APPENDIX – A

FIGURES IN THE THESIS

Figure: A.1 Common Knowledge Construction Model (Ebenezer & Connor 1998, Ebenezer & Haggarty 1999)
Figure: A.3 Dr. Joseph Novak - Professor Emeritus, Cornell University, Ithaca and senior scientist of Institute of Human and Machine Cognition (IHMC)
Figure: A. 4 The relationship between Common Knowledge Construction Model (Ebenezer & Connor, 1998) and Learning Science (Ebenezer, 2003) source: e-mail of Dr. Ebenezer (2004)
Figure A.5  PRIOR CONCEPT MAP OF AIR AND ITS PROPERTIES – Praiselin. OF STANDARD VII

- Air helps in burning
- Air gives rise to dissolved gases
- Air has a mixture of gases
- Oxygen helps aquatic life
- Part of air is active
- Atmospheric oxygen is active
- Oxygen is aquatic life

- 29-10-07
- CHAPTER 5
- Air, Oxygen and Orides
Figure A.6  CONCEPT MAP DEVELOPED BY PRAISELIN DURING THE CLASSROOM INSTRUCTION
Figure A.7 CONCEPT MAP CONSTRUCTED BY THE TEACHER
FOR DISCUSSION

Characteristics of Air
RESPIRATORY SYSTEM

HOW AIR (OXYGEN) REACHES THE BLOOD FROM OUTSIDE???
Weekly assignment of Praislein -
Focus question: what is Air and what are its Properties?
Weekly assignment of Neha -
Focus question: Oxygen and its preparation?

Neha with her Concept Map
A Class in progress

Students busy constructing Concept Maps
# APPENDIX – B

## TABLES

### B.1 SPICER HIGHER SECONDARY SCHOOL CALENDAR OF EVENTS

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>School reopens</td>
<td>June 4, 2007</td>
</tr>
<tr>
<td>Interview for new students (std VI, IX &amp; XI)</td>
<td>June 4 &amp; 7</td>
</tr>
<tr>
<td>Registration for Old students</td>
<td>June 4-6</td>
</tr>
<tr>
<td>Registration for New students</td>
<td>June 7-8</td>
</tr>
<tr>
<td>Instruction begins</td>
<td>June 11</td>
</tr>
<tr>
<td>First mid term test - 50 marks</td>
<td>(August 1-8)</td>
</tr>
<tr>
<td>Independence Day</td>
<td>August 15</td>
</tr>
<tr>
<td>Teachers’ Day</td>
<td>September 5</td>
</tr>
<tr>
<td>Gandhi Jayanthi</td>
<td>October 2</td>
</tr>
<tr>
<td>Half yearly Exam – 100 marks</td>
<td>October 4-17</td>
</tr>
<tr>
<td>Dusshera</td>
<td>October 21 &amp; 22</td>
</tr>
<tr>
<td>Diwali</td>
<td>November 9-12</td>
</tr>
<tr>
<td>Children’s Day</td>
<td>November 14</td>
</tr>
<tr>
<td>Second Mid term test -50 marks</td>
<td>December 13-20</td>
</tr>
<tr>
<td>Christmas Holidays</td>
<td>Dec: 21-Jan 4.08</td>
</tr>
<tr>
<td>School reopens</td>
<td>January 7</td>
</tr>
<tr>
<td>Division Exams X &amp; XII</td>
<td>January 14-18</td>
</tr>
<tr>
<td>Annual Programme</td>
<td>January 23 &amp; 24</td>
</tr>
<tr>
<td>Republic Day</td>
<td>January 26</td>
</tr>
<tr>
<td>Annual Sports</td>
<td>January 28-30</td>
</tr>
<tr>
<td>Preliminary Exam XII</td>
<td>January 21-31</td>
</tr>
<tr>
<td>Preliminary Exam X</td>
<td>February 15-16</td>
</tr>
<tr>
<td>ICSE &amp; ISC Exam X, XII</td>
<td>March ---</td>
</tr>
<tr>
<td>Annual School Exam Nursery – IX</td>
<td>April 2-16</td>
</tr>
<tr>
<td>Promotion Committee</td>
<td>April 18</td>
</tr>
<tr>
<td>Result</td>
<td>April 20</td>
</tr>
<tr>
<td>Summer vacation</td>
<td>April 21-May 31</td>
</tr>
<tr>
<td>School reopens</td>
<td>June 2</td>
</tr>
<tr>
<td>Registration</td>
<td>June 2-6</td>
</tr>
<tr>
<td>Classes begin</td>
<td>June 9, 2006</td>
</tr>
<tr>
<td>Period</td>
<td>Monday</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>1</td>
<td>Moral</td>
</tr>
<tr>
<td>2</td>
<td>History</td>
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<td>3</td>
<td>Math</td>
</tr>
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<td>4</td>
<td>Physics</td>
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<td></td>
<td><strong>Recess</strong></td>
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<tr>
<td>6</td>
<td>Biology</td>
</tr>
<tr>
<td>7</td>
<td>Geography</td>
</tr>
<tr>
<td>8</td>
<td>supw</td>
</tr>
</tbody>
</table>
## APPENDIX B.3

