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- <https://pib.gov.in/PressReleaseDetail.aspx?PRID=2004958>

Appendix: 1

Experts List

Prof. S. C. Panigrahi

Professor
Department of Education, The
Maharaja Sayajirao University of
Baroda

Prof. G. R. Angadi

Professor
Dean, Department of Education,
Karnataka Central University

Prof. V. P. Arya

Professor
Regional Institute of Education,
National Council of Educational
Research and Training, Ajmer

Prof. Prerna H. Shelat

Professor
Director, Center of Education, Indian
Institute of Teacher Education
Gandhinagar, Gujarat

Dr. Ajeet Kumar Rai

Associate Professor
Faculty of Education, Banaras Hindu
University

Dr. Alka Macwan

Associate Professor
Department of Education, Sardar Patel
University, Vidyanagar

Dr. Ramesh M.

Assistant Professor
Indira Gandhi National Tribal
University, Amarkantak

Dr. Naveen M.

Assistant Professor
Maulana Azad National Urdu
University (MANUU), Bidar

Dr. Deepika Rajavat

Assistant Professor
Department of Education, The
Maharaja Sayajirao University of
Baroda

Dr. Roshni Deshai

Assistant Professor
Department of Education, Sardar Patel
University, Vidyanagar.

Dr. Jyotshna Amin

Assistant Director (Academics)
Vidyamandir Trust, Palanpur

Dr. Sandeep Songara

Post Graduate Teacher (Science), at
Central Hindu School, Banaras Hindu
University.

Dr. Sanjay Kesari

Post Graduate Teacher (Science), at
Central Hindu School, Banaras Hindu
University.

Ms. Shiny

Post Graduate Teacher (Science), at
Basil School, Vadodara

Alex Christy

Post Graduate Teacher (Science), at
Vidyut Board Vidyalaya

Appendix: 2
Science Achievement Test

Name: _____

Class: _____ **Section:** _____ **Age:** _____

Gender: Male: () Female: (), **Locality:** Rural: () Urban: ()

Occupation: (i) Father: _____ (ii) Mother: _____

Educational status: (i) Father: _____ (ii) Mother: _____

School _____

General instruction -

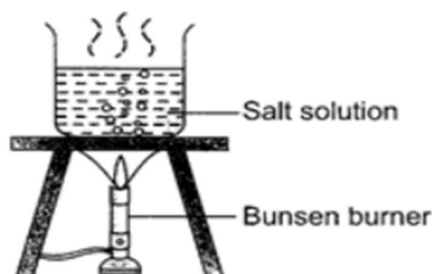
1. This test is for measuring your achievement in the science subject.
2. This test will be used only for research purpose. Your answer will be kept confidential.
3. All questions are compulsory to attempt.
4. Each question carries four options. Choose one correct answer.
5. Questions no. 01 to 85 belong to the multiple-choice questions.
6. Questions no. 86 to 100 belong to the descriptive type.
7. Choose the correct answer by putting a tick mark [√] in the box given in front of the correct answer on a separate answer sheet provided to you.

1. Can a rubber band change shape and still be considered a solid?
 - A. Yes, it changes shape and cannot be called solid.
 - B. No, it does not change shape, but it is solid.
 - C. Yes, it changes shape, and it's solid.
 - D. No, it doesn't change shape, and it is not a solid
2. Which one of the following statements is not correct about solids?
 - A. Solids have a fixed shape
 - B. Solids have fixed volume
 - C. Solids can flow
 - D. Solids have high densities
3. A piece of chalk can be broken into small particles by hammering, but a piece of iron cannot be broken into smaller particles by hammering. It illustrates that
 - A) Particles of matter have space in between them
 - B) Particles of matter possess kinetic energy

- C) Particles of matter attract one another
D) All of these
4. What is the primary constituent of matter according to the particle theory?
A) Atoms
B) Molecules
C) Particles
D) Elements
5. Which one of the following options is correct?
Statement 1: The physical state of a substance can be changed by changing its temperature. Statement 2: The physical state of a substance can be changed by changing pressure.
A) Statement 1
B) Statement 2
C) Both statements are correct
D) Both statements are incorrect
6. A few substances are arranged in the increasing order of 'forces of attraction' between their particles. Which one of the following represents a correct arrangement?
A) Water, air, wind
B) Air, sugar, oil
C) Oxygen, water, sugar
D) Salt, juice, air
7. Which one of the following options is correct?
Statement 1: In solids, molecules are tightly packed.
Statement 2: The force of attraction between molecules in solids is weak.
A) Statement 1 only
B) Statement 2 only
C) Both statements are correct
D) Both statements are incorrect
8. Why do earthen pots keep water cool?
A) It absorbs heat.
B) It reflects heat.
C) It allows evaporation.
D) It conducts heat.
9. Cloud formation is performed in nature due to
A) Vaporization
B) Evaporation
C) Condensation
D) Deposition
10. Sneha set up the experiment for melting ice in a beaker and noted down the temperature throughout the process. What do you think she observed when the ice was melting?
A) The temperature in the thermometer kept increasing until the ice melted.

- B) Once the melting process started, the temperature in the thermometer remained constant throughout the experiment.
 - C) There was no change in temperature throughout the experiment.
 - D) Ice did not melt on heating. It was converted to vapours.
11. When suffering from a fever, why does ice provide more relief than ice-cold water?
- A) Ice has a lower melting point.
 - B) Ice absorbs latent heat.
 - C) Ice-cold water is a better conductor.
 - D) Ice increases body temperature.
12. How do the surface area and wind speed affect the evaporation rate?
- A) Greater surface area and higher wind speed increase evaporation
 - B) The smaller surface area and lower wind speed increase evaporation
 - C) The surface area doesn't affect evaporation.
 - D) Wind speed has no impact on evaporation.
13. Which of the following is a pure substance?
- A) Air
 - B) Distilled water
 - C) Steel
 - D) Brass
14. Which of the following statements are true for pure substances?
- I. Pure substances contain only one kind of particle.
 - II. Pure substances may be compounds or mixtures.
 - III. Pure substances have the same composition throughout.
 - IV. Pure substances can be exemplified by all elements other than nickel.
- A) I and II
 - B) I and III
 - C) III and IV
 - D) II and III
15. Identify the non-metal, which is lustrous.
- A) Sulphur
 - B) Graphite
 - C) Iodine
 - D) Phosphorus
16. An example of a metalloid is.
- A) Boron
 - B) Lead
 - C) Chlorine
 - D) Bromine
17. An example of chemical change is.
- A) Plucking of the Table
 - B) Melting of Wax
 - C) Burning of Coal
 - D) Melting of Water

18. Geetika poured 20 g of salt into 200 ml of water in a beaker. She stirred the water to dissolve the salt completely. Then, she heated the solution until it was reduced by half. How many grams of salt can be recovered from the remaining solution?
- A. 0 g
 - B. 10 g
 - C. 20 g
 - D. 40 g



19. What happens when salt dissolved in water is heated?
- A) There is an increase in the boiling point.
 - B) There is no change in the boiling point.
 - C) There is a decrease in the boiling point.
 - D) All of the above
20. **Assertion (A):** Water and carbon dioxide are compounds.
Reason (R): Water and carbon dioxide are heterogeneous in nature.
- A) Both A and R are true, and R is a correct explanation of A.
 - B) Both A and R are true, but R is not the correct explanation of A.
 - C) A is true, but R is false.
 - D) A is false, but R is true.
21. **Assertion:** Suspension is a heterogeneous mixture.
Reason: The solute particles do not dissolve but remain suspended throughout the bulk of the medium.
- A) Both A and R are true, and R is the correct explanation of the statement A.
 - B) Both A and R are true, but R is not the correct explanation of A.
 - C) A is true, but R is false.
 - D) A is false, but R is true.
22. Sahil took a white solid from his teacher to find out its melting point. During the experiment, he found that the melting point was 160°C . However, the teacher told him that the actual melting point of the solid is 150°C . What could be the reason for Sahil's observation?
- A) The melting point of a solid depends upon the procedure and the amount taken.
 - B) Solids can have different melting points depending upon the method of storage.
 - C) The solid contains some impurities mixed with the pure compound.
 - D) If the solid is heated strongly, the melting point increases.

23. By which process can we separate camphor from ammonium chloride?
- A) Filtration
 - B) Sublimation
 - C) Dissolution and evaporation
 - D) Distillation
24. What would you do if asked to prepare a 10 per cent glucose in water by mass?" signifies.
- A) 10 grams of glucose dissolved in 100 grams of water.
 - B) 10 grams of glucose dissolved in 90 grams of water.
 - C) 20 grams of glucose dissolved in 200 grams of water.
 - D) 20 grams of glucose dissolved in 90 grams of water.
25. Which of the following statements is correct?
- A) Prokaryotic cells are surrounded by a cell membrane
 - B) Prokaryotic cells have a nucleus and cell organelles
 - C) Eukaryotic cells have membrane-bound organelles
 - D) Eukaryotic cells are associated with nucleoids.
26. In a cell, DNA is found in:
- A) Nucleus, mitochondria, and plastids
 - B) Nucleus, mitochondria, and vacuoles
 - C) Plastids, nucleus, and Golgi bodies
 - D) Mitochondria, Golgi bodies, and lysosomes
27. The endoskeleton of Animal cells is:
- A) Ribosomes
 - B) Lysosomes
 - C) Endoplasmic Reticulum (E.R.)
 - D) Chromosomes
28. Golgi Body helps in:
- A) Respiration
 - B) Protein synthesis
 - C) Photosynthesis
 - D) Transportation of materials
29. The cell theory, jointly given by Schleiden and Schwann, did not explain.
- A) All living organisms are composed of cells, and their products
 - B) The cell is the structural and functional unit of living organisms.
 - C) Formation of new cells
 - D) None of the above
30. **Assertion:** Cells having cell walls withstand very dilute (hypotonic) external media without bursting.
- Reason:** The cell wall exerts an equal pressure against the swollen cell.
- A) Both A and R are true, and R is the correct explanation of the A
 - B) Both A and R are true, but R is not the correct explanation of the A
 - C) A is true, but R is false
 - D) A is false, but R is true

31. When an amoeba is placed in freshwater, the formation of vacuoles is too frequent because.
- A) Vacuoles do not help in maintaining the rigidity of the cell.
 - B) Vacuoles form thread-like tails in sperms of many mammals
 - C) Vacuoles expel excess water and waste products from the cell
 - D) Vacuoles store only excretory products of a cell
32. Animal cells lacking nuclei would also lack
- A) Ribosomes
 - B) Lysosomes
 - C) Endoplasmic reticulum
 - D) Chromosomes
33. The plasma membrane is selectively permeable because.
- A) It allows the movement of all substances within the cell.
 - B) It allows the movement of some substances into the cell.
 - C) It allows the entry and exit of selected material in and out of the cell.
 - D) All of the above
34. What will happen if we put a plant cell in an isotonic solution?
- A) The cell will swell up
 - B) The cell will lose water
 - C) The cell will stay the same size
 - D) The cell will shrink
35. A resin will swell up in the solution because-
- A) The concentration of water molecules in the cell is higher than the concentration of water molecules in the surrounding medium
 - B) The concentration of water molecules in the surrounding medium is higher than the concentration of water molecules in the cell
 - C) The concentration of water molecules is the same in the cell and the surrounding medium
 - D) The concentration of water molecules does not matter
36. Suppose a cell is going to divide. What changes will you see in the cell?
- A) Appearance of DNA
 - B) Appearance of Nucleoid
 - C) Appearance of Genes
 - D) Appearance of Chromosomes
37. When a cell faces a protein accumulation problem, but after examining, you find that protein synthesis in the cell is proper. What problem is the cell facing?
- A) Vacuoles are not functioning
 - B) The Golgi Body is not functioning
 - C) The ribosome is not functioning
 - D) E.R. is not functioning
38. Displacement is?
- A) The actual length of the path covered
 - B) The change in the position of an object
 - C) The length of the shortest path between the initial and final positions

- D) The distance travelled in a straight line
39. What is the SI unit of speed?
- Meter
 - Meter per second (m/s)
 - Kilometre per hour (km/h)
 - Second
40. The rate of change of displacement with time is.
- Speed
 - Acceleration
 - Retardation
 - Velocity
41. The ratio of magnitudes of average speed and average velocity is.
- Always less than one
 - Always greater than one
 - Always equal to one
 - Sometimes less than one and sometimes greater than one
42. **Assertion:** The speedometer of an automobile measures the instantaneous speed of the automobile.
- Reason:** Average velocity is equal to total displacement per total time taken.
- Both A and R are true, but R is not the correct explanation of A.
 - Both A and R are true, and R is the correct explanation of A.
 - A is true, but R is false.
 - A is false, but R is true.
43. **Assertion:** Displacement of the body may be zero when the distance travelled by it is not zero.
- Reason:** The displacement is the longer distance between the initial and final positions.
- Both A and R are true, and R is the correct explanation of A.
 - Both A and R are true, but R is not the correct explanation of the A.
 - A is true, but R is false.
 - A is false, but R is true.
44. **Assertion:** Position-time graph of a stationary object is a straight line parallel to the time axis.
- Reason:** The position does not change with time for a stationary object.
- Both A and R are true, and R is the correct explanation of A.
 - Both A and R are true, but R is not the correct explanation of the A.
 - A is true, but R is false.
 - A is false, but R is true.
45. **Assertion:** The position-time graph of a uniform motion in one dimension of a body can have a negative slope.
- Reason:** When the body's speed decreases with time, the position-time graph of the moving body has a negative slope.
- Both A and R are true, and R is the correct explanation of A.
 - Both A and R are true, but R is not the correct explanation of the A.

C) A is true, but R is false.

D) A is false, but R is true.

46. **Assertion:** A body can accelerate even with constant speed.

Reason: In a uniform circular motion, the speed of the body is constant, but its velocity continuously changes

A) Both A and R are true, and R is the correct explanation of A.

B) Both A and R are true, but R is not the correct explanation of A.

C) A is true, but R is false.

D) A is false, but R is true.

47. Suppose you are travelling in a train and tossing a coin. The coin falls backwards, which means.

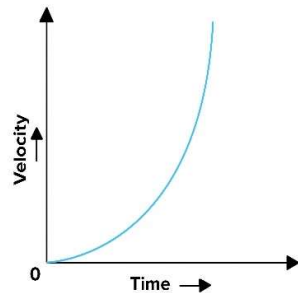
A) The train accelerated

B) The train is slowing

C) Train in Uniform motion

D) The train stops suddenly

48. Based on Rohan's walking, a plot is drawn. What will you infer from the plot?



A) Non-uniform motion

B) Uniform motion

C) Accelerated motion

D) Circular motion

49. A car accelerates uniformly from 10 m/s to 30 m/s in 4 seconds. Calculate the acceleration.

A) 5 m/s²

B) 10 m/s²

C) 20 m/s²

D) 40 m/s²

50. The inertia of a moving object depends on:

A) Mass of the object

B) Momentum of the object

C) Speed of the object

D) Shape of the object

51. The rate of change in momentum is directly proportional to

A) Area

B) Balanced force

C) Unbalanced force

D) Inertia

52. The inertia of an object tends to cause the object.
- To increase its speed
 - To decrease its speed
 - To resist any change in its state of motion
 - To decelerate due to friction
53. The unit of measuring the momentum of a moving body is:
- m/s
 - kg·m/s
 - kg·m/s²
 - N·m²/kg²
54. When a rubber ball is pressed between two hands, its shape changes. This happens because:
- Balanced forces act on the ball
 - Unbalanced forces act on the ball
 - Frictional forces act on the ball
 - Gravitational force acts on the ball
55. The resultant force acting on a body is zero.
- The body is in the un-equilibrium
 - The body is in equilibrium
 - The body moves with constant acceleration
 - Body moves with retardation
56. **Assertion:** If the net external force on the body is zero, then its acceleration is zero.
Reason: Acceleration does not depend on force.
- Both A and R are true, and R is the correct explanation of A.
 - Both A and R are true, but R is not the correct explanation of A.
 - A is true, but R is false.
 - A is false, but R is true.
57. **Assertion:** To every action, there is an equal and opposite reaction.
Reason: Thrust on a rocket depends upon the exhaust speed of the gases.
- Both A and R are true, and R is the correct explanation of A.
 - Both A and R are true, but R is not the correct explanation of A.
 - A is true, but R is false.
 - A is false, but R is true.
58. Why can a fast-moving cricket ball cause more injuries to a cricketer than a moving tennis ball?
- Due to large size
 - Due to the large momentum
 - Both [a] and [b]
 - None of the above
59. A football and a stone have the same mass; then, how much force must be applied to change their position?
- Same force because of the same inertia
 - Same force because of the same momentum
 - Different forces because of different objects.

- D) Different forces because of different momentum
60. A dirty blanket is beaten by a stick to remove dust particles. Which law holds good for this?
- A) Law of conservation of momentum
 - B) Law of inertia
 - C) Law of impulse
 - D) Law of conservation of energy
61. What happens to the acceleration if the mass of a body and the force acting on it are doubled?
- A) Doubled
 - B) Halved
 - C) Remains the same
 - D) Becomes zero
62. The Earth's atmosphere is held by the
- A. Wind
 - B. Clouds
 - C. Earth's magnetic field
 - D. Gravity
63. Which of the following is true when a Mango falls from a Mango Tree?
- A. Only the Earth attracts Mango.
 - B. Only Mango attracts the Earth.
 - C. Both Mango and Earth attract each other
 - D. Both Mango and Earth repel each other
64. The weight of an object on the Moon's surface is
- A. $1/3^{\text{rd}}$ of the weight on Earth
 - B. $1/5^{\text{th}}$ of the weight on Earth
 - C. $1/6^{\text{th}}$ of the weight on Earth
 - D. $1/2^{\text{nd}}$ of the weight on Earth
65. Buoyant force depends on _____.
- A. The colour of the liquid
 - B. The density of the liquid
 - C. The depth of the liquid
 - D. The weight of the liquid
66. If two objects are submerged in water, then
- A. Buoyant force is the same for both objects.
 - B. Buoyant force is different for both objects.
 - C. Buoyant force does not apply to the fully submerged object.
 - D. None of the above
67. When a body is immersed in a fluid, partially or completely, the force of buoyancy is equal to _____.
- A. The weight of the fluid displaced by the body.
 - B. The weight of the volume of the fluid is equal to the volume of the body.
 - C. The product of the weight of the body and acceleration due to gravity.
 - D. The weight of the body.

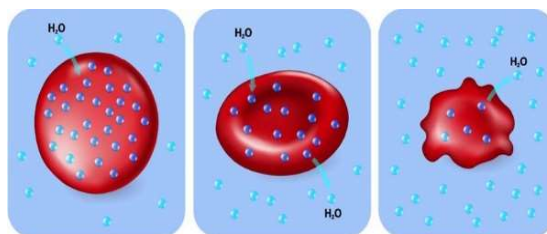
68. Which of the following proves there is a gravitational force between the Earth and the Sun?
- A. Occurrence of day and night.
 - B. Earth revolving around the sun.
 - C. The sun is apparently revolving around the Earth.
 - D. Falling bodies deviating towards the east.
69. The distance between two masses is doubled; what happens to the gravitational force between them?
- A. Double
 - B. Half
 - C. Remains the same
 - D. Decreased to a quarter
70. Which of the following statements is correct?
- Statement 1:** Acceleration due to gravity decreases with height.
- Statement 2:** The value of G changes from place to place.
- A. Statements 1 and 2 both are correct
 - B. Statement 1 is correct, and Statement 2 is incorrect
 - C. Statement 1 is incorrect, and Statement 2 is correct
 - D. Statements 1 and 2 both are incorrect
 - E. None of these
71. If a plastic ball floats on the surface of the water on Earth, what will happen if placed in a bucket of water on the moon?
- A. Float
 - B. Sink
 - C. Firstly, float, but after some time it will sink
 - D. None of the Above
72. An ice cube floats in the glass of water. What happens to the level of water in the glass when ice melts?
- A. Decrease
 - B. Increase
 - C. Remains the same
 - D. First Increases, then decreases
73. The time period of an artificial satellite in a circular orbit of radius r is four days. If the time period of another satellite in a circular orbit is thirty-two days, then its radius of orbit will be:
- A. $32r$
 - B. $16r$
 - C. $8r$
 - D. $4r$
74. Which of the following is the term used for the practice of bee culture?
- A) Sericulture
 - B) Apiculture
 - C) Agriculture

- D) Pisciculture
75. What are the three macronutrients needed for plant growth?
- A) Calcium, chlorine, and magnesium.
 - B) Nitrogen, phosphorus, and potassium.
 - C) Zinc, boron, and copper.
 - D) Calcium, zinc, and copper.
76. The season for rabi crop is-
- A) November to April
 - B) June to October
 - C) October to February
 - D) April to August
77. Which one of the following fish is a surface feeder?
- A) Rohus
 - B) Mrigals
 - C) Common carps
 - D) Catla
78. Which of the following is not an organic method used to control weeds?
- A) Proper seed beds
 - B) Weedicides
 - C) Intercropping
 - D) Crop rotation
79. Which of the following is true regarding fertilizer?
- A) long term benefits and no-cost farming
 - B) Long-term benefits and low-cost farming
 - C) Short-term benefits and high-cost farming
 - D) Short-term benefits and low-cost farming.
80. Weeds affect the crop plants by:
- A) Killing of plants in the field before they grow.
 - B) Dominating the plants to grow.
 - C) Competing for various resources of crops (plants) causing low availability of nutrients.
 - D) All the above
81. Why are exotic breeds preferred to local breeds?
- A) Exotic breeds have low resistance to diseases.
 - B) Exotic breeds need less food.
 - C) Exotic breeds need less maintenance.
 - D) Exotic breeds have a long lactation period.
82. Crop rotation is an important part of organic farming. Why is mono-cropping problematic?
- A) The crop is vulnerable to organized crop thieves.
 - B) It encourages the build-up of diseases and pests that destroy a particular crop.
 - C) It does not use minerals.
 - D) It is expensive.

