to draw its own image on the Black board  **Phase III Bridging**  Can you give the Simple test for water?  How will you detect the presence of Chloride in water?  Give the chemical equation?  Ask the student Group 1 to perform experiment using chemicals AgNO3 , NaCl and apparatus Test tube given  What is the product formed?  What is the colour of the ppt formed?  What is the System in this Experiment? | Thermodynamics implies flow of Heat or Energy. Thermodynamics deals with energy changes in the Physical and Chemical Process  System and Surrounding  Yes  Chloride test for water  Using AgNO3 and dilute HNO3  **NaCl + AgNO3  1,000+ Free Arrow Sign & Arrow Images - Pixabay AgCl + NaNO3**  Group 1 Perform Experiment  AgCl  White Curdy ppt  The chemical reaction inside the test tube is the System |
| **Procedural Knowledge**  The students doing experiments through sequence of steps | |

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| **Phase IV Questions**  Can you define System?  What are Surroundings?  Can you define Surroundings?  What is Boundary?  What is Universe?  What is State and Path function?  **Phase V Exhibit**  Give the examples of State and Path function from the following? Heat q, P, V, T, U, H, S, G, work w | | System is the part of Universe which is under Investigation Outside the Test tube  Surrounding is the part of universe other than System  The wall that separates the system from the surroundings is called Boundary  System and surrounding together constitute the Universe  State function is a property of the system whose value depends upon initial and final states of the system  Path function is a property of the system whose values depend on path followed  Group1 students exhibit heat q and work w as path function (BB)  Group 2 students exhibit P, V, T, U, H, S as State function  w and q as path function | |
| **Factual knowledge**  Students recognises the system and surroundings | | |
| Can you classify the System?  Ask the student Group 2 exhibit the types of system present in following examples?  a) Hot tea in a Closed Jar  b) Hot tea in a Cup  c) Hot tea in a Thermoflask  Each Group can present their findings? | Open system, closed system and isolated system Group 1 students exhibit hot tea in a closed jar as closed System  Group 2 students exhibit hot tea in a Cup as Open System  Group 3 students exhibit hot tea in a thermoflask as Isolated System | |

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| **Procedural knowledge**  The students categorise the different system from given examples | |
| **Phase V Reflections**  Can you define Open, Closed and Isolated System?  Each Group students defines the Open, Closed and Isolated System  Each Group identifies these systems with examples | Group1 students defines Open system as the system which can exchange matter as well as energy with the surroundings,  Group 2 students define closed system as the system which can exchange energy but no matter with the surroundings.  Group 3 students define isolated system as the system which can neither exchange energy nor any matter with the surroundings |
| **Conceptual knowledge**  The students define the above-mentioned facts and concepts | |
| Which process involves the changes in the State of the System?  What is Isothermal, Adiabatic, Isobaric and Isochoric Process? What is Reversible and Irreversible P**r**ocess? What is Cyclic Process?  In Cyclic Process a system undergoes a series of change and returns back to its initial state  **Follow up Activities**  Q1 Predict the Value of ∆U and ∆H in Cyclic Process?  Q2 The equation for the First Law of Thermodynamics is ∆U = q +w From, this can you give equation for Cyclic Process? | Thermodynamic process  Isothermal Process ∆T = 0  Adiabatic Process dq =0  Isobaric Process ∆P =0  Isochoric Process ∆V =0  The process is carried out slowly that system and the surroundings are always in equilibrium is called Reversible Process  The process is carried out so fast that system does not get a chance to attain equilibrium is called Irreversible Process  Q 1) ∆U = 0 ∆H = 0  Q 2) For Cyclic Process ∆U =0  **q = \_ w** |
| **Meta cognitive knowledge** The students can acquire the awareness of knowledge, thinking and learning strategies in Thermodynamics Terms, process, state and path functions | |