### MAJOR CATEGORIES IN THE COGNITIVE DOMAIN OF THE TAXONOMY OF EDUCATIONAL OBJECTIVES - BLOOM (1956)
(CITED BY LINN & GRONLUND 1995)

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Descriptions of the Major Categories in the Cognitive Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Knowledge:</strong> Knowledge is defined as the remembering of previously learned material. This may involve the recall of a wide range of material, from specific facts to complete theories, but all that is required is the bringing to mind of the appropriate information. Knowledge represents the lowest level of learning outcomes in the cognitive domain.</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Comprehension:</strong> Comprehension is defined as the ability to grasp the meaning of material. This may be shown by translating material from one form to another (words or numbers), by interpreting material (explaining or summarizing), and by estimating further trends (predicting consequences or effects). These learning outcomes go one step beyond the simple remembering of material and represent the lowest level of understanding.</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Application:</strong> Application refers to the ability to use learned material in new and concrete situations. This may include the application of such things as rules, methods, concepts, principles, laws and theories. Learning outcomes in this area require a higher level of understanding than those under comprehension.</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Analysis:</strong> Analysis refers to the ability to break down material into its component parts so that its organizational structure may be understood. His may include the identification of the parts, analysis of the relationships between parts, and recognition of the organizational principles involved. Learning outcomes here represent a higher intellectual level than comprehension and application because they require an understanding of both the content and the structural form of the material.</td>
</tr>
<tr>
<td>5.</td>
<td><strong>Synthesis:</strong> Synthesis refers to the ability to put parts together to form a new whole. This may involve the production of a unique communication (theme or speech), a plan of operations (research proposal) or a set of abstract relations (scheme for classifying information). Learning outcomes in this area stress creative behaviors, with major emphasis on the formulation of new patterns or structures.</td>
</tr>
<tr>
<td>6.</td>
<td><strong>Evaluation:</strong> Evaluation is concerned with the ability to judge the value of material (statement, novel, poem, research report) for a given purpose. The judgments are to be based on definite criteria. These may be internal criteria (organization) or external criteria (relevance to the proposal) and the student may determine the criteria or be given them. Learning outcomes in this area are highest in the cognitive hierarchy because they contain elements of all of the other categories plus value judgments based on clearly defined criteria.</td>
</tr>
</tbody>
</table>
APPENDIX B.4

EXAMPLES OF GENERAL INSTRUCTIONAL OBJECTIVES
AND CLARIFYING VERBS FOR THE COGNITIVE DOMAIN OF
THE TAXONOMY. (CITED BY LINN & GRONLUND 1995)