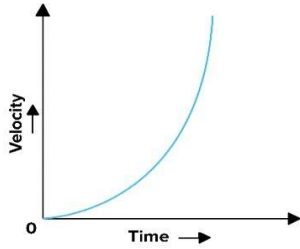
83. Which of these is/ are the advantages of crop rotation?
- It prevents the depletion of selective nutrients.
 - It prevents the buildup of diseases and pests of a particular crop.
 - It enhances the production by increasing the soil fertility.
 - All of the above
84. Which of the following conditions will benefit farmers most?
- Use of high-quality seeds, fertilisers, and no irrigation
 - Use of high-quality seeds, irrigation, use of fertilisers, and crop protection measures
 - Use of ordinary seeds, irrigation, and use of fertilisers
 - Use of high-quality seeds, irrigation, excessive use of chemical fertilisers, and crop protection measures
85. What will you do if you want to take Short-term benefits in high-cost farming?
- You will use fertilizer
 - You will use Manure
 - You will use mixed cropping
 - You will use intercropping
86. What will you do if you want to improve the crop production in your field
- You will choose a plant with tallness as the desired character of cereals.
 - Profuse branching is good for fodder crops
 - Variety resistance to biotic stress is a good factor to improve crops.
 - You will choose a crop of shorter duration from sowing to harvesting.

Descriptive Question

87. Why should we wear cotton clothes in Summer? Give the reason.
88. Why does steam produce more severe burns than boiling water? Explain with reason.
89. Solutions A and B are saturated at 5°C, but we want to dissolve more sugar. How will it be possible?
90. How do physical and chemical changes help us in daily life?
91. Explain the phenomena that are shown in the diagram.



92. What will happen if a cell loses its cell wall?
93. When we found this graph. Explain with reason.



94. An object has moved through a distance. Can it have zero displacement? If yes, support your answer with an example.
95. How a dirty cloth becomes clean in the washing machine. Which law of Newton applied to this phenomenon?
96. Why does a ball cause more severe hurt than tennis?
97. Why is swimming in seawater easier than in freshwater?
98. Why will a sheet of paper fall slower than one that is crumpled into a ball?
99. How does a crossbreed animal help in the quality improvement of cattle?
100. If a farmer asks you, I want to improve the yield in my field. What will you suggest to him?

*Appendix: 3***COGNITIVE LOAD SCALE**

Name: _____

Class: _____ Section: _____ Age: _____

Gender: Male: () Female: (), Locality: Rural: () Urban: ()

Occupation: (i) Father: _____ (ii) Mother: _____

Educational Status: (i) Father: _____ (ii) Mother: _____

School: _____

General instruction:

1. This Scale contains eight statements: Five are related to mental load, and three are related to mental effort.
2. Every statement has five options: ‘Strongly Disagree (SDA), Disagree (DA), Undecided (UD), Agree (A), and Strongly Agree (SA)’.
3. Please read each statement carefully and tick the option of your choice. There is no right or wrong option here.
4. Your answer will be kept confidential and used only for research work.

Sr.	Statement		SDA	DA	UD	A	SA
1	The learning content in this learning activity was difficult for me.						
2	I had to put a lot of effort into answering the questions in this learning activity.						
3	It was difficult for me to answer the questions in this learning activity.						
4	I felt frustrated answering the questions in this learning activity.						
5	I did not have enough time to answer the questions in this learning activity.						
6	During the learning activity, the way of instruction or learning content presentation caused me a lot of mental effort.						
7	I need to put lots of effort into completing the learning tasks or achieving the learning objectives in this learning activity.						
8	The instructional way in the learning activity was difficult to follow and understand.						

Appendix: 4

Reaction Scale on ‘Constructivist Pedagogical Intervention’ (CPI)

Name: _____

Class: _____ **Section:** _____ **Age:** _____

Gender: Male () Female (), **Locality:** Rural: () Urban: ()

Occupation: (i) Father: _____ (ii) Mother: _____

Educational status of: (i) Father: _____ (ii) Mother: _____

School: _____

General instruction -

1. This Scale contains twenty-four statements that will assess your opinion towards constructivist pedagogical intervention.
2. Every statement has five options: ‘Strongly Disagree (SDA), Disagree (DA), Undecided (UD), Agree (A), and Strongly Agree (SA)’.
3. Please read each statement carefully and tick the option of your choice. There is no right or wrong option here.
4. Your answer will be used only for research work and will be kept confidential.

Sr	Statement	SDA	DA	UD	A	SA
1	It helped to promote divergent thinking.					
2	It helped me to think rationally.					
3	It helped me solve problems or questions during the learning process.					
4	It helped me to think creatively.					
5	I want to learn other subjects through this teaching method (CPI).					
6	It raised my interest in learning.					

7	I enjoyed learning Science through this method.					
8	I feel it made learning more enjoyable.					
9	I felt activities done in groups were interesting.					
10	Through this method, I found the scope of healthy discussion among classmates.					
11	It made learning more interactive.					
12	It gave more scope for interaction with the teacher.					
13	It made the classroom democratic.					
14	I was free to ask questions in the classroom.					
15	I found it distracts the class from the topic.					
16	It promoted a better conceptual understanding of the topic/ the concept of the subject.					
17	It helped me achieve high scores on the examination.					
18	I feel that it helps me in the better expression of my ideas.					
19	This method helped me to produce many new examples of concepts.					
20	This CPI gave more scope for the activity than the lecture method.					
21	Through this method, I found the opportunity to link classroom activity to our daily lives.					
22	I found it helped in the improvement of my self-confidence.					
23	This method helped me to identify my strengths in the subject.					

CHAPTER 8: MOTION

Lesson Plan: 1

Name of the Student Teacher: XYZ		Chapter: Motion	
Subject: Science		Chapter No: 8	
Class: IX		Period: 30	
Topic of the Lesson: Motion and Displacement		Date: xyz	

Entry Behaviour:

- Students are familiar with the concept of motion.
- Students know about straight motion.
- Students know about displacement.

Specific Objectives:

- Students will be able to explain motion and displacement.
- Students will be able to give examples of motion and displacement.
- Students will be able to solve the problems related to motion.
- Students will be able to solve the problems related to velocity, time and motion.

Approach of Teaching: Constructivism

Method of Teaching: Constructivism with Lecture

Materials Required: Balls, a watch, thread, and other materials present in the surroundings.

Classroom Activities:

Students: Good morning, sir!

Teacher: Good morning, students!

Teacher: Take two balls, one in a static position and the second in a moving condition and ask to students what you observe. (Demonstration)

Ask to identify motion in our surroundings and what type of motion.

Students: Identify the phenomena and reply, one ball is moving, and another is in a static position (assimilation, recall).

Teacher: That means one ball in motion. Ask another question. Please identify the objects in our surroundings that represent motion.



Students: Students identify the motion in our surroundings and give a response, like the circular motion of the fan, the watch, the straight motion of the teacher in the classroom, etc. (Assimilation)

Teacher: Good, today we will study motion. In moving the ball, how can we say the ball is moving?



Students: Because this ball travels a certain distance. (Assimilation)

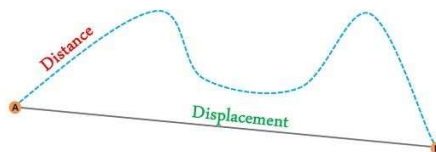
Teacher: Yes. From where the ball starts travel distance is called as origin.

Teacher: What is the difference between distance and displacement?

Students: Recall and respond that the length covered by an object from the origin is called distance, and the minimum distance from the origin to the object is called as displacement. (Recall and Assimilation).

After that teacher will explain the distance and displacement in detail.

Teacher: Distance is a scalar quantity that refers to "how much ground an object has covered" during its motion. This is speed of an object is multiplied by the total time taken by the object to travel the length of its path. Displacement is a vector quantity that refers to "how far out of place an object is"; it is the object's overall change in position. This is the minimum distance of the object from its origin point. Displacement is a vector quantity, which means it has direction and magnitude. [Explains distance and displacement through the lecture method. (Explanation)].



Teacher: In the previous class 8, you studied about motion in a straight line, uniform and non-uniform motion. (Try to connect previous knowledge, Recall)

Teacher: Gives an example when you want to go from Vadodara to Surat. For this, you choose to train. What type of motion takes place?

Students: In a straight line

Teacher: Yes. Show the table of distance travelled by two cars and ask to calculate the distance according to time (Make groups and discuss).

Time	Distance travelled by object A in m	Distance travelled by object B in m
9:30 am	10	12
9:45 am	20	19
10:00 am	30	23
10:15 am	40	35
10:30 am	50	37
10:45 am	60	41
11:00 am	70	44

Students: They examine and calculate the distance and respond group-wise (accommodation)

Teacher: Give some examples of uniform and non-uniform in your daily life. (Reflective question)

Students: Will give responses according to their experience. (Equilibrium)

Teacher: Why is it important to understand the difference between uniform and non-uniform motion?

Students: They analyse the previous experiences and synthesize the concept and previous experiences, and give diverse responses, like in traffic control, covering a large distance, and so on. (Brainstorm)

Teacher: The teacher appreciates the response of the students and asks a question based on the response of the students. Suppose a car travels 25 m in 10

seconds and 50 m and 5 seconds, then what is the average speed of the car?

(Problem solving)

Students: Analyse the problem and apply the formula (Accommodation and Assimilation)

Average Speed = Total distance travelled / Total time taken

$$\begin{aligned} & \mathbf{25+50 / 10+5} \\ & = \mathbf{75 / 15} \\ & = \mathbf{5 \text{ m/s}} \end{aligned}$$

Teacher: Appreciates the response of students. Explain the concept of speed and velocity (Explanation)

The distance travelled by an object in a given time is called speed. Speed is the measure of how fast an object is moving. It tells us the distance an object travels in a certain amount of time. Speed is a scalar quantity, which means it only has a size (magnitude) but no direction. For example, if a car travels 60 kilometers in 1 hour, its speed is 60 km/h.

Velocity is the measure of how fast an object is moving in a specific direction. It is a vector quantity, which means it demands both magnitude and direction. For example, if a car is moving at 60 km/h to the north, its velocity is 60 km/h north. Even if the speed stays the same, a change in direction means the velocity has changed. [Explains distance and displacement through the lecture method. (Explanation)].

Students: Note down the concept and the teacher's explanation. (Assimilation and accommodation)

Teacher: Ask if a car starts moving in a straight line, or starting odometer shows reading of 1000 km, and the end of journey odometer shows 1800 km. If the trip took 12 hours, calculate the average velocity of the car in kilometres/hour and meters/second. (Problem solving)

Students: Distance covered by car = 1800 – 1000

$$= 800 \text{ km}$$

Time elapsed (t) = 12 hours

$$= 800 / 12 = 66.66 \text{ km/h}$$

$$= 800 \times 1000 / 12 \times 60 \times 60 = 800000 / 43200 = 18.5 \text{ m/s}$$

(Assimilation and accommodation)

Teacher: If students face a problem, then the teacher will give scaffolding.

Summarization

The teacher summarizes the class

Distance: The total path covered by an object, regardless of direction.

Displacement: The shortest straight-line distance between the starting and ending points, along with direction.

Speed: The rate at which an object covers distance.

Velocity: The rate of change of displacement with direction.

Homework

- Can distance ever be equal to displacement? Can it ever be less? Explain with examples.
- If two cars are moving at the same speed but in opposite directions, are their velocities the same? Why or why not?
- If your speed is constant, can your velocity still change? Give a real-life example to support your answer.

Evaluation

Science Academic Achievement Test.

Chapter 2: Is Matter Around Us Pure

Lesson Plan: 1

Name of the Student Teacher: XYZ	Chapter: Is Matter Around Us Pure
Subject: Science	Chapter No: 2
Class: IX	Period: 30 minutes
Topic of the Lesson: Substance and Mixture	Date: xyz

Entry Behaviour:

- Students are familiar with the concept of substance and matter.
- Students know about evaporation and condensation.
- Students know about the solution.
- Students are aware of the process of separation, like sieving, picking.

Specific Objectives:

- Students will be able to discuss pure substances and mixtures.
- Students will be able to list out the characteristics of pure substances and mixtures.
- Students will be able to explain the state of matter based on chemical properties.
- Students will be able to explain the importance of substances and mixtures.

Teaching Approach: Constructivism

Teaching Method: Lecture with Constructivism

Required Materials: Water, KMnO_4 , lemon, salt, sugar

Classroom Activities:

Students: Good morning, sir!

Teacher: Good morning, dear students

Teacher: What do you mean by pure?

Students: Pure means substance that has no impurities

Teacher: Take water, KMnO_4 solution and lemonade. Ask to identify pure substances in the given substances.



Students: Some students say water is pure, some say lemonade is impure. Other responses will also come.

Teacher: Prompt (scaffolding)

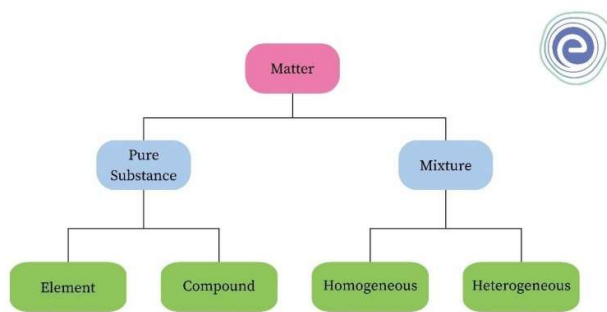
Students: Students will give unclear responses, like the KMnO_4 solution is impure.

Teacher: Dear students, today we will discuss substances, their classification and mixture.

Teacher: In the previous lecture, we studied matter and its classification. Then, how many states of matter are based on the physical property of matter? (Seeking Information)

Student: Three types, i.e. solid, liquid and gas. (Recall)

Teacher: Like this, based on the chemical natures, the matter is classified under two categories, i.e. substances and mixtures. It is further divided into subcategories. Pure substance is divided into element and compound, and mixture is divided into homogeneous and heterogeneous mixture (Explanation with lecture).



Students: Note down (Assimilation)

Teacher: What is substance?

Student: It is a type of matter that occupies space and elements, and other responses. (try to assimilate new information).

Teacher: Yes, it has a type of matter that contains a pure single form of matter. That means all particles have the same type of chemical nature. (Describe)

Pure substances have a uniform and definite composition. They are further divided into elements and compounds. Elements consist of only one kind of atom and cannot be broken down into simpler substances by chemical methods; examples include oxygen, gold, and hydrogen. Compounds, on

the other hand, are formed when two or more elements combine chemically in a fixed ratio, such as water (H₂O) or carbon dioxide (CO₂).

Mixtures are combinations of two or more substances that are physically mixed but not chemically combined. They can be separated by physical methods. Mixtures are of two types: homogeneous and heterogeneous. A homogeneous mixture has a uniform composition throughout, and its components are not visibly distinguishable. Examples include salt water and air. In contrast, a heterogeneous mixture has a non-uniform composition, where the different substances are visibly distinct, such as sand in water or a salad. (Teacher explains through lecture with examples).

Students: Note down (Accommodation with the new concept)

Teacher: What do you think makes a substance "pure"? Can something look pure but actually be a mixture? Give examples. (make a group, brainstorm or discuss).

Students: They will give diverse response, like Milk is a pure substance, tap water is pure, etc.

Teacher: Clarify the misconception of the student about how milk is not a pure substance. And ask the student what happens if we mix more than one substance?

Students: A mixture is formed. (Assimilation)

Teacher: Yes, a mixture has more than one type of pure substance, but the substance has only one type of molecule.

Now he explains how milk is not pure. Milk contains protein and fat particles; therefore, it is a mixture, not a pure substance (Explanation with lecture).

Therefore, the mixture can be separated into its constituents, but substances can't be. And ask, what happens if we heat the salt and water solution?

Student: Water evaporates, and salt remains in the pot.

Teacher: What do you conclude from this incident?

Students: We can infer that we can separate the substance from the mixture, but the substance can't be found in its constituent particles. (Equilibrium)

Teacher: Ask for other examples of the mixture.

Students: Milk-sugar solution, etc. (Assimilation)

Teacher: He asks some questions and starts brainstorming on the mixture and substance, and its importance.

- Can you separate a mixture back into its original components? Can you do the same with a compound? Why or why not? **(Discussion)**
- Which is more useful in daily life, pure substances or mixtures? Why? **(Brainstorming)**
- If air is a mixture, why can't we see its different components? **(Discussion)**
- Can two elements combine and still remain a mixture instead of forming a compound? Give examples. **(Discussion)**
- Why do you think understanding mixtures and pure substances is important in food, medicine, and industry? **(Brainstorming)**

Students: Give various responses based on their experiences. (Assimilate)

Teacher: Correct the misconception among the students.

Summarization:

The teacher summarizes the class

Pure Substance: A substance made up of only one kind of particle with a fixed composition.

Element: A pure substance that cannot be broken down into simpler substances by chemical means.

Compound: A pure substance formed by the chemical combination of two or more elements in a fixed ratio.

Mixture: A combination of two or more substances that are physically mixed, not chemically combined.

Homogeneous Mixture: A mixture with a uniform composition throughout, where components are not visibly separate.

Heterogeneous Mixture: A mixture with a non-uniform composition, where different components are visibly distinct.

Homework:

- Why do you think understanding mixtures and pure substances is important in food, medicine, and industry? Write in detail.

Evaluation: Science Achievement Test

Chapter 5: The Fundamental Unit of Life

Name of the Student Teacher: XYZ Chapter: Fundamental Unit of Life	
Subject: Science	Chapter No: 5
Class: IX	Period: 30 Minutes
Topic of the Lesson: Cell and Cell Wall	Date:

Entry Behaviours:

- Students are aware of cells and the types of cells.
- Students know the cell membrane and its basic function.
- Students know the cell wall and its basic function.

Specific Objectives:

- Students will be able to state the function of the cell membrane and cell wall.
- Students will be able to analyse the problems arising due to the absence of the cell wall.
- Students will be able to evaluate the advancement of the cell over another.
- Students will be able to reflect on the cell, the importance of the cell wall and the cell membrane in the cells.

Approach: Constructivist

Method: Lecture with constructivist strategy

Required Materials: Chart paper, Diagrams in the classroom.

Classroom Activities

Students: Good morning, sir!

Teacher: Good morning, dear students!

Teacher: In the previous class 8, you studied the cell. Let us recall. Ask the question:

What is the cell?

Student- Cell is the basic unit of the body. (Recall)

Teacher: Good, tell the history of the cell. In 1665, Robert Hook was a scientist who was very curious. Once he wanted to study wood cork. For this task, he made a microscope through a common lens and observed it. He finds a honeycomb-like structure called the cell (explain and introduce the cell through an interactive story)

Now we will study the cell and its types, and functions.

Students: Note down the information given by the teacher. (Assimilate)

Teacher: Show the pictures of the cells on a blackboard or Chart paper and ask students to identify the different shapes of the cell.

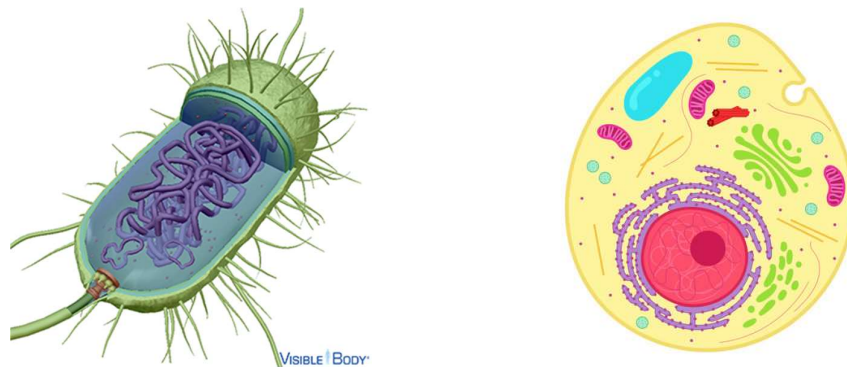
Students: Give the answer according to the cell's shape. i.e. Oval, elongated, rounded spherical, etc.