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Illustrative General Instructional objectives</th>
<th>Illustrative Verbs for Stating Specific Learning Outcomes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Knowledge: Knows common terms</td>
<td>Defines, describes, identifies, labels, lists, matches, names, Outlines, reproduces, selects, states.</td>
</tr>
<tr>
<td></td>
<td>Knows specific facts</td>
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<tr>
<td></td>
<td>Knows methods and procedures</td>
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<tr>
<td></td>
<td>Knows basic concepts</td>
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<tr>
<td></td>
<td>Knows principles</td>
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<tr>
<td>2.</td>
<td>Understands:</td>
<td>Converts, defends, distinguishes, estimates, explains, extends, generates, gives examples, infers, paraphrases, predicts, rewrites, summarize.</td>
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<tr>
<td></td>
<td>Understands facts and principles</td>
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<tr>
<td></td>
<td>Interprets verbal material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interprets charts and graphs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Translates verbal material to mathematical formulas.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Estimates consequences implied in data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Justifies methods and procedures</td>
<td></td>
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<tr>
<td>3.</td>
<td>Application:</td>
<td>Changes, computes, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses,</td>
</tr>
<tr>
<td></td>
<td>Applies principles to new situations</td>
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<tr>
<td></td>
<td>Applies theories to practical situations</td>
<td></td>
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<tr>
<td></td>
<td>Solves mathematical problems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constructs charts and graphs</td>
<td></td>
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<tr>
<td></td>
<td>Demonstrates correct usage of a procedure</td>
<td></td>
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<tr>
<td></td>
<td>Writes a well – organized theme</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gives a well – organized speech</td>
<td></td>
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<tr>
<td></td>
<td>Writes a creative short story or poem</td>
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<tr>
<td></td>
<td>Proposes a plan for an experiment</td>
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<tr>
<td></td>
<td>Integrates learning from different areas</td>
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<tr>
<td></td>
<td>into a plan for solving a problem</td>
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<tr>
<td></td>
<td>Formulates a new scheme for classifying objects ( or events or ideas)</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Evaluation:</td>
<td>Appraises, compares, concludes, contrasts, criticizes, describes, discriminates, explains, interprets, justifies, relates, summarizes, supports.</td>
</tr>
<tr>
<td></td>
<td>Judges the consistency of written material.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Judges the adequacy with which conclusions are supported by data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Judges the value of a work ( art, music, writing) by use of internal criteria.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Judges the value of a work ( art, music, writing) by use of external standards.</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX – C

QUESTION BOOKLETS

APPENDIX C.1: FINAL FORM OF UNIT TEST II - CHEMISTRY

CHEMISTRY

Unit: Air, Oxygen, and Oxides, Hydrogen
Marks: 15

STD: VII

INSTRUCTIONS

The main purpose of the test is to measure the Higher Mental Abilities in Science.
You are requested to read the instructions given in each question carefully.

1) YOU HAVE TO SOLVE ALL THE QUESTIONS. KEEP IN MIND THAT NONE OF THE QUESTIONS SHOULD REMAIN UNANSWERED

2) YOU ARE PROVIDED WITH SEPARATE ANSWER SHEET, FILL IN THE ANSWER IN THE SHEET PROVIDED.

3) WRITE THE TIME WHEN YOU START THE TEST AND FINISH THE TEST ON THE SIDE OF THE ANSWER SHEET.

4) CHECK AGAIN AT THE END OF THE TEST WHETHER YOU MISSED ANY QUESTIONS

Read carefully and properly the questions. Do not spend too much time on any questions. Go to the next question and come back to the questions which you have not solved.

1. What is the chemical formula of pure steam?
   a) H2O, b) CO, c) SO, d) steam has no chemical formula

2. Vishnu opened a wet box of iron nails after many days, he found it has become rusted. How did this happen?
   b) Iron rusts in presence of water
   c) Iron rusts in presence of water and air
   d) Iron rust in presence of air
   e) Iron rust in presence of air water and acids

3. Rekha went with her father for a trek (climbing) on Himalayas. She found it was difficult to breathe in higher altitudes. She asked her father the reason for this change. Find out the answer given by her father.
   f) Oxygen content is less at higher altitudes.
   g) Oxygen content is more at higher altitudes
h) Oxygen content is same at higher altitudes
i) Rekha is new to the Himalayas.

4. When a glass jar is kept over a lighted candle the flame goes out

![Image of a glass jar over a lighted candle]

Why does this happen?

j) Oxygen is required for burning  
k) The smoke cannot come out  
l) The glass makes it cold  
m) The glass is placed too fast

5. Kiren took a hard glass test tube with two outlets as shown in the figure. He placed lime water in the hard glass test tube. Then he sucked air through end ‘B’ of the outlet of the test tube. The lime water turns slowly milky.

![Image of a hard glass test tube with lime water]

Why does this happen?

n) Air contains oxygen  
o) Air contains carbon dioxide  
p) Air contains carbon monoxide  
q) Air contains hydrogen peroxide

6. Ann wanted to cut an iron rod, the welder used an oxyhydrogen flame. why did he use this flame?

r) It produces normal heat  
s) It produces great heat  
t) It produces less heat  
u) It produces very less heat.
7. Bobby got mixed up in the procedure for the preparation of Hydrogen gas. The mixed up steps are given below
   1) Zinc and hydrochloric acid reacts to form hydrogen gas.
   2) Flask, thistle funnel, trough and gas jar are fitted together
   3) Zinc granules are added to the flask
   4) Dilute HCl is added through the thistle funnel.
   5) Collected by downward displacement of water
   6) Hydrogen gas formed passes through the delivery tube

What is the correct step for the preparation of hydrogen gas.
   a) 2, 3, 4, 5, 6, 1
   b) 4, 3, 2, 6, 1, 5
   c) 2, 3, 4, 6, 5
   d) 6, 5, 3, 4, 2, 1

8. Though Hydrogen is lighter it is not used in air balloons. What is the best reason for this?
   a) It becomes heavy in air balloons
   b) It is highly inflammable
   c) It is odorless
   d) It turns into moisture

9. Fishes and plants in an aquarium breathe. Where do they get oxygen from?
   a) From the rocks in the water
   b) From the dissolved oxygen in the water
   c) By the breakdown of water into its components
   d) None of the above.

10. Take a glass tumbler cleaned and dried from outside. Put some pieces of ice in it and allow it to stand sometime. Water droplets appear on the outer surface of the tumbler. What do you conclude from this observation?
   a) Water vapour in the air condenses on the cooler surface of the tumbler
   b) Watervapour from the ice reaches the surface of the tumbler
   c) Watervapour leaked to the surface of the tumbler
   d) Watervapour appeared from some unknown place.
11. Which option correctly identifies processes X and Y

Process X: Gives out both heat and light
Process Y: Carried out by both plants and animals.

<table>
<thead>
<tr>
<th>Option</th>
<th>Process X</th>
<th>Process Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Respiration</td>
<td>Photosynthesis</td>
</tr>
<tr>
<td>b</td>
<td>Decay</td>
<td>Respiration</td>
</tr>
<tr>
<td>c</td>
<td>Photosynthesis</td>
<td>Burning</td>
</tr>
<tr>
<td>d</td>
<td>Burning</td>
<td>Respiration</td>
</tr>
</tbody>
</table>

12. You are provided with an apparatus producing hydrogen gas and a dish containing soap solution. Using this how will you experimentally prove hydrogen is lighter than air? Select the correct experimental setup for this?

![Experimental setup images]

13. Kiren during the preparation of Hydrogen collected the gas by downward displacement. Why did he use this method?

   a) Because hydrogen is a gas
   b) Because hydrogen is lighter.
   c) Because there is no other method
   d) Because it is a colorless gas.
14. Seema took water in a trough and pressed an inverted glass tumbler over the water. She tilted the glass tumbler to one side. Bubbles of air were seen coming out.

What does this show?

v) Air was released from the water
w) Air present in the space of the tumbler came out as bubbles
x) Glass tumbler produced the air
y) None of the above answer.
APPENDIX C.2: FINAL FORM OF UNIT TEST II - BIOLOGY

BIOLOGY
Unit: Organ systems of the Body
STD: VII
Marks: 15

INSTRUCTIONS

The main purpose of the test is to measure the Higher Mental Abilities in Science. You are requested to read the instructions given in each questions carefully.