Teacher: Good, describe other facts about the cell before the student and show the relevant pictures (varies in shape and size). **Cell** is the **Latin word** for **little room**, and firstly, Leeuwenhoek discovered living cells in pond water. Size could be more or less fixed and peculiar for the particular type of cell.

A cell is the basic structural and functional unit of all living organisms. It is often called the "building block of life" because all life forms, from the smallest bacteria to the largest animals and plants, are made up of cells. Some organisms, like amoebas and bacteria, are made of a single cell (unicellular), while others, like humans and trees, are made of many cells (multicellular). Each cell carries out essential life processes such as growth, reproduction, respiration, and waste removal. Cells can vary in shape and size depending on their function. They contain various components, such as the nucleus, which controls cell activities, and the cytoplasm, where most cell processes occur. Cells are broadly classified into prokaryotic (without a defined nucleus) and eukaryotic (with a defined nucleus). The study of cells helps us understand how living organisms function and grow. For example: red blood cells, ovum, sperm, muscle cells, etc. (explanation through lecture).

Students: Note down the information (assimilation and accommodation)

Teacher: Shows a picture of eukaryotic cells and prokaryotic cells. Ask to identify similarities and dissimilarities in the cell.



Students: Identify the similarities and dissimilarities between cells and evaluate which cell is more advanced based on the nucleus and organelles, and draw a conclusion. (Assimilation, accommodation, equilibrium)

Teacher: Conclude the findings of students on the blackboard and ask what you infer from this observation.

Students: Prokaryotic cells have no nuclear membrane, more developed organelles etc. but Eukaryotic cells contain nuclear membrane and membrane bound, well developed organelles.

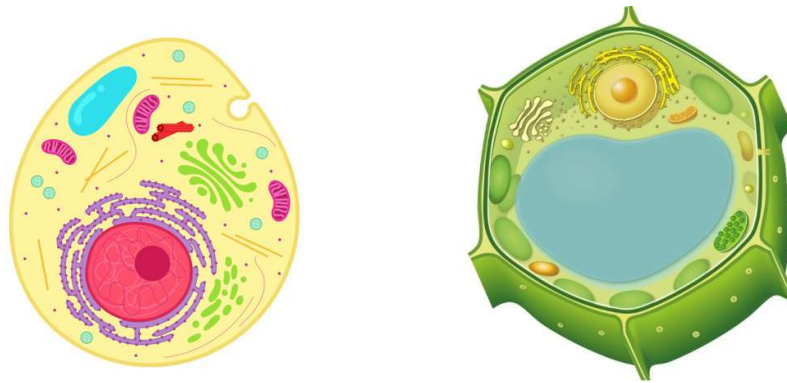
Teacher: What is the importance of prokaryotic organisms in our lives? (Brainstorming and discussion).

Students: Give a diverse answer based on their experiences.

Teacher: Give some prompts, like bacteria are prokaryotic.

Students: Produce many responses on the importance of prokaryotic organisms in our lives.

Teacher: Show another picture that has the structures of a Plant cell and an Animal cell. Ask to identify similarities and dissimilarities between the cells. (Disequilibrium).



Students: Identify and compare the dissimilarities and similarities between cells. One cell contains a cell wall and the cell membrane, but another cell contains only the cell membrane, which is known as the Plant cell and the Animal cell, respectively. Some give the wrong answer. (try to accommodate and assimilate)

Teacher: Plant cells and animal cells are both eukaryotic cells, meaning they have a well-defined nucleus and other membrane-bound organelles. However, there are some key differences between them. Plant cells have a cell wall made of cellulose that gives them a rigid shape, while animal cells do not have a cell

wall and are usually round or irregular in shape. Plant cells also contain chloroplasts, which help in photosynthesis by converting sunlight into energy. These (the Cell wall and chlorophyll) are not found in animal cells. In addition, plant cells usually have a large central vacuole that stores water and nutrients, whereas animal cells have smaller vacuoles. Both cell types share common structures like the nucleus, cytoplasm, mitochondria, and cell membrane. (Describe through lecture)

Students: Write the information (accommodate and assimilate)

Teacher: Describe the Plant and animal cell, and show the resemblance of the cell wall with the outer wall of the home, and ask for the function of the cell wall?

Students: State the functions of the cell wall (recalls and assimilates).

- Protect the cell
- It provides strength to the cell
- Help in the transport of the materials from one cell to another cell etc.

Teacher: Explain the function of the cell wall and its composition (explanation).

The **cell wall** is made up of cellulose and provides structure, support, and protection to plant cells. It is a rigid outer layer made mainly of cellulose that surrounds the cell membrane. The cell wall helps the plant cell maintain its shape, prevents it from bursting when water enters the cell (by exerting pressure), and acts as a barrier against mechanical stress and pathogens. It also allows the free movement of water, gases, and some substances in and out of the cell.

Student: Note down (accommodate with new information and assimilate).

Teacher: The teacher asks questions and starts brainstorming or discussion among learners.

- Why is this particular material, i.e. cellulose, found in the cell wall of plants?
- How does the cell wall help in Disease Control in the plant cell? (Discussion-based question, assimilate, accommodate, equilibrium) (Group formation).

Students: Create many responses based on their understanding, thinking and analysis. (accommodation and equilibrium).

Teacher: Facilitate and evaluate the response of students through their collaboration and correct the misconceptions of the students.

Students: Conclude with the help of students. (Accommodate and equilibrium)

Teacher: Conclude the session.

Summarization

The teacher summarizes the activities of the classroom.

Cell: The basic structural and functional unit of all living organisms.

Eukaryotic Cell: A cell with a well-defined nucleus and membrane-bound organelles.

Prokaryotic Cell: A cell without a true nucleus or membrane-bound organelles.

Animal Cell: A eukaryotic cell found in animals, lacking a cell wall and chloroplasts.

Plant Cell: A eukaryotic cell found in plants, containing a cell wall, chloroplasts, and a large vacuole.

Cell Wall: A rigid outer layer found in plant cells that provides structure and protection.

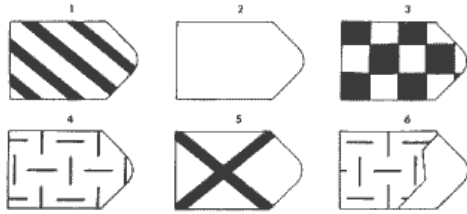
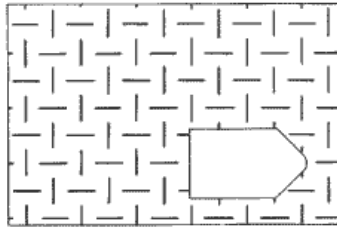
Function of Cell Wall: To support the cell, maintain its shape, and protect it from external damage.

Homework:

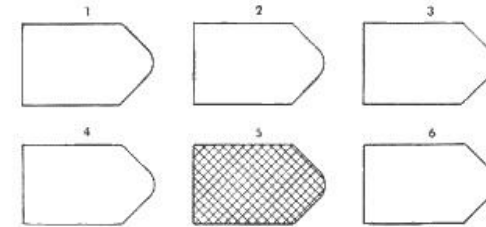
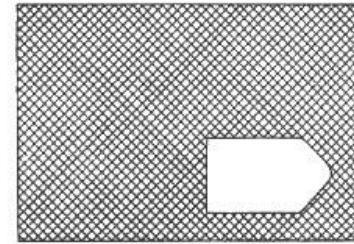
- How do prokaryotic organisms affect our lives? Explain with examples.
- Write the names of the cells that are present in our surroundings.

Evaluation: Science Achievement Test

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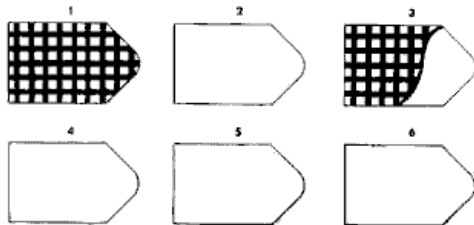
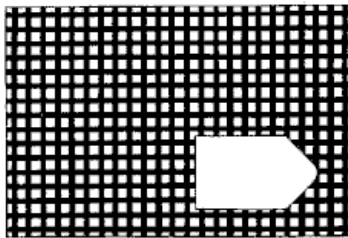


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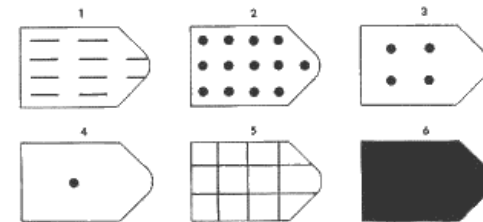
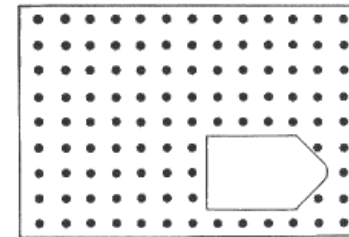
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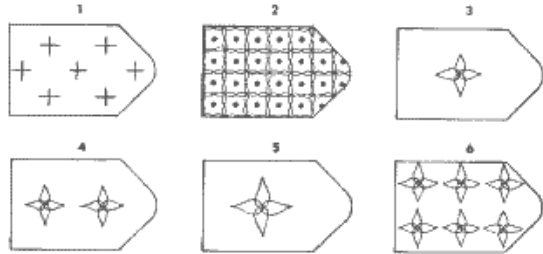
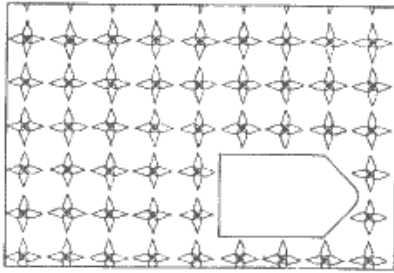
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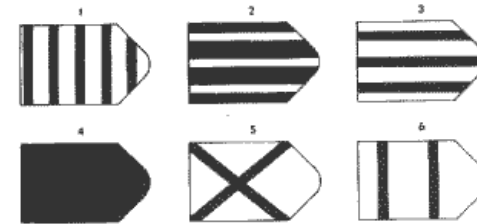
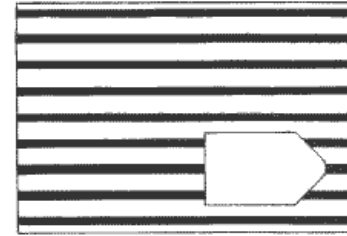
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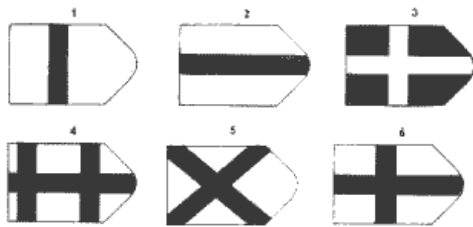
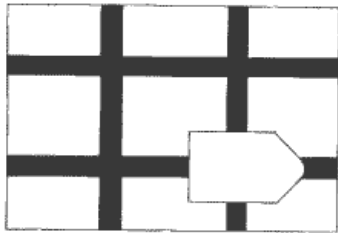
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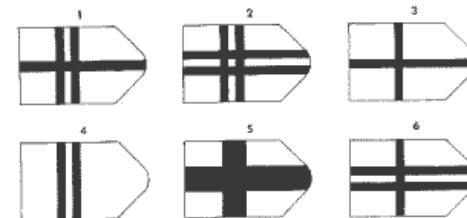
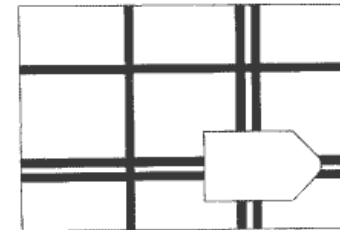
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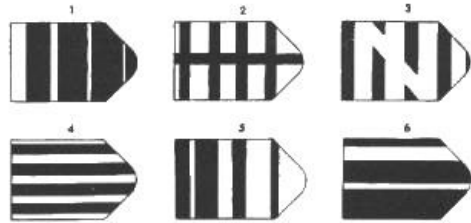
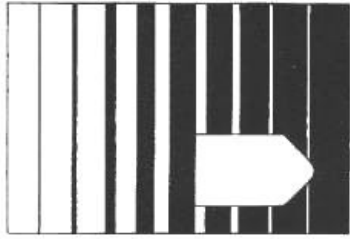
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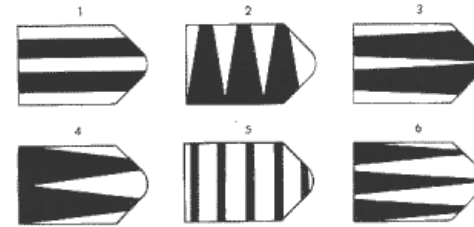
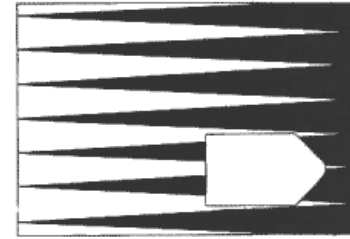


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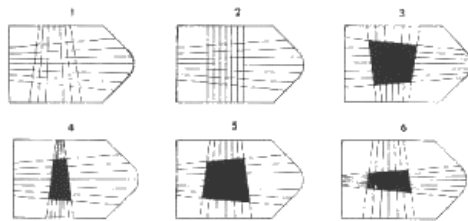
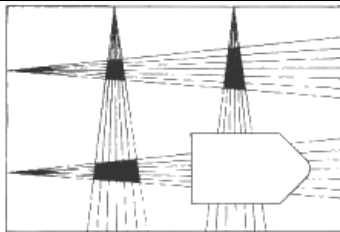