1) YOU HAVE TO SOLVE ALL THE QUESTIONS. KEEP IN MIND THAT NONE OF THE QUESTIONS SHOULD REMAIN UNANSWERED
2) YOU ARE PROVIDED WITH SEPARATE ANSWER SHEET, FILL IN THE ANSWER IN THE SHEET PROVIDED.
3) WRITE THE TIME WHEN YOU START THE TEST AND FINISH THE TEST ON THE SIDE OF THE ANSWER SHEET.
4) CHECK AGAIN AT THE END OF THE TEST WHETHER YOU MISSED ANY QUESTIONS

Read carefully and properly the questions. Do not spend too much time on any questions. Go to the next question and come back to the questions which you have not solved.

1. The following are the parts of the respiratory system. How will you arrange it according to the flow of air from out side to the inside of the lungs? Select the correct sequence.
   a) Pharynx, → nose, → larynx, → trachea, → bronchii, → bronchioles, → alveoli
   b) Bronchioles, → bronchii, → trachea, → larynx, → nose, → alveoli, → pharynx
   c) Trachea, →bronchioles, → bronchii, → larynx, → nose, → alveoli, → pharynx
   d) Nose, → pharynx → larynx, → trachea, → bronchii, → bronchioles, → alveoli.

2. Which of the following is the correct sequence in the formation of an organism?
   e) Organ → System → Tissue → Cell → Organism
   f) Cell → Tissue → Organ → System → Organism
   g) Tissue → Cell → System → Organ → Organism
   h) System → Cell → Organ → Tissue → Organism
3. Which of the following should come in the empty box in the given chart?

\[
\begin{array}{c}
? \\
\downarrow \\
\text{Bones} \quad \text{ligaments} \quad \text{cartilage} \quad \text{tendons}
\end{array}
\]

i) Nervous system  
 j) Digestive system  
 k) Circulatory system  
 l) Skeletal system

4. What happens to our body temperature on a cold winter day or a hot summer day?
   a) There is no difference in the temperature. It is approximately 37 degrees C  
   b) The temperature is much lower in winter and higher in summer  
   c) The temperature of the body is much higher in winter and lower in summer  
   d) The temperature of the body changes with season, but depends on body weight.

5. Sandhya noticed that the skin (epidermis) on the sole of the feet is thicker than the skin (epidermis) on the lips. What can be the possible reason for this?
   a) The regions exposed to air are more thicker  
   b) The regions exposed to friction is more thicker than other regions  
   c) The skin is uneven in some people  
   d) The regions exposed to water are thicker.

6. Shown here is the picture of an umbrella. The function of the thin metal rods in the umbrella is similar to which ‘organ system’ in our body?

\[
\begin{array}{c}
\text{Thin Metal Rods}
\end{array}
\]

a) Muscular system  
 b) Skeletal system  
 c) Respiratory system  
 d) Digestive system
7. “A curved vertebral column is better than a straight vertebral column”
   Justify?
   a) It gives flexibility and absorbs impact of shock
   b) It gives beauty to the body shape
   c) It helps to accommodate the internal organs
   d) It was formed in such a manner

8. Ambuja wanted to know the movement of food in her alimentary canal. Select correct pathway of food in the alimentary canal.
   a) Mouth → stomach → oesophagus, → small intestine, → large intestine.
   b) Mouth, → oesophagus, → stomach, → small intestine, → large intestine.
   c) Mouth, → stomach, → large intestine, → small intestine, → oesophagus
   d) Stomach, → mouth → large intestine, → small intestine, → oesophagus.

9. “We should breathe through the nose not through the mouth” why?
   a) The nose filter the air and warms the air
   b) The nose is always open
   c) The nose will turn dry if air does not pass through them
   d) None of the above answer

10. Devise a simple experiment to show that there is carbon dioxide in the exhaled air?
    a) Blow into a test tube filled with lime water
    b) Blow into a test tube filled with sodium chloride solution
    c) Blow on the surface of a cold steel plate.
    d) None of the above

11. Devise a method to show your friend the heart beats regularly. Select from the options given below
    a) Press the vein on the wrist were the heart beat can be felt.
    b) Press the abdomen to measure the heart beat.
    c) Press the artery on the wrist were the heart beat can be felt.
    d) None of the above.

12. The pathway of toxic waste is shown below is not in the correct order
    1. waste enters the urinary bladder
    2. waste enters the ureter
    3. waste enters the kidney
    4. waste enters the urethra
    The correct order in which the activity takes place is-
    a) 1 → 2 → 3 → 4
    b) 3 → 2 → 1 → 4
    c) 2 → 3 → 1 → 4
    d) 4 → 2 → 3 → 1
APPENDIX C.3 ANSWER SHEET FOR CHEMISTRY, BIOLOGY

ANSWER SHEET FOR CHEMISTRY BOOKLET ----

INSTRUCTIONS:
1. Every question is provided with four optional answers, out of which only one is the correct answer. You have to select only one of the options as your answer by darkening it completely. Eg a, b, c, d Ans: a, b, c, d
2. Use PENCIL to answer by darkening the chosen option. You can use an eraser in case you wish to make a change but make sure you clearly rub earlier chosen option.
3. You will be given 5 minutes at the end of the examination to darken the chosen answer by a BLACK/BLUE INK. This is done so that the answer will be very clear.
4. Please fill the details on the reverse of this answer sheet.

<table>
<thead>
<tr>
<th>No</th>
<th>Ans 1</th>
<th>Ans 2</th>
<th>Ans 3</th>
<th>Ans 4</th>
<th>Mks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>a, b, c, d</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>a, b, c, d</td>
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<td></td>
<td></td>
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<tr>
<td>3.</td>
<td>a, b, c, d</td>
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<td>4.</td>
<td>a, b, c, d</td>
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<td>5.</td>
<td>a, b, c, d</td>
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<td>6.</td>
<td>a, b, c, d</td>
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<td>7.</td>
<td>a, b, c, d</td>
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<td>8.</td>
<td>a, b, c, d</td>
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<td>9.</td>
<td>a, b, c, d</td>
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<td>10.</td>
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<td>11.</td>
<td>a, b, c, d</td>
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<tr>
<td>12.</td>
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APPENDIX C.4 RELIABILITY OF CHEMISTRY AND BIOLOGY HIGHER MENTAL ABILITY (UNIT TEST II) IN THE SPECIFIC UNITS

Chemistry Reliability

Case Processing Summary

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\a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

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Biology Reliability

Case Processing Summary

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\a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

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APPENDIX C.5  TRIAL TEST CHEMISTRY ACHIEVEMENT TEST
(UNIT TEST I)

CHEMISTRY

Unit Test.

STD: VII                      MKS: 50

I   Name the following:- (10)
    1. The lightest element in the universe.
    2. The dilute acid used in Hydrogen preparation from zinc granules.
    3. A non metal which burns in oxygen giving an oxide which dissolves in water forming sulphurous acid.
    4. The meaning of the word hydrogen is .
    5. An example of basic oxide.
    6. The molecular number of Hydrogen.
    7. The molecular formula of oxygen.
    8. The atomic number of oxygen.
    9. The symbol of oxygen.
    10. The symbol of Hydrogen

II Complete the following statements with appropriate words. (11)
    1. Iron rusts in the presence of ----- and --------.
    2. Oxygen supports ---------- and is used up in burning
    3. Air has a variable composition and there is -------- oxygen at higher altitudes than at lower altitudes.
    4. A candle burns brightly in a jar of oxygen but is -------- in a jar of nitrogen.
    5. Fishes and aquatic plants survive on ------------ oxygen in the water
    6. A soap bubble filled with hydrogen rises ------------
    7. It is a strong reducing agent and reduces metallic oxides to    --
    8. A burning candle is extinguished when introduced in a jar of hydrogen since hydrogen is a -------- of combustion.
    9. Artificial respiration is with the help of  -----------.