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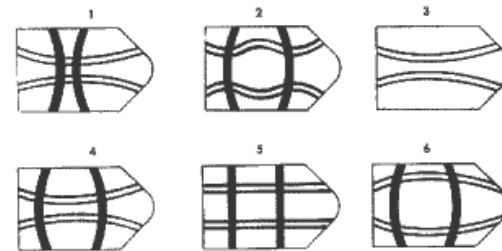
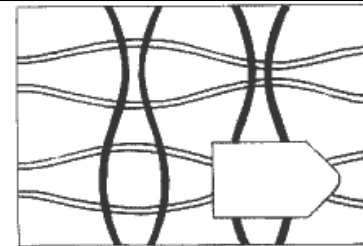
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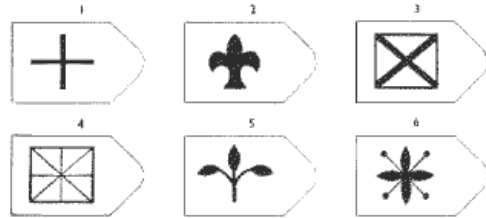
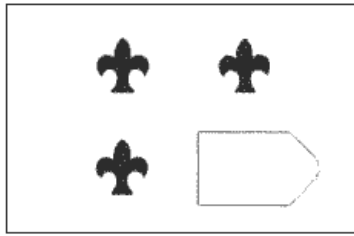
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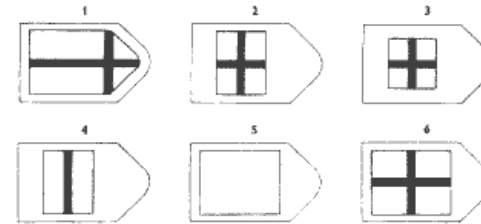
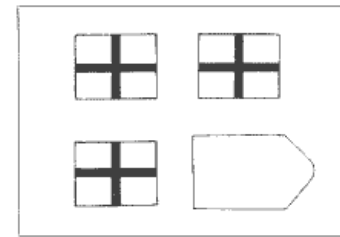
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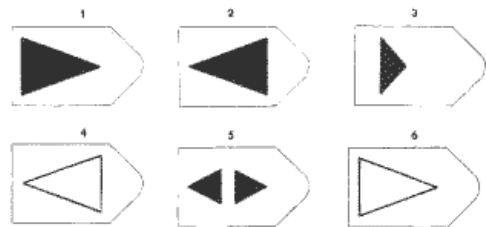
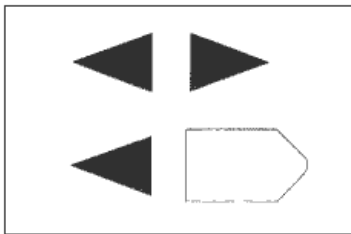
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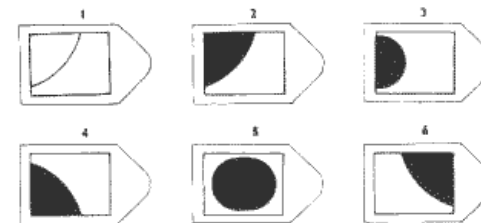
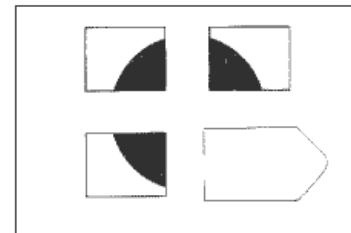
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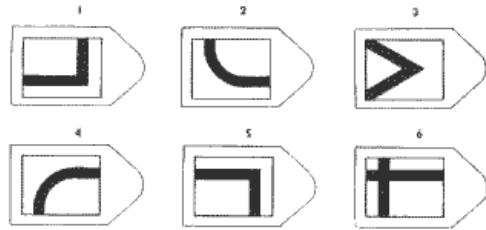
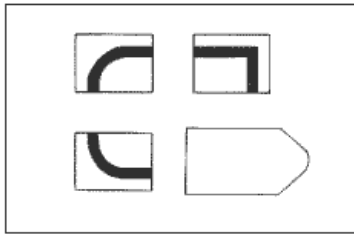
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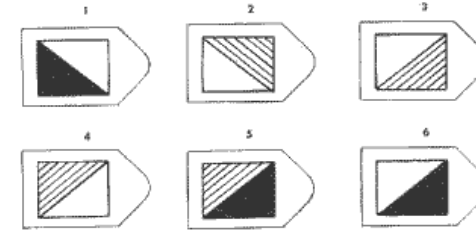
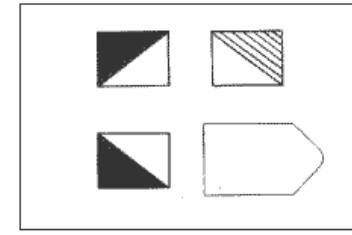
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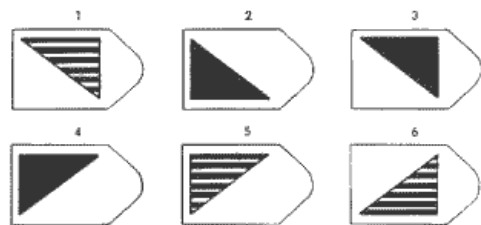
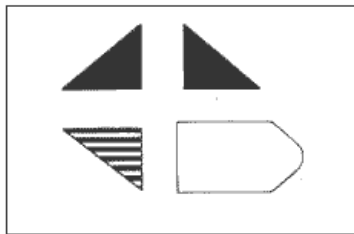
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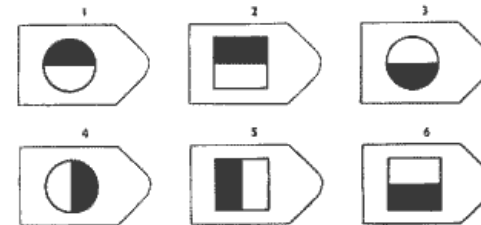
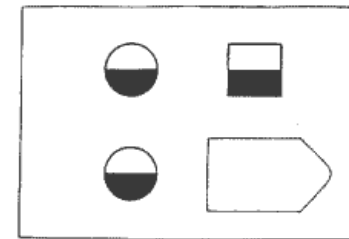
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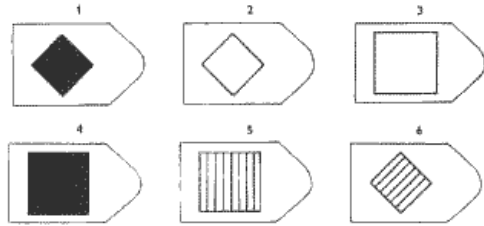
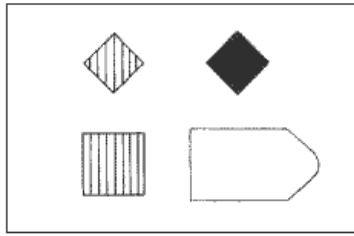
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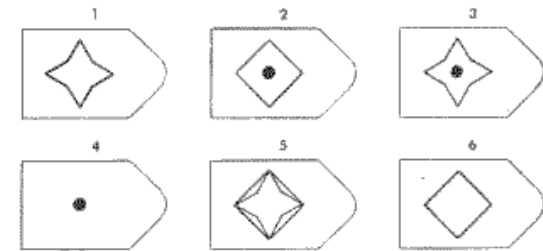
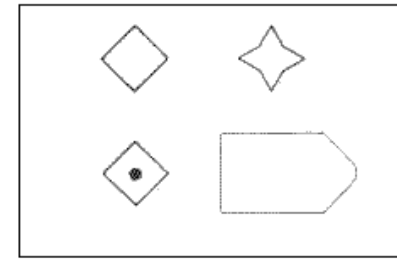
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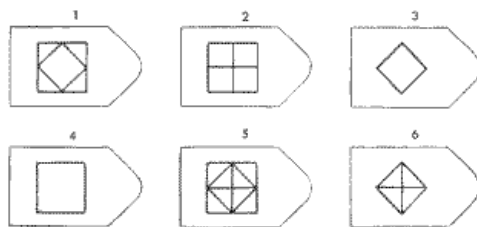
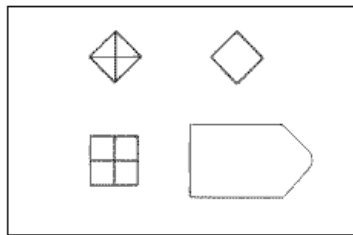
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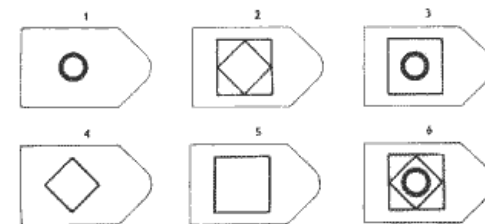
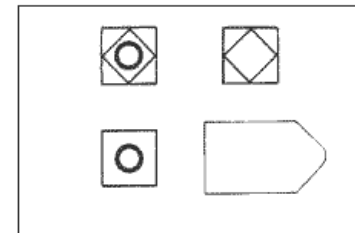
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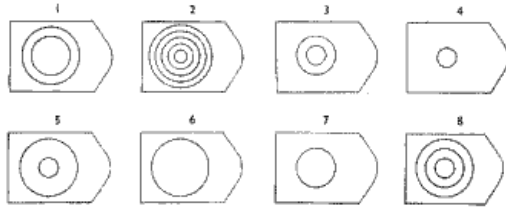
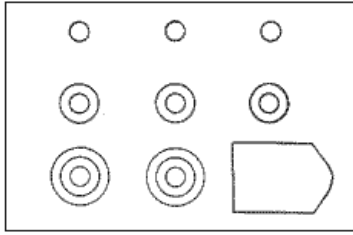
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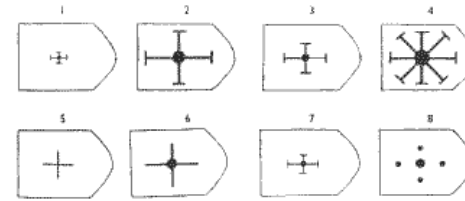
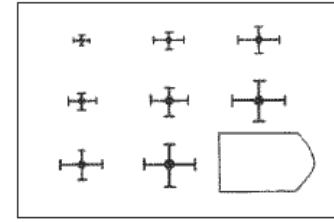
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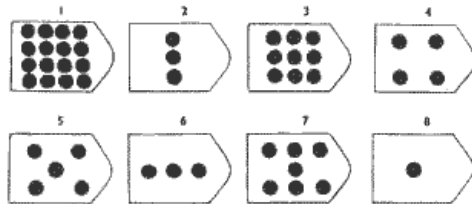
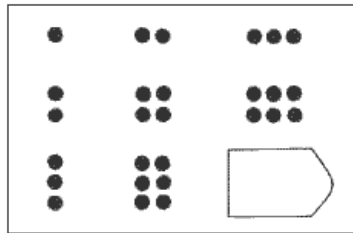
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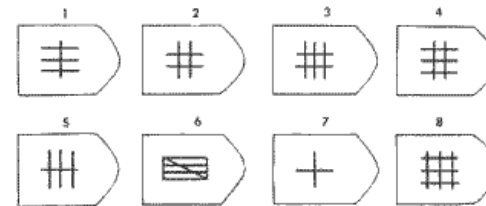
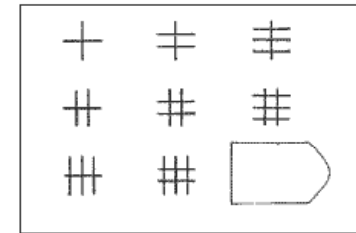
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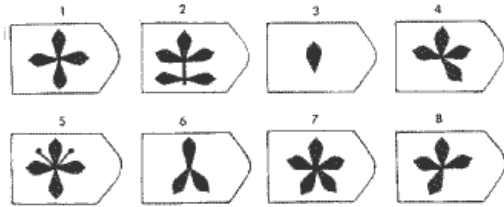
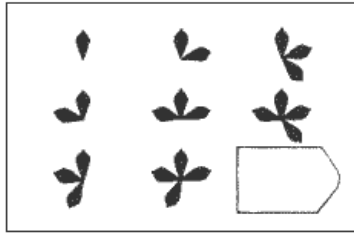
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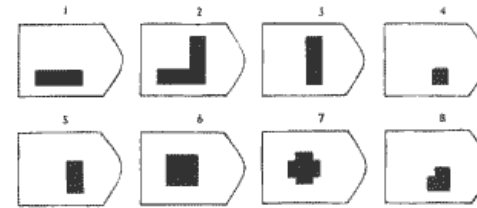
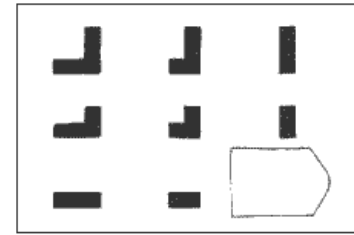
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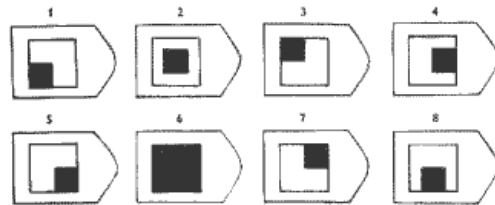
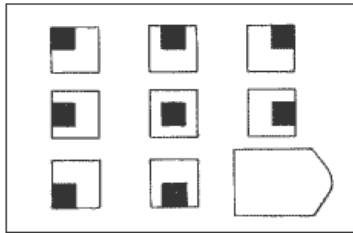
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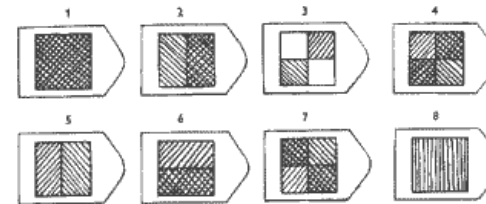
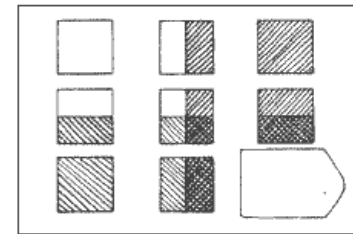
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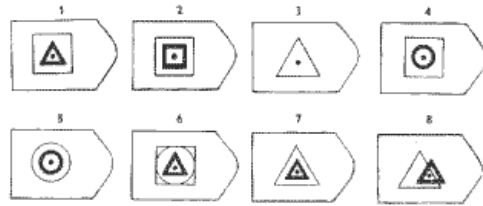
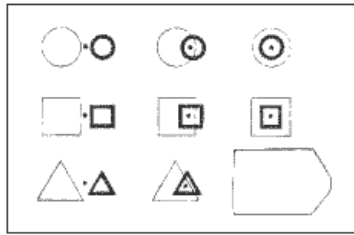
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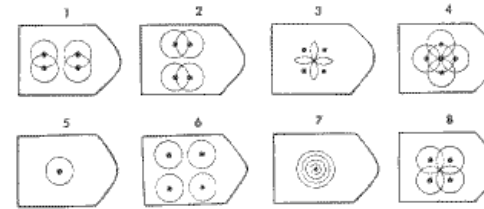
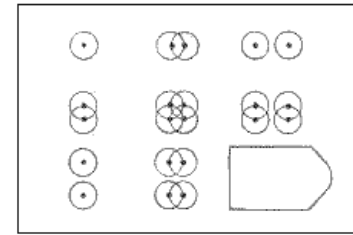
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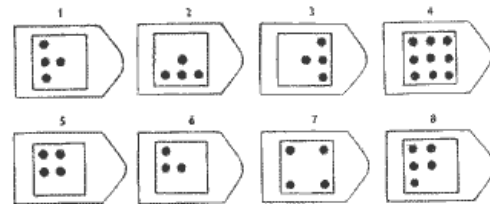
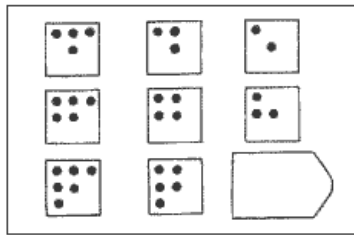
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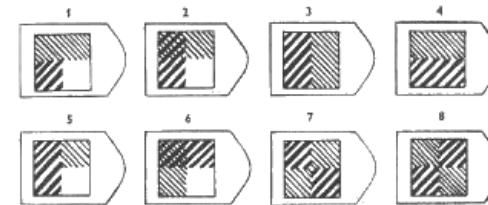
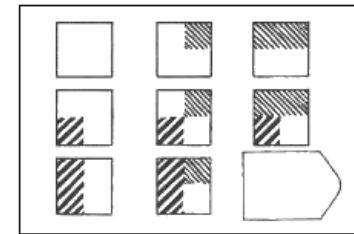
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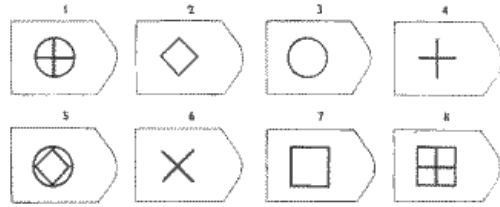
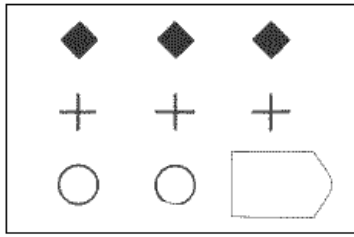
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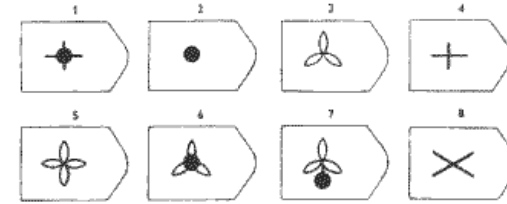
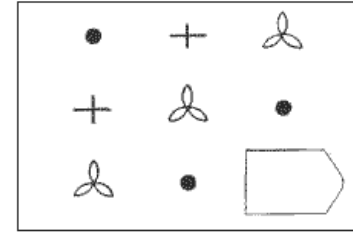
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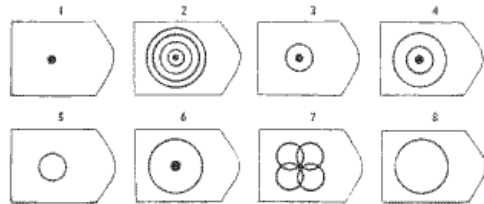
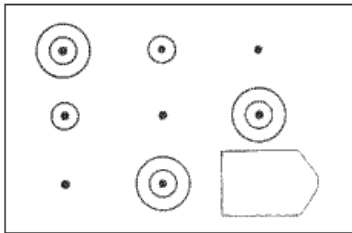
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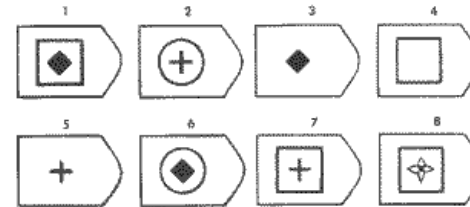
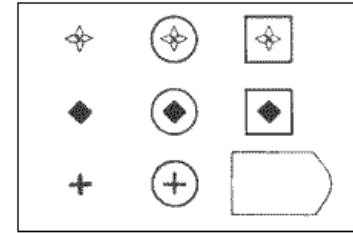
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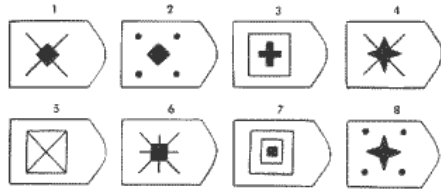
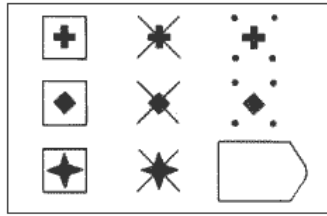
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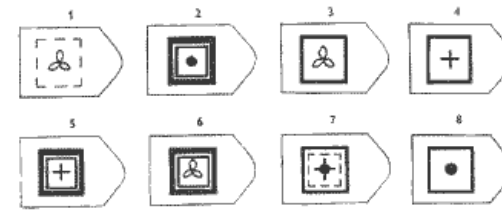
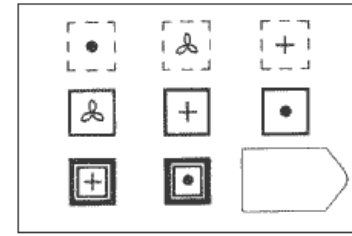
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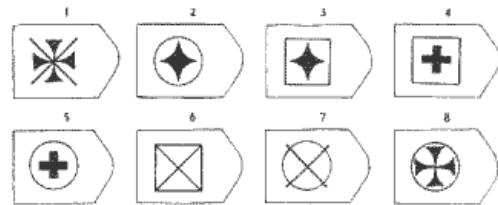
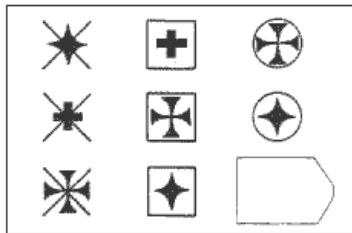
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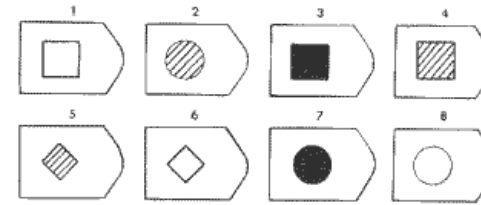
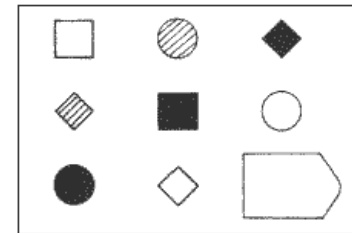
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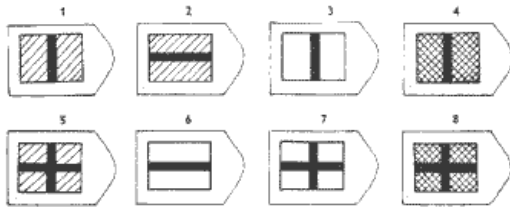
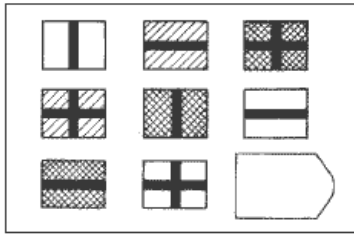
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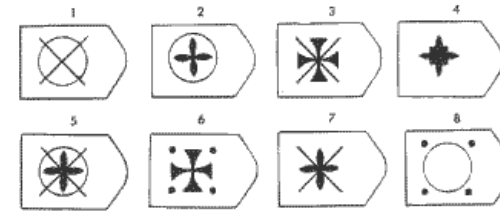
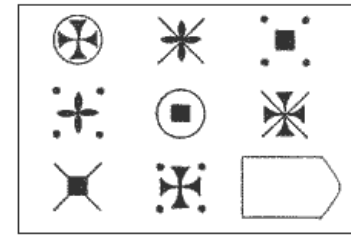
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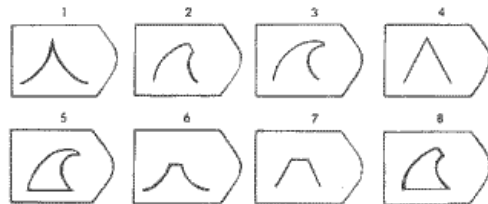
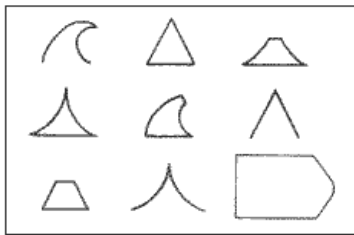
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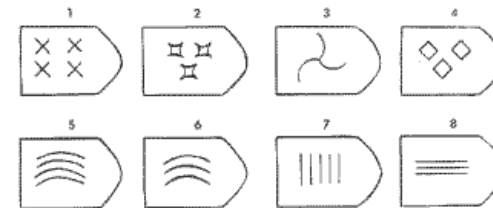
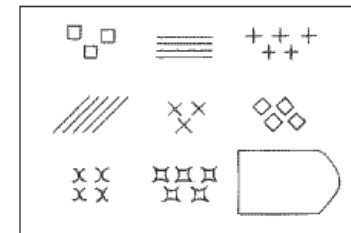
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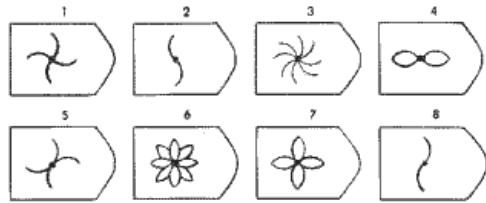
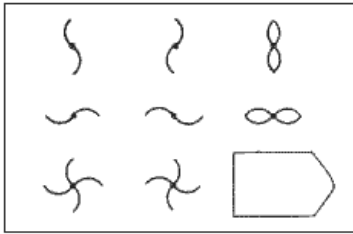
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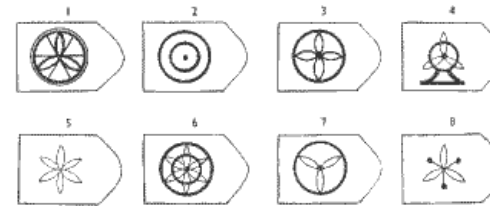
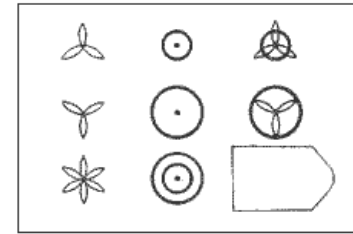
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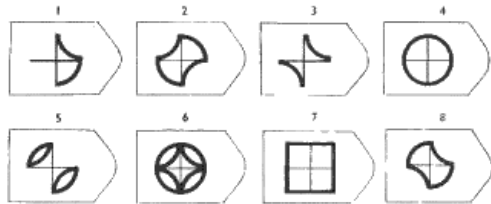
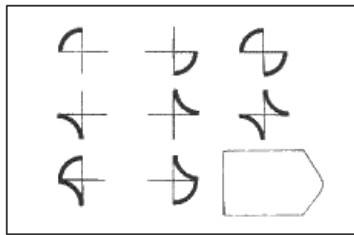
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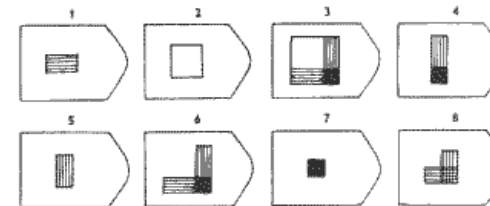
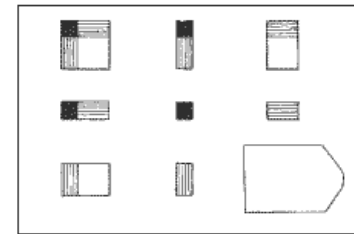
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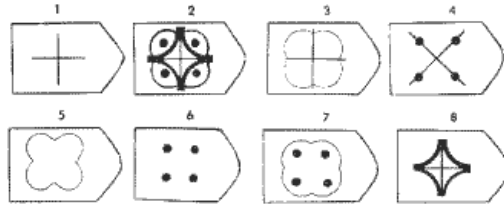
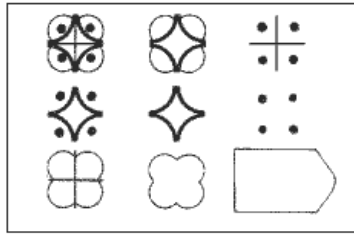
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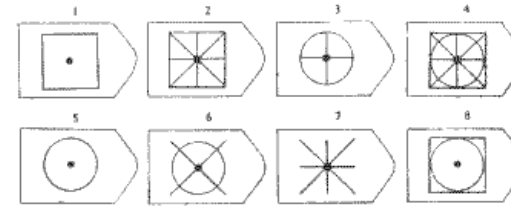
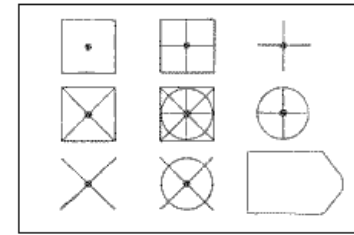
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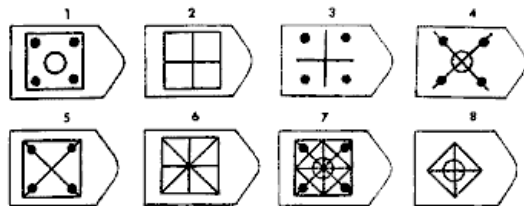
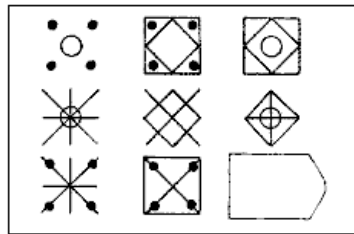
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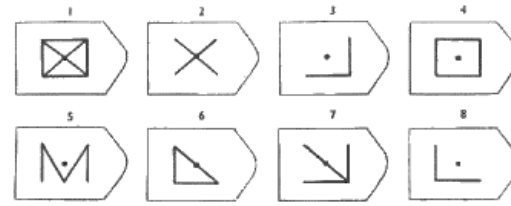
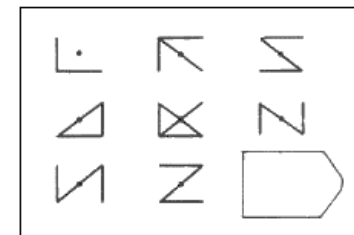
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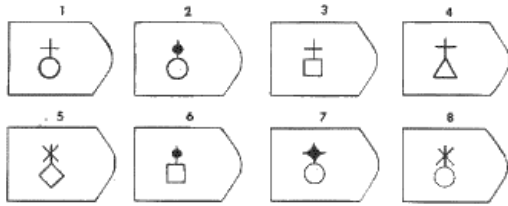
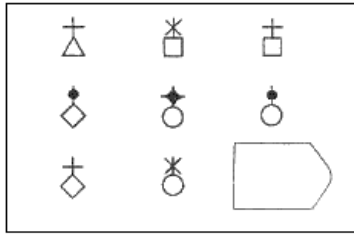
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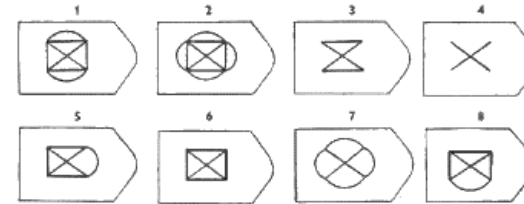
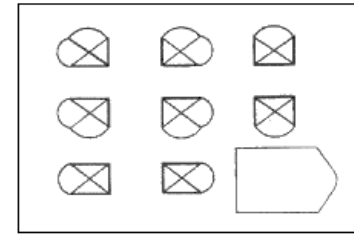
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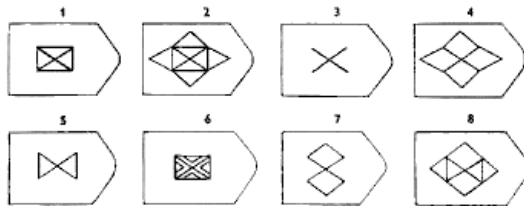
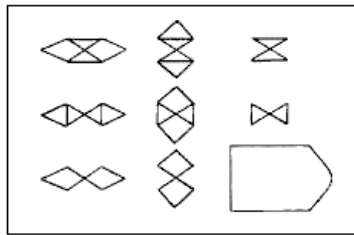
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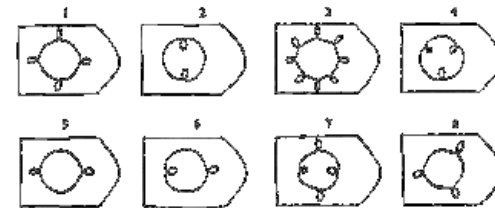
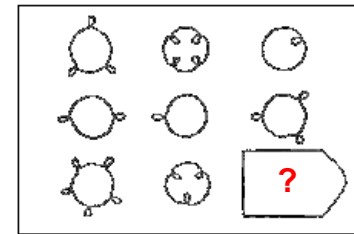
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Appendix: 7
First Draft
Science Achievement Test

Name: _____

Class: _____ **Section:** _____ **Age:** _____

Gender: Male: () Female: (), **Locality:** Rural: () Urban: ()

Occupation: (i) Father- _____ (ii) Mother- _____

Educational status: (i) Father- _____ (ii) Mother- _____

School _____

General instruction -

1. This test is for measuring your achievement in the science subject.
2. This test will be used only for research purpose. Your answer will be kept confidential.
3. All questions are compulsory to attempt.
4. Each question carries four options. Choose one correct answer.
5. In last 16 questions belong to the descriptive type.
6. Choose the correct answer by putting a tick mark [√] in the box given in front of the correct answer on a separate answer sheet provided to you.

Matter in our surroundings

1. Can a rubber band change shape and still be considered a solid?
 - a. Yes, it changes shape and cannot be called solid.
 - b. No, it does not change shape, but it is solid.
 - c. Yes, it changes shape, and it's solid.
 - d. No, it doesn't change shape, and it is not a solid
2. Which one of the following statements is not correct about solid?
 - A) Solids have fixed shape
 - B) Solids have fixed volume
 - C) Solids can flow
 - D) Solids have high densities
3. A piece of chalk can be broken into small particles by hammering, but a piece of iron cannot be broken into smaller particles by hammering. It illustrates that
 - A) Particles of matter have space in between them
 - B) Particles of matter possess kinetic energy
 - C) Particles of matter attract one another
 - D) All of these
4. What is the primary constituent of matter according to the particle theory?
 - A) Atoms
 - B) Molecules

- C) Particles
D) Elements
5. Which one of the following options is correct?
Statement 1: The physical state of a substance can be changed by changing its temperature. Statement 2: The physical state of a substance can be changed by changing pressure.
A) Statement 1
B) Statement 2
C) Both statements are correct
D) Both statements are incorrect
6. A few substances are arranged in the increasing order of 'forces of attraction' between their particles. Which one of the following represents a correct arrangement?
A) Water, air, wind
B) Air, sugar, oil
C) Oxygen, water, sugar
D) Salt, juice, air
7. Which state of matter has particles with the least force of attraction and maximum intermolecular space?
A) Solid
B) Liquid
C) Gas
D) Plasma
8. Which one of the following options is correct?
Statement 1: In solids, molecules are tightly packed.
Statement 2: The force of attraction between molecules in solids is weak.
A) Statement 1 only
B) Statement 2 only
C) Both statements are correct
D) Both statements are incorrect
9. What is the main reason for the bursting of a balloon left in the sun?
A) Decreased pressure.
B) Increased pressure
C) Changes in humidity
D) Presence of helium
10. Explain why spreading wet clothes increases the rate of evaporation.
A) It increases air pressure.
B) It increases humidity.
C) It increases surface area.
D) It decreases temperature.
11. Why does the water level not change when salt is dissolved in water?
A) Salt evaporates.
B) Salt dissolves and absorbs in intermolecular space.
C) Salt particles stick to the water particles.
D) Salt contracts
- Answer: b. Salt dissolves and absorbs in intermolecular space
12. Why do earthen pots keep water cool?
A) It absorbs heat.
B) It reflects heat.
C) It allows evaporation.
D) It conducts heat.
- Answer: C. It allows evaporation.
13. The property of flow is unique to fluids. Which one of the following statements is correct?
A) Only gases behave like fluids
B) Gases and solids behave like fluids
C) Gases and liquids behave like fluids
D) Only liquids are fluids

14. Cloud formation is performed in nature due to
- A) Vaporization
 - B) Evaporation
 - C) Condensation
 - D) Deposition
15. Sneha set up the experiment for melting ice in a beaker and noted down the temperature throughout the process. What do you think she observed when the ice was melting?
- A) The temperature in the thermometer kept increasing until the ice melted.
 - B) Once the melting process started, the temperature in the thermometer remained constant throughout the experiment.
 - C) There was no change in temperature throughout the experiment.
 - D) Ice did not melt on heating. It was converted to vapours.
16. When suffering from a fever, why does ice provide more relief than ice-cold water?
- A) Ice has a lower melting point.
 - B) Ice absorbs latent heat.
 - C) Ice-cold water is a better conductor.
 - D) Ice increases body temperature.
17. Seema visited a Natural Gas Compressing unit and found that the gas can be liquefied under specific temperature and pressure conditions. While sharing her experience with friends, she got confused. Please help her to identify the correct set of conditions.
- A) Low temperature, low pressure
 - B) High temperature, low pressure
 - C) Low temperature, high pressure
 - D) High temperature, high pressure

18. How do the surface area and wind speed affect the evaporation rate?
- A) Greater surface area and higher wind speed increase evaporation
 - B) The smaller surface area and lower wind speed increase evaporation
 - C) The surface area doesn't affect evaporation.
 - D) Wind speed has no impact on evaporation.

Is matter around us pure?

19. Which of the following is a pure substance?
- A) Air
 - B) Distilled water
 - C) Steel
 - D) Brass
20. Which of the following statements are true for pure substances?
- I. Pure substances contain only one kind of particle.
 - II. Pure substances may be compounds or mixtures.
 - III. Pure substances have the same composition throughout.
 - IV. Pure substances can be exemplified by all elements other than nickel.
- A) I and II
 - B) I and III
 - C) III and IV
 - D) II and III
21. Identify the non-metal, which is lustrous.
- A) Sulphur
 - B) Graphite
 - C) Iodine
 - D) Phosphorus

22. Which of the metals is not a good conductor of electricity?

- A) Lead
- B) Graphite
- C) Aluminium
- D) Silver

23. An example of a metalloid is.

- A) Boron
- B) Lead
- C) Chlorine
- D) Bromine

24. An example of chemical change is.

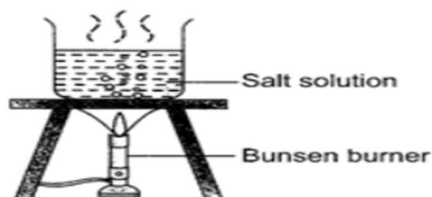
- A) Plucking of Table
- B) Melting of Wax
- C) Burning of Coal
- D) Melting of Water

25. Identify the non-metal which is a good conductor of electricity.

- A) Copper
- B) Graphite
- C) Aluminium
- D) Silver

26. Geetika poured 20 g of salt into 200 mL of water in a beaker. She stirred the water to dissolve the salt completely. Then, she heated the solution until it was reduced to half. How many grams of salt can be recovered from the remaining solution?

- a. 0 g
- b. 10 g
- c. 20 g
- d. 40 g



27. Which of the following is a characteristic of both mixtures and compounds?

- A) They contain components in fixed proportions.
- B) Their properties are the same as those of their components.
- C) Their weight is equal to the sum of the weights of their components.
- D) Energy is given out when they are being prepared.

28. Which of the following processes of separating substances involves evaporation and condensation?

- A) Filtration
- B) Crystallisation
- C) Distillation
- D) Sedimentation

29. What happens when salt dissolved in water is heated?

- A) There is an increase in the boiling point.
- B) There is no change in the boiling point.
- C) There is a decrease in the boiling point.
- D) All of the above

30. **Assertion (A):** Water and carbon dioxide are compounds.

Reason (R): Water and carbon dioxide are heterogeneous in nature.

- A) Both A and R are true, and R is a correct explanation of A.
- B) Both A and R are true, but R is not the correct explanation of A.
- C) A is true, but R is false.
- D) A is false, but R is true.

31. **Assertion-** Suspension is a heterogeneous mixture.

Reason- The solute particles do not dissolve but remain suspended throughout the bulk of the medium.

- A) Both A and R are true, and R is the correct explanation of the statement A.
- B) Both A and R are true, but R is not the correct explanation of the A.
- C) A is true, but R is false.
- D) A is false, but R is true.

32. Sahil took a white solid from his teacher to find out its melting point. During the experiment, he found that the melting point was 160°C . However, the teacher told him that the actual melting point of the solid is 150°C . What could be the reason for Sahil's observation?

- A) The melting point of a solid depends upon the procedure and the amount taken.
- B) Solids can have different melting points depending upon the method of storage.
- C) The solid contains some impurities mixed with the pure compound.
- D) If the solid is heated strongly, the melting point increases.

33. By which process can we separate camphor from ammonium chloride?

- A) Filtration
- B) Sublimation
- C) Dissolution and evaporation
- D) Distillation

34. What would you do if asked to prepare a 10 per cent glucose in water by mass?" signifies.

- A) 10 grams of glucose dissolved in 100 grams of water.

B) 10 grams of glucose dissolved in 90 grams of water.

C) 20 grams of glucose dissolved in 200 grams of water.

D) 20 grams of glucose dissolved in 90 grams of water.

Fundamental Unit of Life

35. The cells were discovered by.

- A) Robert Hooke
- B) Purkinje
- C) Leeuwenhoek
- D) Robert Brown

36. Which of the following statements is correct?

- A) Prokaryotic cells are surrounded by a cell membrane
- B) Prokaryotic cells have a nucleus and cell organelles
- C) Eukaryotic cells have membrane-bound organelles
- D) Eukaryotic cells are associated with nucleoids.

37. In a cell, DNA is found in:

- A) Nucleus, mitochondria, and plastids
- B) Nucleus, mitochondria, and vacuoles
- C) Plastids, nucleus, and Golgi bodies
- D) Mitochondria, Golgi bodies, and lysosomes

38. Which is the largest cell organelle present in a plant cell?

- A) Nucleus
- B) Chloroplast
- C) Endoplasmic reticulum
- D) Mitochondria

39. Which of the following is not a membrane-bound organelle?

- A) Ribosomes
- B) Lysosomes

- C) Endoplasmic reticulum
D) Nucleus
40. The endoskeleton of Animal cells is:
A) Ribosomes
B) Lysosomes
C) Endoplasmic Reticulum (E.R.)
D) Chromosomes
41. Cell theory states that cells are the structural and functional unit of
A) Plants
B) animals
C) Both [a] and [b]
D) Virus
42. Name of the organelle in which Steroid hormone is synthesized.
A) Endoplasmic reticulum
B) Hypothalamus
C) Pituitary gland
D) Pancreas
43. Site of the cellular respiration is-
A) Lung
B) Mitochondria
C) Nucleoplasm
D) Alveoli
44. Golgi Body helps in:
A) Respiration
B) Protein synthesis
C) Photosynthesis
D) Transportation of materials
45. The only cell organelle seen in prokaryotic cells is
- A) Mitochondria
B) Ribosomes
C) Plastids
D) Lysosomes
46. The cell theory, jointly given by Schleiden and Schwann, did not explain.
A) All living organisms are composed of cells, and their products
B) The cell is the structural and functional unit of living organisms.
C) Formation of new cells
D) None of the above
47. Which of the following is responsible for the mechanical support, protein synthesis, and material transport?
A) Cell membrane
B) Ribosomes
C) Endoplasmic reticulum
D) Golgi apparatus
48. **Assertion:** Cells having cell walls withstand very dilute (hypotonic) external media without bursting.
Reason: The cell wall exerts an equal pressure against the swollen cell.
A) Both A and R are true, and R is the correct explanation of the A
B) Both A and R are true, but R is not the correct explanation of the A
C) A is true, but R is false
D) A is false, but R is true
49. When an amoeba is placed in freshwater, the formation of vacuoles is too frequent because.
A) Vacuoles do not help in maintaining the rigidity of the cell.
B) Vacuoles form thread-like tails in sperms of many mammals
C) Vacuoles expel excess water and waste products from the cell
D) Vacuoles store only excretory products of a cell

50. Animal cells lacking nuclei would also lack in

- A) Ribosomes
- B) Lysosomes
- C) Endoplasmic reticulum
- D) Chromosomes

51. **Assertion:** Cells having cell walls withstand very dilute (hypotonic) external media without bursting.

Reason: The cell wall exerts an equal pressure against the swollen cell.

- A) Both A and R are true, and R is the correct explanation of the A
- B) Both A and R are true, but R is not the correct explanation of the A
- C) A is true, but R is false
- D) A is false, but R is true

52. Plasma membrane is selectively permeable because.

- A) It allows the movement of all substances within the cell.
- B) It allows the movement of some substances into the cell.
- C) It allows the entry and exit of selected material in and out of the cell.
- D) All of the above

53. **Assertion:** Robert Brown discovered the nucleus.

Reason: The Nucleoplasm and cytoplasm of a living cell together form the protoplasm.

- A) Both A and R are true, and R is the correct explanation of the A
- B) Both A and R are true, but R is not the correct explanation of the A
- C) A is true, but R is false
- D) A is false, but R is true

54. What will happen if we put a plant cell in an isotonic solution?

- A) Cell will swell up
- B) Cell will lose water
- C) The cell will stay the same size
- D) Cell will shrink

55. A resin will swell up in the solution because-

- A) The concentration of water molecules in the cell is higher than the concentration of water molecules in the surrounding medium
- B) The concentration of water molecules in the surrounding medium is higher than the water molecules concentration in the cell
- C) The concentration of water molecules is the same in the cell and the surrounding medium
- D) The concentration of water molecules does not matter

Correct Answer: **B.**

56. Suppose a cell is going to divide. What changes will you see in the cell?

- A) Appearance of DNA
- B) Appearance of Nucleoid
- C) Appearance of Genes
- D) Appearance of Chromosomes

57. When a cell faces a protein accumulation problem, but after examining, you find protein synthesis in the cell is proper. What problem is facing the cell?

- A) Vacuoles are not functioning
- B) Golgi Body is not functioning
- C) Ribosome is not functioning
- D) E.R. is not functioning

Motion

58. Displacement is?
- A) The actual length of the path covered
 - B) The change in the position of an object
 - C) The length of the shortest path between initial and final positions
 - D) The distance travelled in a straight line
59. What is the SI unit of speed?
- A) Meter
 - B) Meter per second (m/s)
 - C) Kilometre per hour (km/h)
 - D) Second
60. The unit of acceleration is.
- A) m/s
 - B) ms
 - C) m/s^2
 - D) None of these
61. Displacement of a body can be
- A) Positive
 - B) Negative
 - C) Zero
 - D) All of these
62. The rate of change of displacement with time is.
- A) Speed
 - B) Acceleration
 - C) Retardation
 - D) Velocity
63. The ratio of magnitudes of average speed and average velocity is.
- A) Always less than one
 - B) Always greater than one
 - C) Always equal to one
 - D) Sometimes less than one and sometimes greater than one
64. Acceleration can be defined as the rate of change of which quantity?
- A) Displacement
 - B) Velocity
 - C) Momentum
 - D) Inertia
65. **Assertion:** The speedometer of an automobile measures the instantaneous speed of the automobile.
Reason: Average velocity is equal to total displacement per total time taken.
- A) Both A and R are true, but R is not the correct explanation of A.
 - B) Both A and R are true, and R is the correct explanation of A.
 - C) A is true, but R is false.
 - D) A is false, but R is true.
66. **Assertion:** Displacement of the body may be zero when the distance travelled by it is not zero.
Reason: The displacement is the longer distance between the initial and final positions.
- A) Both A and R are true, and R is the correct explanation of A.
 - B) Both A and R are true, but R is not the correct explanation of the A.
 - C) A is true, but R is false.
 - D) A is false, but R is true.
67. What is the acceleration for an object that performs a uniform circular motion?
- A) constant in direction
 - B) constant in magnitude and direction
 - C) constant in magnitude but not in direction
 - D) constant in neither magnitude nor in direction

68. **Assertion:** Position-time graph of a stationary object is a straight line parallel to the time axis.

Reason: The position does not change with time for a stationary object.

- A) Both A and R are true, and R is the correct explanation of A.
- B) Both A and R are true, but R is not the correct explanation of the A.
- C) A is true, but R is false.
- D) A is false, but R is true.

69. **Assertion:** The position-time graph of a uniform motion in one dimension of a body can have a negative slope.

Reason: When the body's speed decreases with time, the position-time graph of the moving body has a negative slope.

- A) Both A and R are true, and R is the correct explanation of A.
- B) Both A and R are true, but R is not the correct explanation of the A.
- C) A is true, but R is false.
- D) A is false, but R is true.

70. **Assertion:** A body can accelerate even with constant speed.

Reason: In a uniform circular motion, the speed of the body is constant, but its velocity continuously changes

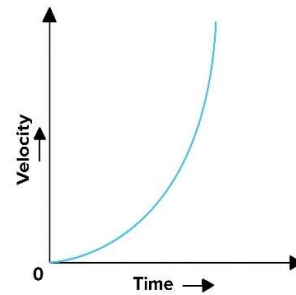
- A) Both A and R are true, and R is the correct explanation of A.
- B) Both A and R are true, but R is not the correct explanation of the A.
- C) A is true, but R is false.
- D) A is false, but R is true.