III. State the following statements are True or False (13)
    1. Air is a mixture of gases.
    2. Components of air cannot be separated by physical methods.
    3. Air has no weight.
4. Oxygen is 1/5 of the air.
5. A mixture has fixed composition
6. Oxygen is the most abundant element on the earth
7. Compounds do not have definite properties.
8. Acids turn blue litmus red.
9. Alkalis turn red litmus blue
10. Atmosphere is an ocean of air surrounding the earth.
11. Oxygen is slightly heavier than air
12. Hydrogen is insoluble in water
13. Hydrogen is a supporter of combustion

IV. Choose the best answer:- (15)
1. Hydrogen is generally not used in air balloons because-
   i) It is non inflammable   ii)It is inflammable   iii)It is heavy.
2. Oxy hydrogen flame is used for welding because of-
   i) High temperature ii)Low temperature  iii)Medium temperature
3. When hydrogen reacts with vegetable oil at 200°C –
   i)nothing happens ii) vanspathi is formed iii) butter is formed.
4. The catalyst for the reaction of hydrogen with nitrogen is-
   i) nickel ii) iron iii) copper
5. Hydrogen reacts with nitrogen to give –
   i) ammonia ii)oxide iii)hydrate
6. The catalyst for the hydrogenation of oil is-
   i)nickel ii) iron iii) copper.
7. Oxygen burns in acetylene producing a temperature of –
   i)600 °C  ii)900 °C  iii)3000 °C
8. The product of candle burning in atmospheric air-
   i) co₂ + water vapour  ii)co₂ + oxygen iii) co₂ + ammonia.
9. Acidic oxides react with water to give-
   i) acid  ii) alkali  iii) water
10. Acidic oxides are also called-
   i)metallic oxides ii)non metallic oxides iii)gaseous oxides
11. Basic oxides are also called-
   i)metallic oxides ii)non metallic oxides iii)gaseous oxides
12. The scientist who discovered oxygen is-
   i) Antoine Lavoiser  ii) Joseph Priestly iii) Rutherford
13. The scientist who studied the properties of hydrogen is-
14. The scientist who gave the name hydrogen is-
15. The scientist who gave the name oxygen is –
APPENDIX C.6 MODIFIED CHEMISTRY ACHIEVEMENT TEST
(UNIT TEST I)

CHEMISTRY

Unit Test.

STD: VII MKS:35

Instruction: write the answer in the space provided.

I  Name the following:-(7)

11. The dilute acid used in Hydrogen preparation from zinc granules. ----
12. A non metal which burns in oxygen giving an oxide which dissolves in water forming sulphurous acid. ----
13. An example of basic oxide. ----
14. The molecular number of Hydrogen. ----
15. The molecular formula of oxygen. ----- 
16. The atomic number of oxygen. ----
17. The symbol of Hydrogen ---------

II Complete the following statements with appropriate words. (6)

11. Iron rusts in the presence of water and --------.
12. Oxygen supports -------- and is used up in burning
13. Fishes and aquatic plants survive on ----------- oxygen in the water
14. A burning candle is extinguished when introduced in a jar of hydrogen since hydrogen is a ---------- of combustion.
15. Artificial respiration is with the help of -----------.

III. Read each of the following statements. If the statement is true, write true, if the statement is false, write false. (8)

14. Components of air cannot be separated by physical methods.
15. Air has no weight.
16. Oxygen is 1/5 of the air.
17. A mixture has fixed composition
18. Alkalis turn red litmus blue
19. Atmosphere is an ocean of air surrounding the earth.
20. Hydrogen is insoluble in water
21. Hydrogen is a supporter of combustion