71. Suppose you are travelling in a train and tossing a coin. The coin falls backwards, which means.

- A) Train accelerated
- B) Train Slowing
- C) Train in Uniform motion

D) Train stops suddenly

72. Based on Rohan's walking, a plot is drawn. What will you infer from plot?



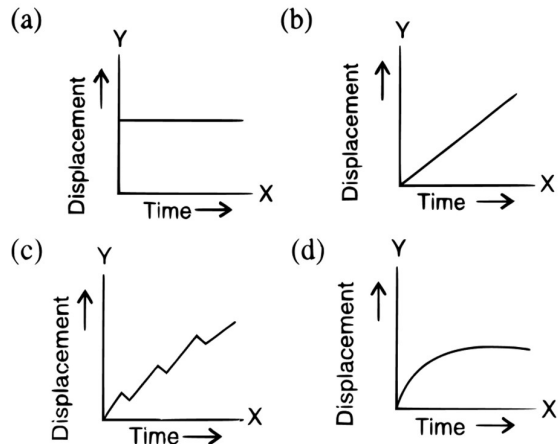
- A) Non-uniform motion
- B) Uniform motion
- C) Accelerated motion
- D) Circular motion

73. A car accelerates uniformly from 10 m/s to 30 m/s in 4 seconds. Calculate the acceleration.

- A) 5 m/s²
- B) 10 m/s²
- C) 20 m/s²
- D) 40 m/s²

74. A car moves 5 km in 5 minutes. After that, it moves 10 km in 5 minutes. Which graph is correct?

- A) A
- B) B
- C) C
- D) D



Force and Laws of Motion

75. The inertia of a moving object depends on:

- A) Mass of object
- B) Momentum of object
- C) Speed of object
- D) Shape of object

76. Force of friction always opposes.

- A) Motion
- B) Force
- C) Momentum
- D) Inhibition of speed.

77. The rate of change in momentum is directly proportional to

- A) Area
- B) Balanced force
- C) Unbalanced force
- D) Inertia

78. The inertia of an object tends to cause the object.

- A) To increase its speed
- B) To decrease its speed
- C) To resist any change in its state of motion
- D) To decelerate due to friction

79. The second law of motion is.

- A) $F = ga$
- B) $F = ma$
- C) $F = mg$
- D) $F = G.ma$

80. The unit of measuring the momentum of a moving body is:

- A) m/s
- B) $\text{kg}\cdot\text{m/s}$
- C) $\text{kg}\cdot\text{m/s}^2$
- D) $\text{N}\cdot\text{m}^2/\text{kg}^2$

81. When a rubber ball is pressed between two hands, its shape changes. This happens because:

- A) Balanced forces act on the ball
- B) Unbalanced forces act on the ball
- C) Frictional forces act on the ball
- D) Gravitational force acts on the ball

82. There are two statements:

A. Newton's first law is valid for the pilot in an aircraft taking off.

B. Newton's first law is valid for the observer in a train moving with constant velocity.

Which of the following is correct?

- A) Only A
- B) Only B
- C) Both A and B
- D) None of the above

83. The resultant force acting on a body is zero.

- A) The body is in the un-equilibrium
- B) The body is in equilibrium
- C) The body moves with constant acceleration
- D) Body moves with retardation

84. If the force acting on the body is zero, its momentum will be:

- A) Zero
- B) Constant
- C) Infinite
- D) Variable

85. **Assertion:** If the net external force on the body is zero, then its acceleration is zero.

Reason: Acceleration does not depend on force.

- A) Both A and R are true, and R is the correct explanation of A.
- B) Both A and R are true, but R is not the correct explanation of A.

- C) A is true, but R is false.
D) A is false, but R is true.
86. **Assertion:** To every action, there is an equal and opposite reaction.
Reason: Thrust on a rocket depends upon the exhaust speed of the gases.
A) Both A and R are true, and R is the correct explanation of A.
B) Both A and R are true, but R is not the correct explanation of A.
C) A is true, but R is false.
D) A is false, but R is true.
87. **Assertion:** When various forces are acting on a body, then the body may accelerate or remain static.
Reason: Acceleration in a body is produced only due to the resultant force acting on it.
A) Both A and R are true, and R is the correct explanation of A.
B) Both A and R are true, but R is not the correct explanation of A.
C) A is true, but R is false.
D) A is false, but R is true.
88. A football and a stone have the same mass; then how much force must be applied to change their position:
A) Same force because of the same inertia
B) Same force because of the same momentum
C) Different forces because of different objects.
D) Different forces because of different momentum
89. A dirty blanket is beaten by a stick to remove dust particles. Which law holds good for this?
A) Law of conservation of momentum
B) Law of inertia
C) Law of impulse
D) Law of conservation of energy
90. What happens to the acceleration if the mass of a body and the force acting on it are doubled?
A) Doubled
B) Halved
C) Remains the same
D) Becomes zero
91. Why can a fast-moving cricket ball cause more injuries to a cricketer than a moving tennis ball?
A) Due to large size
B) Due to the large momentum
C) Both [a] and [b]
D) None of the above
- Gravitation**
92. The Earth's atmosphere is held by the
A. Wind
B. Clouds
C. Earth's magnetic field
D. Gravity
93. Which of the following is true when a Mango falls from a Mango Tree?
A. Only the Earth attracts Mango.
B. Only Mango attracts the Earth.
C. Both Mango and Earth attract each other
D. Both Mango and Earth repel each other
94. The weight of an object on the Moon's surface is
A. $\frac{1}{3}$ rd of the weight on Earth
B. $\frac{1}{5}$ th of the weight on Earth
C. $\frac{1}{6}$ th of the weight on Earth
D. $\frac{1}{2}$ nd of the weight on Earth
95. Buoyant force depends on _____.
A. The colour of the liquid
B. The density of the liquid
C. The depth of the liquid
D. The weight of the liquid

Understanding

96. If two objects are submerged in water, then

- A. Buoyant force is the same for both objects.
- B. Buoyant force is different for both objects.
- C. Buoyant force does not apply to the fully submerged object.
- D. None of the above

97. When a body is immersed in a fluid, partially or completely, the force of buoyancy is equal to _____.

- A. The weight of the fluid displaced by the body.
- B. The weight of the volume of the fluid is equal to the volume of the body.
- C. The product of the weight of the body and acceleration due to gravity.
- D. The weight of the body.

98. Which of the following proves there is a gravitational force between the Earth and the Sun?

- A. Occurrence of day and night.
- B. Earth revolving around the sun.
- C. The sun is apparently revolving around the Earth.
- D. Falling bodies deviating towards the east.

99. The distance between two masses is doubled; what happens to the gravitational force between them?

- A. Double
- B. Half
- C. Remains the same
- D. Decreased to a quarter

100. Which of the following statements is correct?

Statement 1: Acceleration due to gravity decreases with height.

Statement 2: The value of G changes from place to place.

- A. Statements 1 and 2 both are correct
- B. Statement 1 is correct, and Statement 2 is incorrect
- C. Statement 1 is incorrect, and Statement 2 is correct
- D. Statements 1 and 2 both are incorrect
- E. None of these

Application

101. If a plastic ball floats on the surface of the water on Earth, what will happen if placed in a bucket of water on the moon?

- A. Float
- B. Sink
- C. Firstly, float, but after some time it will sink
- D. None of the Above

102. An ice cube floats in the glass of water. What happens to the level of water in the glass when ice melts?

- A. Decrease
- B. Increase
- C. Remains the same
- D. First Increases, then decreases

103. The time period of an artificial satellite in a circular orbit of radius r is four days. If the time period of another satellite in a circular orbit is thirty-two days, then its radius of orbit will be:

- A. $32r$
- B. $16r$
- C. $8r$
- D. $4r$

Improvements in food resources

104. Which cropping method involves growing two or more crops simultaneously on the same land?

- A) Intra-cropping
- B) Intercropping
- C) Mixed cropping

- D) Ultra cropping
105. Which of the following is the term used for the practice of **bee culture**?
- Sericulture
 - Apiculture
 - Agriculture
 - Pisciculture
106. What are the three macronutrients needed for plant growth?
- Calcium, chlorine, and magnesium.
 - Nitrogen, phosphorus, and potassium.
 - Zinc, boron, and copper.
 - Calcium, zinc, and copper.
107. The poultry bird groomed for obtaining meat is called _____, while that groomed for obtaining eggs is called _____.
- Broiler, Chicken
 - Chicken, Layer
 - Layer, Broiler
 - Broiler, Layer
108. The season for rabi crop is-
- November to April
 - June to October
 - October to February
 - April to August
109. Cyperinus and Parthenium are types of
- Diseases
 - Pesticides
 - Weeds
 - Pathogens
110. Which one of the following fish is a surface feeder?
- Rohus
 - Mrigals
 - Common carps
 - Catla
111. Apis Dorsata is commonly known as
- Indian bee
 - Rock bee
 - Little bee
 - Italian bee
112. The green revolution refers to the drastic increase in production.
- Milk
 - Cereals
 - Water
 - Fish
113. Which of the following is not an organic method used to control weeds?
- Proper seed beds
 - Weedicides
 - Intercropping
 - Crop rotation
114. Cattle farming is done for the following purposes.
- Milk Production
 - Agricultural work
 - Meat production
 - Egg production
- (a), (b) and (c)
 - (b), (c) and (d)
 - (c) and (d)
 - (a) and (d)
115. Which of the following is true regarding fertilizer?
- long term benefits and no-cost farming
 - Long-term benefits and low-cost farming
 - Short-term benefits and high-cost farming

- D) Short-term benefits and low-cost farming.
116. Weeds affect the crop plants by:
- Killing of plants in the field before they grow.
 - Dominating the plants to grow.
 - Competing for various resources of crops (plants) causing low availability of nutrients.
 - All the above
117. Why are exotic breeds preferred to local breeds?
- Exotic breeds have low resistance to diseases.
 - Exotic breeds need less food.
 - Exotic breeds need less maintenance.
 - Exotic breeds have a long lactation period.
118. Nitrogenous fertilizers are not required by which of the following crops?
- Pulses
 - Groundnut
 - Red gram
 - All the above
119. Which of the following statements is correct?
- Statement P: The quality value of honey depends upon the flowers available.
- Statement Q: *Apis dorsata* is commonly known as the little bee.
- Statement P is correct, and statement Q is incorrect.
 - Statement Q is correct, and statement P is incorrect.
 - Both the statements are correct.
 - Both statements are incorrect.
120. Which of the following factors is the most important factor that led to the green revolution in India?
- Judicious use of pesticides
 - Proper use of water
 - Increase in land area under cultivation
 - Introduction of high-yielding varieties of crops
121. Which of the following conditions will benefit farmers most?
- Use of high-quality seeds, fertilisers, and no irrigation
 - Use of high-quality seeds, irrigation, use of fertilisers, and crop protection measures
 - Use of ordinary seeds, irrigation, and use of fertilisers
 - Use of high-quality seeds, irrigation, excessive use of chemical fertilisers, and crop protection measures
122. Crop rotation is an important part of organic farming. Why is mono-cropping problematic?
- The crop is vulnerable to organized crop thieves.
 - It encourages the build-up of diseases and pests that destroy a particular crop.
 - It does not use minerals.
 - It is expensive.
123. What will you do if you want to take Short-term benefits in high-cost farming?
- You will use fertilizer
 - You will use Manure
 - You will use mixed cropping
 - You will use intercropping
124. Which of these is/ are the advantages of crop rotation?

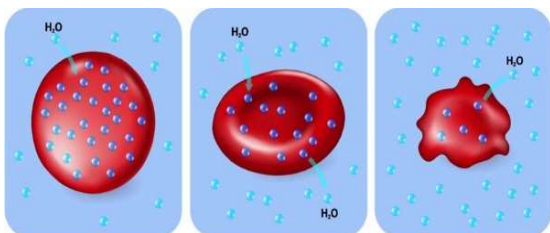
- A) It prevents the depletion of selective nutrients.
- B) It prevents the building up of diseases and pests of a particular crop.
- C) It enhances the production by increasing the soil fertility.
- D) All of the above

125. What do you do if you want to improve the crop production in your field

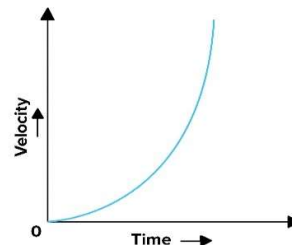
- A) You will choose a plant with tallness as the desired character of cereals.
- B) Profuse branching is good for fodder crops
- C) Variety resistance to biotic stress is a good factor to improve crops.
- D) You will choose a crop of shorter duration from sowing to harvesting.

Descriptive Question

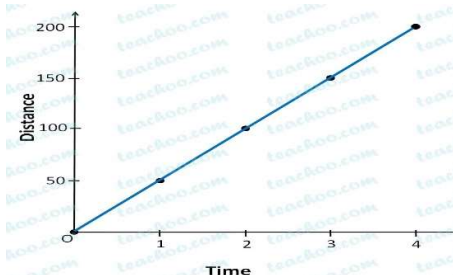
1. Why should we wear cotton clothes in Summer? Give the reason.
2. Why does steam produce more severe burns than boiling water? Explain with reason.
3. Solutions A and B are saturated at 5°C, but we want to dissolve more sugar. How will it be possible?
4. A solution contains 60 grams of NaCl in 400 grams of water. Calculate the concentration in terms of the mass-by-mass percentage of the solution.
5. How do physical and chemical changes help us in daily life?
6. Explain the phenomena that are shown in the diagram.



7. What will happen if a cell loses its cell wall?
8. When we found this graph. Explain with reason.



9. When we found this graph. Explain with reason.



10. An object has moved through a distance. Can it have zero displacement? If yes, support your answer with an example.
11. How a dirty cloth becomes clean in the washing machine. Which law of Newton applied in this phenomenon?
12. If a man jumps forward from a small boat, the boat moves backwards. What is the reason behind this phenomenon?
13. Why does a ball cause more severe hurt than tennis?
14. Why is swimming in seawater easier than in freshwater?
15. Why will a sheet of paper fall slower than one that is crumpled into a ball?
- 16.
17. How does a crossbreed animal help in the quality improvement of cattle?
18. If a farmer asks you, I want to improve yielding in my field. What will you suggest to him?
19. How can you protect crops from different types of pests?

Answer Sheet

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
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106. A B C D
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108. A B C D
109. A B C D
110. A B C D
111. A B C D
112. A B C D
113. A B C D

From
Mr. Chandrang Pathak
Research Scholar, Department of Education
Faculty of Education and Psychology
The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat

Date: 12th June 2023

Through Proper Channel

To,
The Principal,
University Experimental School [English Medium]
Vadodara, Gujarat

Subject: Permission to collect data from the students of Standard IX.

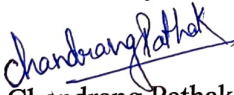
Respected Ma'am,
Greetings!

I am doing Ph.D. on "*Situating Constructivist Strategies in Lecture: An Exploration in Pedagogy of Science at Secondary Level*" under the guidance of Prof. R. C. Patel, Professor in Education, Department of Education, Faculty of Education and Psychology, The Maharaja Sayajirao University of Baroda, Vadodara. As a part of my study, I need to collect data from a school following the Gujarat Secondary and Higher Secondary Education Board (English medium) Syllabus. Your school has been selected as a CONTROL group for my study. I need to collect data on the achievement of students of Standard IX in the subject of science in the beginning and at the end of the semester of the academic year 2023-24. I assure you ma'am that the collected data will be used only for research purpose.

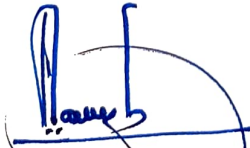
In this connection, I request your kind self to grant me permission to collect data from your school.


Thanking you in anticipation of a positive response.

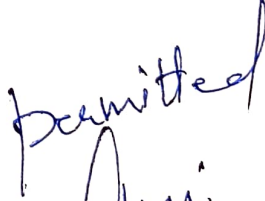

With Kind regards!
Yours Faithfully,


Mr. Chandrang Pathak
Researcher

Forwarded through:


Prof. R. C. Patel
Guide
Department of Education [CASE]
Faculty of Education & Psychology
The M. S. University of Baroda
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Prof. Ashutosh Biswal
Head
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Head
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15/6/23
Principal
University Experimental School (E.M.)
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Prof. Ashutosh Biswal
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The Maharaja Sayajirao University of Baroda
Vadodara - 390 002.

From
Mr. Chandrang Pathak
Research Scholar, Department of Education [CASE]
Faculty of Education and Psychology
The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat

Date: 15th April 2023

Through Proper Channel

To,
The Principal
Vidyut Board Vidyalaya
Vadodara, Gujarat

Subject: Permission to conduct an experiment with the students of Standard IX for one semester and subsequently for data collection

Respected Sir,
Greetings!


I am doing Ph.D. on "*Situating Constructivist Strategies in Lecture: An Exploration in Pedagogy of Science at Secondary Level*" under the guidance of Prof. R. C. Patel, Professor in Education, Department of Education, Faculty of Education and Psychology, The Maharaja Sayajirao University of Baroda, Vadodara. As a part of my study, I need to collect data from a school following the Gujarat Secondary and Higher Secondary Education Board Syllabus. Based on all practical aspects like; the availability of facilities, expected cooperation as well as the availability of school for experimentation throughout one semester, I would like to undertake my study in your esteemed school. I assure you that I will be teaching science subject to the first Semester students of Standard IX during the academic year 2023-24 and shall fulfil all the requirements of completing the syllabus, helping in the assessment of students, and other normal duties in the school. I also assure you sir that the collected data will be used only for research purpose.

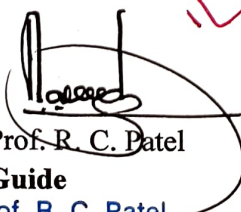
In this connection, may I request your kind self to grant me permission to carry out my Ph.D. work in your school?

Thanking you in anticipation of a positive response.


With Kind regards!

Yours Faithfully,

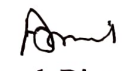

Mr. Chandrang Pathak
Researcher


Prof. R. C. Patel
Guide
Prof. R. C. Patel
Department of Education [CASE]
Faculty of Education & Psychology
The M. S. University of Baroda
Vadodara, GUJARAT.

Forwarded through:


Prof. Ashutosh Biswal
Head

Department of Education Faculty of Education and Psychology
Centre of Advanced Studies in Education
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The Maharaja Sayajirao University of Baroda,
Vadodara.


Prof. Ashutosh Biswal
Dean

Dean
Faculty of Education and Psychology
The Maharaja Sayajirao University of Baroda
Vadodara - 390 002.

Shreegopal
June to next
Six months

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Bhagyesh N. Thakkar

Principal

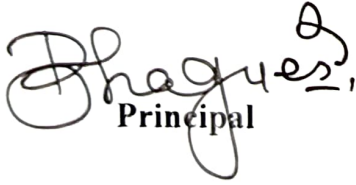
M.Sc., M.Ed., P.D.E.M., M.B.A. (HR)

Ref. No. : VBV / EM / 24125 - 64
Date :

TO WHOM SO EVER IT MAY CONCERN

Date: 27th October 2023

This is to certify that Chandrang Pathak, a research scholar, Department of Education, Faculty of Education and Psychology, The Maharaja Sayajirao University of Baroda, has implemented the programme developed on Constructivist strategies as part of his Ph.D. study titled "Situating Constructivist Strategies in Lecture: An Exploration in Pedagogy of Science at Secondary Level" in class 9 through out 1st semester in session 2023-24.


Principal

INDEX No. :

S.S.C. 65-363 ENG.

H.S.C. 15-031 ENG.

ENGLISH MEDIUM SECTION

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Academics section

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA
Head Office, Maharaja Fatehsinghrao Gaekwad Marg, Fatehgunj,
Vadodara – 390 002, Gujarat, INDIA

: office-academics@msubaroda.ac.in dr-academic@msubaroda.ac.in

ACA7/1280

Date: 1/03/2024

To,
The Dean, Faculty of Education and Psychology,
The Maharaja Sayajirao University of Baroda,
Vadodara.

Subject : Issuance of Ph.D. Course Work completion Certificate.

Sir/Madam,

Please find an enclosed certificate towards completion of Ph.D. Course work of the below specified Research Scholar:

Name of the Research Scholar : **Chandrang Pathak**
Registration Number : **272**
Registration Date : **12/01/2021**
Ph.D. course work certificate number : **FOEDU/272**

Since the certificate being a pre-requisite for the submission of the synopsis, you are requested to arrange to send the certificate to the Research Scholar concerned through the concerned guide for further necessary actions.

Deputy Registrar (Academics)
For Registrar (Offg.)
The Maharaja Sayajirao University of Baroda.

Enclosure:
Ph.D. Course Work completion Certificate of Chandrang Pathak.

Copy to:
• Section Examination

In word. no. 351
dt. 2/3/2024

Dean
Faculty of Education and Psychology
The Maharaja Sayajirao University of Baroda
Vadodara - 390 002.



THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA

CERTIFICATE

[As per **O.Ph.D. 5** under UGC (Minimum Standards and Procedure for Awards of M.Phil./Ph.D. Degree) Regulation, 2016 for (8 to 16) Credits to be earned by Ph.D. Scholars]

This is to certify that **Chandrang Pathak**, Research Scholar, registered under UGC (Minimum Standards and Procedure for Awards of M.Phil./Ph.D. Degree) Regulation, 2016, vide Registration Certificate Number **272** dated **12/01/2021**, for pursuing Ph.D. on has undertaken and completed the course work with the Grade A.

STATEMENT OF CREDITS EARNED

Name of Research Scholar: **Chandrang Pathak**

Faculty/Institution: Faculty of Education and Psychology

Department: Department of Education

Paper Number	Course Title	Course Credits	Grade Earned	EGP
Core Courses – 02 Credits [Offered at University Level]				
I	Research and Publication Ethics	2	B	16
Core Courses – 04 Credits [Offered at Faculty Level]				
II	Fundamentals of Research Methodology	4	A	36
Departmental Courses – 06 Credits [Offered at Departmental Level]				
III	Conceptual and Theoretical Framework	3	B	24
IV	Review of Related Literature	3	A	27
Total Credits		12	Total EGP	103
CGPA		8.58	Equivalent Percentage	85.8%
Overall Grade			A	

UC: 96 – (2021-22) (080422)
FC: 01 – (1-21 December, 2021)
DC: FEP/444 (010224)

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Date of Issue: 23-02-2024

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विद्यया ऽ मृतमश्नुते



एन सी ई आर टी
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क्षेत्रीय शिक्षा संस्थान, भोपाल
राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्, नई दिल्ली

Regional Institute of Education, Bhopal
National Council of Educational Research and Training, New Delhi



प्रमाण पत्र
Certificate

This is to certify that Dr./Mr./Ms. Chandrang Pathak of Dept. of Education
M.S. University, Baroda Presented a paper/science Model entitled
Effectiveness of Constructivist Strategies with Lecture
in the National Conference on "Recent Advances in Science Education" held
at Regional Institute of Education, Bhopal from February 26-28, 2024.

Bhinghri

Conference Coordinator

Chutea

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Principal



International Conference

on

Cognitive Science: Evidences for Teacher Education
(13th & 14th, Aug 2024)

Organised by

School of Education, Pondicherry University, Puducherry

in Collaboration with

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Certificate

This is to certify that Prof/Dr/Mr/Mrs Chandreang Pathak has Participated / Presented ✓
a paper entitled ... From Ideas to Achievement: How Brainstorming Influences
Cognitive Load and Performance.
in the International Conference on Cognitive Science: Evidences for Teacher Education held on
13th & 14th Aug, 2024 organised by School of Education, Pondicherry University,
Puducherry, India-605014

Jahitha Begum

Prof. **Jahitha Begum**

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Department of Education Gandhigram Rural Institute

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Prof. **K. Chellamani**

Dean, School of Education,
Pondicherry University

Effectiveness Of Constructivist Strategies With Lecture In Science

Mr. Chandrang Pathak¹, Prof. R. C. Patel²

ABSTRACT

The constructivist approach is a philosophy of teaching in which a learner constructs their knowledge with the help of their previous experiences. The constructivist approach advocates the teaching method and strategies which gives more scope to the learners in the classroom. This approach offers many strategies for teaching science which promote the construction of knowledge by the learners. This paper is intended to investigate the effectiveness of constructivist strategies with the lecture method. In the present study, the researcher has used the "pre-test post-test non-equivalent control group" design. All students of standard 9th of Vadodara city were considered as the population of the study. Two schools in Vadodara city have been purposively selected by the researcher. The sample of 100 (55 in the experimental group and 45 in the control group) students who were studying in standard 9th. For Intervention, the syllabus suggested by NCERT has been followed by the researcher. The researcher has given intervention for a month. During the intervention, the researcher used constructivist strategies with the lecture method according to the demand for content. For data collection, a self-made achievement test has been used. The researcher has used the Mann-Whitney U test to analyze the data. The finding revealed that if constructivist strategies are used with the lecture in the classroom for teaching science, then the achievement of students becomes enhanced in comparison to the lecture.

Keywords: Constructivist approach, Lecture Method, Problem Solving, Brainstorming.

INTRODUCTION

In the realm of pedagogy, the ongoing discourse on effective instructional methods has led to an exploration of strategies that optimize learning outcomes while considering cognitive load. The juxtaposition of constructivist approaches with traditional lecture-based methods forms a critical area of inquiry in educational psychology. This research delves into the effectiveness of integrating constructivist pedagogical strategies within the context of lectures and its impact on both academic achievement and cognitive load. Constructivism is the theory that advocates learning as an active process in which students create knowledge via meaningful interactions with the learning environment. It is based on the work of Piaget and Vygotsky. The application of constructivist principles within educational settings has garnered attention for its potential to enhance engagement, critical thinking, and knowledge retention among learners (Jonassen, 1999). The constructivist approach is also helpful in the enhancement of conceptual understanding and academic achievement (Fernando and Marikar, 2017; McWright, 2017; Pangat, 2017; Sandhu, 2017; Chandi, 2020, Dahal, 2023). Contrastingly, traditional lectures, efficient in content delivery, often pose challenges related to high cognitive load, potentially hindering information processing and comprehension (Sweller, 1999). According to Sweller (2019), cognitive load is divided into three types intrinsic, extraneous, and germane. This is concerned with the complexity of

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content and instructional method respectively, if the instruction is provided effectively then the cognitive load of the person will decrease (Ayres, 2011). On this belief, Liang and Lai (2013) designed instruction with the lack of equipment for color management, Figen (2014), designed instruction through storytelling, and Andrade et al. (2015) investigated the effect of multimedia-based instruction on cognitive load and revealed that better instruction reduced the cognitive load in learners but Bala et al. (2017) revealed that the lecture method is also an effective method for the teaching and learning and Hadie and Zul (2018) prove that lecture method also helps in decreasing cognitive load. However, after reviews, the researcher was unable to find the effect of constructivism on cognitive load. This study aims to investigate the effect of the symbiotic relationship between constructivist learning strategies, such as problem-based learning, collaborative learning, and scaffolding techniques when integrated with lecture-based instruction on the achievement and cognitive load of the learners. By assessing their impact on students' academic achievement and cognitive load, this research endeavors to contribute empirical evidence to the ongoing dialogue on optimizing pedagogical practices. The theoretical framework guiding this study draws upon the Cognitive Load Theory (CLT) proposed by Sweller, which elucidates the limitations of working memory in processing information and emphasizes the importance of instructional design in minimizing extraneous cognitive load to facilitate learning (Sweller, Ayres, & Kalyuga, 2011). Additionally, this study aligns with the socio-constructivist perspective, emphasizing the social and collaborative nature of learning, as advocated by Vygotsky (1978).

By shedding light on the intricate interplay between pedagogical methodologies and cognitive processes, this study aspires to offer insights that inform instructional design practices and optimize learning environments for diverse learners.

RATIONALE

The intersection of instructional methodologies and their impact on learning outcomes has been a focal point in educational psychology. The rationale for investigating the effectiveness of combining constructivist strategies with lectures on achievement and cognitive load stems from the recognized need to optimize pedagogical approaches to enhance learning experiences. Constructivism, as a theoretical framework, emphasizes active learner engagement and knowledge construction (Piaget, 1976; Pangat, 2017; Singh and Yaduvanshi, 2018). Integrating these principles into traditional lecture formats holds promise for fostering deeper understanding and application of content among students. Moreover, the efficacy of lectures, while fundamental in content dissemination, often encounters limitations related to cognitive load (Carpenter, Fister, & Torres, 2018). Cognitive Load Theory (CLT) asserts that an overload of cognitive resources can impede learning by overwhelming working memory capacity (Sweller, 1988). Understanding the intricate relationship between cognitive load and instructional design is pivotal in refining pedagogical methods to alleviate unnecessary cognitive burdens while optimizing learning engagement and comprehension. This research aims to bridge the gap between theoretical frameworks and practical application by investigating how the integration of constructivist strategies within lecture-based instruction influences both academic achievement and cognitive load. By analyzing the potential synergy between these methodologies, this study seeks to offer empirical evidence guiding educators and instructional designers in tailoring instructional approaches that strike a balance between effective content delivery and cognitive load management.

Research Questions

1. How far are intervention programmes based on constructivist strategies effective for science teaching?

Objectives

1. To study the Achievement of standard 9th students in science subjects.
2. To study the Cognitive Load of standard 9th students in science subjects.

3. To compare the experimental and control groups based on their intelligence.
4. To assess the effectiveness of intervention programmes based on constructivist strategies on the achievement of standard 9th students in the science subject.
5. To assess the effectiveness of intervention programmes based on constructivist strategies on the cognitive load of standard 9th students in the science subject.

Participants

All students of standard 9th of Vadodara city were considered as the population of the study. Two schools in Vadodara city have been purposively selected by the researcher. The sample of 100 (55 in the experimental group and 45 in the control group) students who were studying in standard 9th were selected for the study.

Methods and Procedure

For Intervention, the syllabus suggested by NCERT has been followed by the researcher. The researcher has given intervention for a month. During the intervention, the researcher used constructivist strategies according to the demand for content with the lecture method. During the intervention two chapters of the science subject named 'Matter in our surroundings' and 'Is matter around us Pure?' were included. For the delivery of content brainstorming and problem-solving strategies have been used with the lecture method. The lecture method was a dominant method for the during the intervention but at the time of intervention brainstorming and problem solving strategies was used by the researcher.

Delimitations of the study

1. This study was delimited only to standard 9th.
2. The present study delimited to only Vadodara city.

Tools:

Achievement Test- Self-constructed achievement test has been used by the researcher for collecting the scores of achievements. There were 25 questions concerning the respective chapters.

Cognitive Load Scale-The survey instrument utilized to assess cognitive strain has been adapted from the one created by Hwang and colleagues (2013). There are eight items total: three for "mental effort" and five for "mental load." With a Cronbach alpha of 0.784 for mental effort and 0.817 for mental load, the questionnaire's consistency is quite excellent. On a 5-point Likert scale, the student's response was 1 for strongly disagree and 5 for strongly agree.

Ravens Progressive Matrices- This tool was developed by Raven. In this tool, there were five sections each containing 12 questions of general intelligence with increasing difficulty level.

Operational Definition of the Terms

Effectiveness of Programme- The program's effectiveness in this study is determined by the score difference between the post-test results of the experimental and control groups.

Results:

Objective 1- To study the Achievement of standard 9th students in science subjects.

Table 1: Achievement Score of Control and Experimental Groups

Group	N	Minimum Score	Maximum Score	Mean
Control	45	14	68	34.28
Experimental	55	26	75	54.24

Result- The scores of the control group were a minimum score is 14, a maximum score is 68 and the mean was 34.28 and the experimental group obtained a minimum score is 26, a maximum score is 75 and the mean was 54.24.

Objective 2- To study the Cognitive Load of standard 9th students in science subjects.

Table 2: Cognitive Load Score of Control and Experimental Groups

Variable	N	Minimum Score	Maximum Score	Mean
Control	45	10	36	21.48
Experimental	55	08	31	18.69

Result- The scores of the control group were a minimum score is 10, a maximum score is 36 and the mean was 21.48 and the experimental group obtained a minimum score is 10, a maximum score is 31 and the mean was 18.69.

Objective 3- To compare the experimental and control groups based on their intelligence.

H₀₁-There is no significant difference between the intelligence scores of the control group and the experimental group.

Table 3: Comparison Between Intelligence Scores of Experimental and Control Group

Group	N	Mean	Z-Value	U-Value	Level of Significance	Result
Experimental	55	38.48	.391	1772	0.05	Not Significant
Control	45	37.09				

Result-The obtained value of Mann-Whitney U between the control and experimental groups was 1772, while the Z Value was .391. Consequently, the null hypothesis is retained.

Interpretation- The value of Mann-Whitney U reached 1772, while the Z value was determined to be .391. Given that the sample size (N) exceeds twenty and the Z value falls outside the range of ± 1.96 to ± 2.58 , the U statistic is not considered significant at the 0.05 level. This indicates an equal distribution of intelligence among the participants of both groups.

Objective 4- To assess the effectiveness of intervention programmes based on constructivist strategies on the achievement of standard 9th students in science subjects.

H₀₂-There is no significant difference between the achievement scores of the control group and experimental group in the Science subject at the secondary level.

Table 4: Comparison Between Achievement Scores of Experimental and Control Group

Group	N	Mean	Z-Value	U-Value	Level of Significance	Result
Experimental	55	54.24	-7.111	203.50	0.05	Significant at 0.05 alpha
Control	45	34.28				

Result-For the control and experimental groups, the value of Mann-Whitney U was 203.50, with the Z value appearing at -7.111. As a result, the null hypothesis is rejected.

Interpretation- The value of Mann-Whitney U was observed at 203.50, with the value of Z was -7.111. Given that the sample size (N) is above twenty and the value of Z does not

fall within the range of ± 1.96 to ± 2.58 , it indicates that the U statistic is significant at the 0.05 level. This signifies that the integration of constructivist strategies alongside traditional lecture methods enhances student achievements in science more effectively than employing the lecture method alone.

Objective 5- To assess the effectiveness of intervention programmes based on constructivist strategies on the cognitive load of standard 9th students in science subjects.

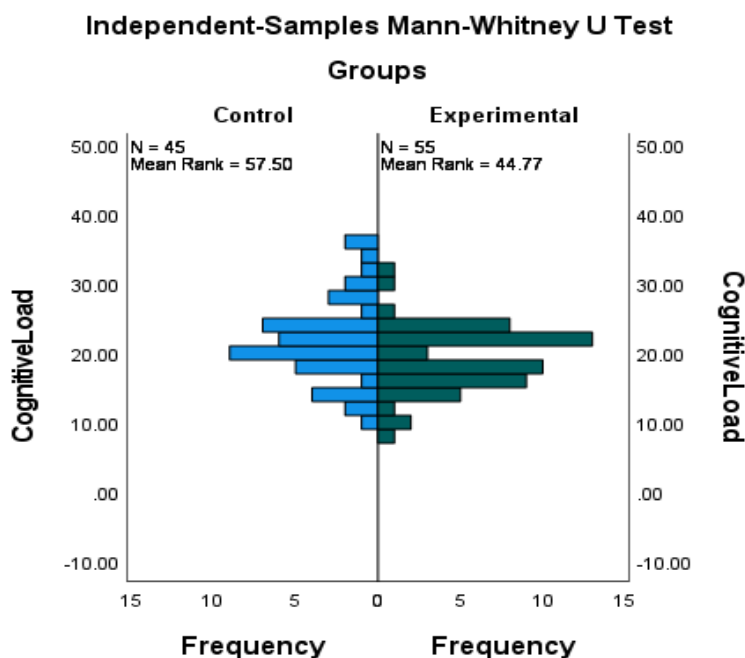
H₀₃-There is no significant difference between the Cognitive Load scores of the control group and experimental group in the Science subject at the secondary level.

Table 5: Comparison Between Cognitive Load Scores of Experimental and Control Group

Group	N	Mean	Z-Value	U-Value	Level of Significance	Result
Experimental	55	21.48	-2.18	922.5	0.05	Significant
Control	45	18.69				

Result: The null hypothesis is rejected because the experimental and control groups' Mann-Whitney U values were 922.50 and their Z-values were -2.18.

Interpretation- Analysis using Mann-Whitney-U, the Z is equal to -2.18 and U equals 922.50. The study's N exceeds twenty, and its Z-value falls between ± 1.96 and ± 2.58 , indicating that U is significant at the 0.05 level. This suggests that using constructivist strategies alongside lectures helps lessen students' cognitive burden when teaching science.



DISCUSSION

This research has corroborated the hypothesis that employing constructivist strategies in conjunction with traditional lecture methods enhances students' academic achievements in science education more significantly than utilizing the lecture method in isolation. The

constructivist approach, which emphasizes student-centered learning and the construction of knowledge through experience and reflection, when amalgamated with the direct and structured transmission of knowledge characteristic of the lecture method, forms a comprehensive pedagogical strategy. This hybrid approach addresses diverse learning styles and needs, thereby fostering a more inclusive and effective learning environment.

The findings of this study are consistent with the research outcomes of several scholars, including Fernando and Marikar (2017), McWright (2017), Pangat (2017), Sandhu (2017), Chandi (2020), and Dahal (2023), who have all documented the efficacy of constructivist methodologies in science education. These researchers collectively assert that constructivist practices, which may include collaborative learning, problem-based learning, and inquiry-based activities, significantly contribute to a deeper understanding and retention of scientific concepts. This study also supported the findings of Ayres (2011) and Sweller (1999) who revealed that if the instructional method is good then the cognitive load of the learners decreases and if the instructional method is poor quality, then the cognitive load of the learners increases. This study has been done on a smaller number of the population and the sample of this study covers only two schools. This study was performed on selected chapters. These could be the limitations of the study.

CONCLUSION

This study shows that constructivist strategies like brainstorming, problem-solving, and questioning are very important methods for the teaching of science. If teachers use these strategies with the lecture, then they can improve the achievement of the students in the science subject and decrease the cognitive load.

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Chapter- I Lesson Plan

Matter in Our Surrounding

Name of the Student Teacher:	Chapter : Matter in Our Surrounding
Subject: Science	Lesson No: 1
Class: IX	Period:
Topic of the Lesson:	Date:

Entry Behaviour:

Students are familiar with concept substance and matter.

Students know about evaporation and condensation.

Students know about solution.

Specific Objectives: *students will be able to*

Students will be able to identify the shapes and volume of solid.

Students will be able to list out the characteristics of particle and states of matter.

Students will be able to discuss the physical nature of matter.

Students will be able to explain the state of matter.

Students will be able to describe the effects of temperature on the solid state of matter.

Students will be able to reflect how the size of particles affects the properties of solid.

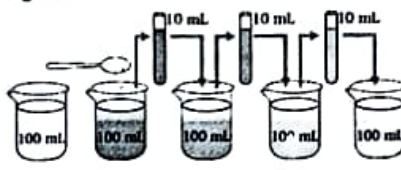
Approach: Constructivist

Method: Lecture with constructivist strategy

Teaching Aid: PPT or Model, burner, water, lemon, sponge, salt, spatula, spoon, KMnO₄, or Dettol.


Tr.	Good Morning Students!	
St.	Good Morning Sir.	
Tr.	<u>What is the matter?</u> <i>start with example from their environment</i>	Recall
St.	Substance have mass, volume, and occupy space is called as matter.	Assimilate
Tr.	Set up an experiment, Take a 100 mL beaker and fill half the beaker with water and mark the level of water. Dissolve some amount of salt/ sugar with the help of a spatula. Note down change in water level and will ask what do you think has happened to the salt? Where does it disappear while level of water remains same?	Demonstration
St.	Students involve in thinking <i>observation</i> and produce many responses. Such as	Assimilate

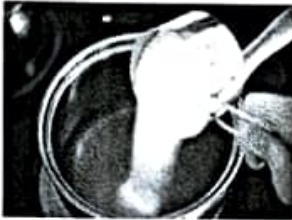
No Need to Report

	<ol style="list-style-type: none"> Salt dissolve in the water → observation Salt particles breakdown in the water → understanding 	
Tr.	Very good, salt particles are breakdown in the water and settled in space between the particles of water. Today we will study about matter and characteristics of particles of matter.	
Tr.	<p>Setup another experiment, Take 5 glasses and 2-3 crystals of potassium permanganate and dissolve them in 100 mL of water (glass no. 1).</p> <p>Take out approximately 10 mL of this solution and put it into another glass of 90 mL of clear water. Keep diluting the solution like this 5 times from glass number 1 to 5.</p> <p>Ask for writing the observation.</p>  <p>Fig. 1.2: Estimating how small are the particles of matter. With every dilution, though the colour becomes light, it is still visible.</p>	Demonstration
St.	<ol style="list-style-type: none"> Water of glass one is dark colored while water of glass 5 is very light colored. Color of water gradually lighter from glass 1 to 5. <p>Student can give other responses.</p>	Observation and critical thinking
Tr.	Why colour gradually lighter in the fifth number of glass	Seeking attention
St.	<ol style="list-style-type: none"> Colored water put into the second (another) glass that's why this happens Amount of $KMnO_4$ transferred in another glass of water. Particles of $KMnO_4$ transferred in another glass of water. Small particles of the $KMnO_4$ comes or transferred in the another glass of water Amount of tiny particles are reduced gradually in the next glass of water in comparison of previous glass of water. 	Assimilate observed and critical thinking
Tr.	Yes, then we can conclude that matter is the made up of the tiny particles.	Equilibrium Explaining
Tr.	Did you observe any change in the volume of water in the previous two experiments?	Questions
St.	No, volumes of the water remain same in the glasses in both the experiments.	Observation
Tr.	What can you conclude by this event?	Questions
St.	Now, we can conclude that the particle of the salt and $KMnO_4$ settled	Equilibrium

Tr. → wait for student response understanding

give example first then go for experiment

	in the interstitial space that present between the two particles of the matter. That means particles of the matter have the space between them.	
Tr.	Set up an experiment, take two glasses of water and put the two to three drops of ink in the water and ask what you observe? 	Demonstration
St.	Observe that ink is spread slowly and slowly in the water and say particle of the ink continuously moving.	
Tr.	Why the particles are moving continuously?	
St.	Due to the kinetic energy of the particles.	Assimilate
Tr.	Yes, Start heating one beaker and second remain undisturbed and ask that what is the effect of temperature on the movement of the particles?	Demonstration
St.	Movement of particles is faster in the hot water than the cold water.	Observation
Tr.	What can you conclude from this event?	
St.	We can conclude that temperature give the more kinetic energy to the particles that's why the particles of the matter move faster in the hot water.	Equilibrium
Tr.	Gives another example as this way we can see at home, when we stir the sugar in coffee and Sharbat then the sugar is dissolve faster in coffee than cold water.	Explanation
Tr.	Take the rubber, nail and wire. Apply some force on it.	Example
St.	Observe that rubber is stretched; wire bended and the nail of iron did not bend.	Observation
Tr.	Why this phenomenon takes place?	
St.	because the particle of matter bounded with the each other	Assimilate
Tr.	Yes, particle of the matter bounded with each other and attract the others; therefore, this phenomenon happened. Now we can classify the matter on the basis of their particle arrangement, energy of the particle and distance or space between the particle that is- Solid, Liquid and Gas.	Explanation
Tr.	Ask to the student to arrange objects of surrounding according to their state.	
St.	Respond and arrange the surrounding object in solid, liquid and gas state.	Assimilate

Tr.	First of all we will discuss the solid and give the some examples of the solid material in the classroom and ask the property of solid (discussion based Question).	Form group
St.	<ol style="list-style-type: none"> 1. Solids are rigid and hard. 2. Solids are incompressible. 3. Solids have definite shape and size. 4. Solids have definite volume. 	Assimilate
Tr.	Teacher conclude discussion and add some more points such as solids have tightly packed molecular arrangement and higher density and less interstitial space between the particles.	
St.	What is density? <i>Start with environment example then ask question.</i>	Curiosity
Tr.	Set up an experiment, take half-filled beaker with water and start boil water and add the sugar and take note on solution.	Demonstration
		
St.	Observe the event firstly sugar concentration is low then the solution is in the liquid form but teacher still add more sugar then solution convert it into the solid	Observation
Tr.	What you conclude by the experiment?	
St.	When the concentration of the molecule is higher than solution become solid.	Equilibrium
Tr.	Yes, with the increasing of concentration of the sugar density of the sugar molecule become higher in the solution and it became solid. That means we can conclude that number of molecule or particles of solute present in the unit volume of solvent is called density.	Explanation
St.	Understand the concept of density.	Assimilate
Tr.	Teacher asks another question for enhancing the understanding of students. What about the sponge. Is it a solid? (Discussion based question).	Group form
St.	Identify the problem, and write probable cause. such as <ol style="list-style-type: none"> 1. Sponges are not solid. 2. Sponges have pores. 3. Sponges are soft. And so on... 	Assimilation
Tr.	Helps in the testing of probable cause which has been stated by students	Scaffolding

?	Conclude that sponges have many pores in which air particles are trapped. When we press the sponge air expelled out and after this we can't press the sponge. Hence it is solid.	Assimilate and accommodate
Tr.	Give the some other examples of → wait students to give response 1. Air, sugar and oil. 2. Juice wind and salt Ask to arrange with increasing force of attraction between particles.	
St.	Responding	Assimilation
Tr.	How the size of solid affects its ability to conduct heat OR how the shape of particle affects the properties of solid (problem solving).	Explanation
St.	<ol style="list-style-type: none"> 1. Identify the problem 2. Define the problem- they will define the problem 3. Conduct background research- investigate the article, document and videos etc. 4. Develop the hypothesis- <ul style="list-style-type: none"> • no effect • increasing size increase the conductivity of heat • increasing size decrease the conductivity of heat • Decreasing size increase the conductivity of heat • Decreasing size decrease the conductivity of heat 5. Designing experiment 6. Conduct experiment by provided material 7. Observe and record data 8. Analyse the data 	Accommodation and equilibrium
Tr.	Help in conduction of experiments and conclude whole activities.	Scaffolding where needed

Home Work

Evaluation: By Achievement Test and Rubric

Hand on experiment
 invalue: students in
 activity.

- You have mention PPT or model but not used in entire class.

Write in proper format of
Lesson plan.

Chapter - 2 Lesson Plan
Is Matter Around Us Pure

Chapter - 2 Lesson plan - 1

Name of the Student Teacher:	Chapter: Is Matter Around Us Pure
Subject: Science	Chapter No: 2
Class: IX	Period:
Topic of the Lesson: Substance and Mixture	Date:

Entry Behaviour:

Students are familiar with concept substance and matter.

Students know about evaporation and condensation.

Students know about solution.

Students aware about the process of separation like sieving, picking.

- Lesson should be interactive and with Examples.
- Ask more questions and get answer from students itself

Specific Objectives:

Students will be able to discuss the pure substance.

Students will be able to list out the characteristics of substance.

Students will be able to explain the state of matter on the basis of chemical properties.

Students will be able to reflect on factors which and how affect the solubility of the product.

Required Materials - Milk, water, ink, lemon, salt, sugar

Students - good morning sir

Teacher - good morning dear students

Teacher - what do you mean by pure?

Students - pure means substance that have no impurities

Teacher - take water, milk and lemonade and water with sand. Ask identify pure substances in the given substances.



Students- some student say water and milk is pure, some say only water with sand is impure.

Other responses also come

Teacher- Prompt (scaffolding)

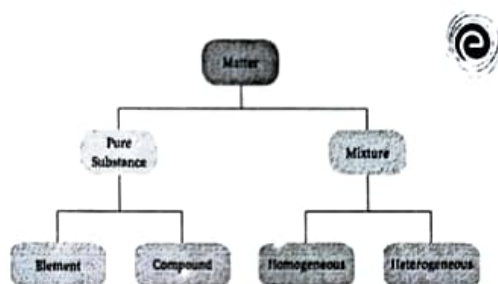
Students- Students will give unclear responses, like milk is pure.

Teacher- Dear students today will discuss substances, its classification and mixture.

Teacher - In the previous lecture, we studied about matter and its classification then how many state of the matter on the basis of physical property of matter? (Seeking Information)

Student - three type i.e. solid, liquid and gas. (Recall)

Teacher - like this on the basis of the chemical natures the matter classified under two categories i.e. substance and mixtures. (Explanation)



Students- Note down (Assimilation)

Teacher- what is substance?

Student- it is a type of matter that occupy the space. (Assimilation)

Teacher- yes, it has a type of matter that contains a pure single form of matter. That means all particles have the same type of chemical nature. (Describe)

Students- Note down (Accommodation)

Teacher- what happened if we mix more than one substances?

Students- a mixture are formed. (Assimilation)

Teacher- yes, a mixture have the more than one type of pure substance but substance has only one type of molecule. Therefore mixture can be separated in its constituents but substance can't be. (Explanation)

Set up an experiment, Takes amount of water in test tube and mix one teaspoon salt in it and prepare a mixtures and heat and observe. (Demonstrate)



Student - observe the phenomenon after sometime water evaporated and salt remains in the test tube.

Teacher - what do you observe in this experiment?

Students - we can infer that we can separate the substance from mixture but substance can't be found in their constituent particles. (Equilibrium)

Teacher - ask for other examples of the mixture.

Students - milk - sugar solution etc. (Assimilation)

Teacher - yes, substance of all these mixture are not reactive with each other. (Assimilate)

Teacher - Are all the mixture of the same type?

Set up an experiment, Take water in 4 test tubes with label A, B, C, D and put salt and sugar in A and B respectively and CaO_2 and Oil in C and D respectively. And ask to students, what do we observe? (Demonstration)



Students - A and B salt and sugar is dissolved in water but CaO_2 and Oil is not dissolved in water.

Teacher - Identify Homogeneous and Heterogeneous mixture in the given solution.

Students - In A and B, test tube substances have no clear strata and both substances are uniformly distributed in the mixtures is known as homogeneous mixture. and in C and D, test tube substance have clear strata that means it is not uniformly distributed in mixture, which known as heterogeneous mixture. (Assimilate)

If students unable to respond

Teacher - Explain Homogeneous and Heterogeneous mixture then asks to give some examples of homogeneous and heterogeneous mixture.

Students - Homogeneous - lemonade

Heterogeneous - salt and sand, water and clay, salad (Assimilate)

Teacher - what are the different means for separation of these mixtures?

Students - by picking, by boiling, by sieving etc. (Assimilate)

Teacher - How the size of particle and mixture affect the separation? (Discussion Based Question)

Teacher - Yes, refers to the previous experiment and prompt. (Scaffolding)

Students - Students discuss and give many responses. (Assimilation)

Teacher - Tests the responses of students in light of scientific literature with help of students then conclude the session.

Students - Note down. (Accommodate)

Teacher - like these mixtures, we can see several types of mixture in our day to day lives which are homogeneous mixture or true solution. Give the examples.

Students - Lemonade or Soda-water. (Assimilate)

Teacher - Good, take the test tube with dissolved salt solution and ask characteristics of solution.

Student – Students state the characteristics of the solution such as;

1. Particles are too small.
2. Particles are uniformly distributed.
3. Particles cannot be separated by filtration and not settled down.

Some other responses can come.

Teacher - Appreciate the response of students, and add some other properties such as True solution does not scatter beams of light and the particle size of true solution is 10^{-9} . And in solution solute and solvent are present. Solvent present in greater amounts while solute present in a small amount. Molecules are not settled down on, therefore it is highly stable. (Explanation)

Teacher - What are the factors that affect the solubility in a true solution (Discussion Based Question)? or what are some ways we can increase the solubility of substances in solvent? (Brainstorming)

Students - Students give the many responses, such as: heat, amount of solvent, surface etc. And give many ideas like when temperature rise then solubility increases and if amount of solvent increase then solubility of solute increases etc. Other responses can also be given by students. (Equilibrium)

Teacher - Record the data and initiate testing of the data with the help of students. Discuss ideas with students and encourage participation.

Students – Give the reflection. (Equilibrium)

Teacher - Ask the real life examples on solubility affected by temperature.

Students- When we dissolve sugar in hot milk, it dissolves faster than when dissolved in cold water. (Assimilate)

Evaluation: Achievement Test and Rubric

Home work: Find the examples where surface affects the solubility of solute.

How amount of solute affects the solubility of solute in solution?

- Not used proper teaching aid in your lesson plan.
- Use examples from daily life.
- Make lecture as you have mention in your Methods.

Chapter-5 Lesson Plan
The Fundamental Unit of Life

Name of the Student Teacher:	Chapter : Fundamental Unit of Life
Subject: Science	Chapter No: 5
Class: IX	Period:
Topic of the Lesson: Cell and cell wall	Date:

Entry Behaviours:

Students are aware about cell and types of cell.

Students know cell membrane and its basic function.

Students know cell wall and its basic function.

Specific Objectives:

Students will be able to state the function of cell membrane and cell wall.

Students will be able to analyse the problems arise due to absence of cell wall.

Students will be able to evaluate the advancement of the cell over one another.

Students will be able to reflect on the cell importance of cell wall and cell membrane in the cells.

Approach: Constructivist

Method: Lecture with constructivist strategy

Pedagogy

Required Materials: Video, PPT, Chart paper.

Students- Good morning sir!

Teacher- Good morning students!

Teacher- in the previous class you studied about the cell, let us recall. ask the question: what is the cell?

Student- Cell is the basic unit of the body. (Recall)

Teacher- Good, tell the history of the cell i.e. in 1665, a scientist who was very curious. Once he wanted to study wood cork. For this task he made a microscope through a common lens and observed. He find honeycomb like structure is called cell (explain through story)

Now we will study about the cell and its function.

Students- Note down the information has been given by teacher. (Assimilate)

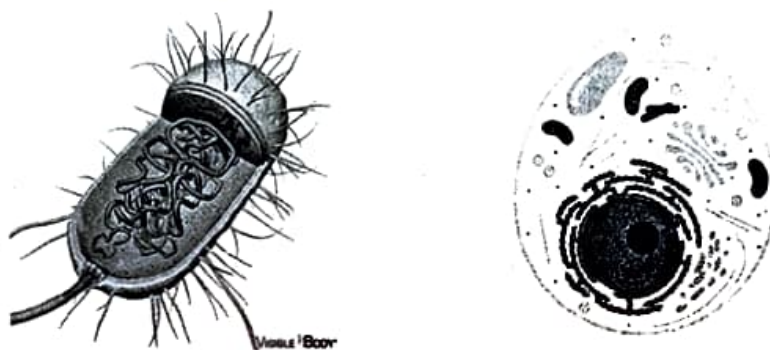
Teacher- Show the pictures of the cell on a slide and ask to identify different shapes of the cell.

Students- Give the answer according to the cell's shape. ie. Oval, elongated, rounded spherical etc.

Teacher- Good, describe other facts about the cell before the student and show the relevant pictures (varies in shape and size also). Cell is the Latin word for little room and firstly, Leeuwenhoek discovered living cells in pond water. Size could be more or less fixed and peculiar for the particular type of cell. For example: red blood cells, ovum, sperm, muscle cells etc. (explanation).

Students- Note down the information (assimilation and accommodation)

Teacher- Shows a picture of cells of eukaryote and prokaryote cells. Ask to identify similarities and dissimilarities in the cell.

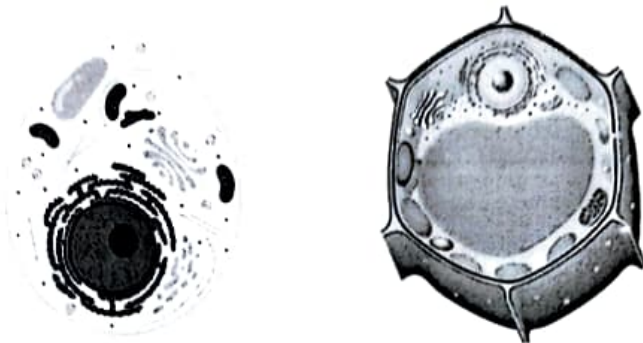


Students- Identify the similarities and dissimilarities between cells and evaluate which cell is more advanced and draw a conclusion. (Assimilation, accommodation, equilibrium)

Teacher- Conclude the finding of students on the blackboard and ask what you infer from this observation?

Students- Prokaryotic cells have no nuclear membrane, more developed organelles etc. but Eukaryotic cells contain nuclear membrane and membrane bound, well developed organelles.

Teacher- Show another picture which has structures of Plant cell and Animal cell. Ask to identify similarities and dissimilarities between both cells.



Students- Identify and compare the dissimilarities and similarities between cells. One cell contains a cell wall, and cell membrane but another cell contains only cell membrane which is known as Plant cell and Animal cell respectively. (Assimilate)

Teacher- Good, ask for the function of the cell wall?

Students- state the functions of the cell wall (recalls and assimilate).

- It provide strength to cell
- Help in transport of the materials from one cell to another cells etc.

If students are unable to state the function of cell wall

Teacher- Explain the function of the cell wall and its composition (explanation).

Shows a video which illustrates the function of the cell wall (demonstrate, assimilate and accommodate).

Student- Note down

Teacher- Why this particular material i.e cellulose is found in the cell wall of plants?

Students- Create many responses on the basis of their understanding, thinking and analysis. (brainstorming based question, accommodate, equilibrium) (Make a group).

Teacher- Evaluate the response of students with their collaboration and conclude the session.

Teacher- How the cell wall helps in Disease Control in the plant cell? (Discussion based question, assimilate, accommodate, equilibrium) (Group formation).

Student- Discuss in group and provide the response. (Assimilate and equilibrium).

Teacher- Verify the response of students in light of scientific facts and evidence.

Students- Draw a conclusion with the help of students. (Accommodate and equilibrium)

Teacher- Conclude the session.

Chapter- 8 Lesson Plan

Motion

Lesson plan – 1

Name of the Students- Teacher-:	Chapter: Motion
Subject: Science	Chapter No: 8
Class: IX	Period:
Topic of the Lesson: Motion and displacement	Date:

Entry Behaviour:

Students are familiar with concept motion.

Students know about straight motion.

Students know about displacement.

- Use more constructive approach in the lesson plan.

- Make interactive class-room.

Specific Objectives:

Students will be able to discuss the motion and displacement.

Students will be able to solve the problems related to motion.

Students will be able to solve the problems related to velocity, time and motion.

- Think real life examples.

Required Material- Balls, Watch

Students- Good morning sir!

Teacher- Good morning students!

Teacher- Take two balls, one in static position and second in moving condition and ask to students what you observe? (Demonstration)

Students- Identify the phenomena and replied, one ball is moving and another in static position (assimilation, recall)

Teacher- That means one ball in motion. Ask another question. Please identify the objects in our surrounding which represent motion.

Students- Identify and replied such as watch, fan etc. (Assimilation)

Teacher- Good, today we will study about motion. In moving ball how can say ball is moving?

Students- Because this Ball Travel certain distance. (Assimilation)

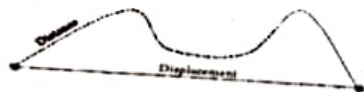
Teacher- Yes. From where the ball starts travel distance is called as origin.

Teacher- What is difference between distance and displacement?

Students- recall and respond that length covered by an object from origin is called distance and minimum distance from origin to object is called as displacement. (Assimilation)

If Students unable to respond.

Teacher- explains distance and displacement. (Explanation)



Teacher- In previous class you studied about motion in straight line uniform and non-uniform motion. Let us recall

Teacher- Gives an example when you want to go Vadodara to Surat. For this you choose train. What type of motion takes place?

Students- In a straight line

Teacher- Yes. Show the table of distance travelled by two cars 8.1 (from groups and discussion)

Time	Distance travelled by object A in m	Distance travelled by object B in m
9:30 am	10	12
9:45 am	20	19
10:00 am	30	23
10:15 am	40	35
10:30 am	50	37
10:45 am	60	41
11:00 am	70	44

Students- examines and calculates the distance and responds group wise (accommodation)

Teacher- Gives the some example of uniform and non-uniform in your daily life. (Reflective question)

Students- Will give the responses according to their experience. (Equilibrium)

Teacher- Why is it important to understand the difference between uniform and non-uniform motion?

Students- Analyses and synthesizes the concept and previous experiences and respond. (Create)

Teacher- suppose if a car travel 25 m in 10 second and 50 m and 5 second then what is the average speed of the car? (Problem solving)

Students- Analyse the problem applied the formula (assimilation and accommodation)

$$\begin{aligned}\text{Average Speed} &= \text{Total distance travelled} / \text{Total time taken} \\ &= 25+50 / 10+5 \\ &= 75 / 15 \\ &= 5 \text{ m/s}\end{aligned}$$

Teacher- appreciates the response of students. Explain the concept of speed and velocity (Explanation)

Such a distance travelled by an object in given time called speed. Speed has magnitude while velocity specific the magnitude as well as direction. These can be uniform or variable

Students- note down concept and teacher's explanation. (Assimilation and accommodation)

Teacher- Ask if a car starts moving in a straight line or starting odometer shows reading 1000 km and the end of journey odometer shows 1800 km. If the trip took 12 hour, calculate the average velocity of car in kilometer/hour and meter/second. (Problem solving)

Students- Distance covered by car = 1800 - 1000
= 800 km

Time elapsed (t) = 12 hours

$$= 800 / 12 = 66.66 \text{ km/h}$$

$$= 800 \times 1000 / 12 \times 60 \times 60 = 800000 / 43200 = 18.5 \text{ m/s}$$

(Assimilation and accommodation)

Teacher- If students face problem then will give scaffolding.



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to Rai

May 29, 2023, 10:26 AM



This plan has been made on the basis of the lecture method by incorporation of constructivist strategies like discussion, brainstorming, problem solving and different types of questioning (Recall, reflective, and inferential) which has been found suitable according to content. In this lesson plan has been made with intention to improve the lecture method therefore, in these plans lecture method in the core. in lesson plan assimilation used when learners construct knowledge on the basis of existing schema and accommodation used when learners construct knowledge by changing in the previous schema and equilibrium used when learners internalise the concept in previous schema and are able to reflect on concepts. I requested to you please validate my plans.

Regard

Chandrang Pathak

Research Scholar (JRF)

Center of Advanced Study in Education

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Matter in our surro...



Fundamental Unit ...



is matter surround ...



Chandrang Pathak <chandrangpathak@gmail.com>

to Rai

May 29, 2023, 10:35 AM



One attachment • Scanned by Gmail



Request Letter.pdf



Ajeet Rai <ajeetrai04@gmail.com>

to me

May 29, 2023, 9:42 PM



I have gone thru the first lesson. Its good. However the lecture component is not uite visible if possible impeove uppn that component

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