IV. Choose the best answer:- (14)
16. Hydrogen is generally not used in air balloons because-
   i) It is non inflammable  
   ii) It is inflammable 
   iii) It is heavy.
17. Oxy hydrogen flame is used for welding because of-
   i) High temperature 
   ii) Low temperature 
   iii) Medium temperature
18. When hydrogen reacts with vegetable oil at 200°C –
   i) nothing happens 
   ii) vanspathi is formed 
   iii) butter is formed.
19. The catalyst for the reaction of hydrogen with nitrogen is-
   i) nickel 
   ii) iron 
   iii) copper
20. Hydrogen reacts with nitrogen to give –
   i) ammonia 
   ii) oxide 
   iii) hydrate
21. The catalyst for the hydrogenation of oil is-
   i) nickel 
   ii) iron 
   iii) copper.
22. Oxygen burns in acetylene producing a temperature of –
   i) 600 °C 
   ii) 900 °C 
   iii) 3000 °C
23. The product of candle burning in atmospheric air-
   i) \( \text{CO}_2 \) + water vapour 
   ii) \( \text{CO}_2 \) + oxygen 
   iii) \( \text{CO}_2 \) + ammonia.
24. Acidic oxides react with water to give-
   i) acid 
   ii) alkali 
   iii) water
25. Basic oxides are also called-
   i) metallic oxides 
   ii) non metallic oxides 
   iii) gaseous oxides
26. The scientist who discovered oxygen is-
   i) Antoine Lavoiser 
   ii) Joseph Priestly 
   iii) Rutherford
27. The scientist who studied the properties of hydrogen is-
   i) Antoine Lavoiser 
   ii) Joseph Priestly 
   iii) Henry Cavendish.
28. The scientist who gave the name hydrogen is-
   i) Antoine Lavoiser 
   ii) Joseph Priestly 
   iii) Henry Cavendish.
29. The scientist who gave the name oxygen is –
   i) Antoine Lavoiser 
   ii) Joseph Priestly 
   iii) Henry Cavendish.
APPENDIX C.7 TRIAL TEST BIOLOGY ACHIEVEMENT TEST (UNIT TEST I)

BIOLOGY

UNIT TEST

STD: VII MKS: 50

I. Give one term (Name) for the following:- (10)

1) A group of cells performing the same function.
2) The process of breaking up food into simpler, soluble substances.
3) The canal from mouth to rectum
4) The secretion of liver
5) The total number of cranial nerves.
6) The largest bone in the body.
7) The Pigment present in the skin
8) Region in the brain which controls Body temperature
9) Voice is produced in-
10) The tube that leads from the urinary bladder to outside.

II Choose the odd one out.(10)

2) Eyes, Nose, Tongue, Lungs
3) Cornified layer, Granular layer, Subcutaneous layer, Malphigian layer.
4) Spinal Cord, Cerebrum, Cerebellum, Medulla Oblongata.
5) Lungs , Kidney, Skin, Heart
6) Larynx, Ureter, Trachea, Bronchi.
7) Salivary gland, pancreas, Liver, Large intestine.
8) Oesophagus, Large intestine, Small intestine, Liver.
9) Red blood cell, White blood cell, Platelets, Ova
10) Arteries, Capillaries, Heart , Veins

III Fill in the blanks with suitable terms given.(10)
(Skeletal, Manometer, sympathetic, parasympathetic, brain, Vertebra, Malphigian, hormones, Keratin, sweat)

1) Epidermis contains water proof protein called ---------
2) When you are afraid (abnormal body condition) the body adjusts itself with the help of ------------------ system.

3) Normal body condition is restored with the help of ------------------ system.

4) ------------------ protects the spinal cord.

5) Skull protects the ------------------.

6) Movements are coordinated by several -----------------Muscles of the body

7) The instrument used for measuring blood pressure is ------------------

8) Endocrine system produces ------------------

9) Vasoconstriction results in less --------------production.

10) The ------------------ layer of the skin protects the body against the harmful effects of UV rays.

III . Choose the correct answer (10)

1) When a boy runs he feels warm this is because-
   a) His Muscles produce heat
   b) His Heart produces heat
   c) His Brain produces heat

2) During Summer we tend produce more sweat because-
   a) The blood vessels in the skin are dilated
   b) The blood vessels in the skin are constricted
   c) The blood vessels in the stomach are dilated.

3) The sole of the feet has thick epidermis because-
   a) The friction to the sole is more
   b) The friction to the sole is less
   c) The friction to the sole is medium.

4) The curved vertebra column helps in-
   a) Flexibility to the backbone
   b) Stiffness to the back bone
   c) None of the above

5) Platelets helps in-
   a) Blood clotting, b) carrying of oxygen, c) fighting against germs.

6) The site were bile is stored-
   a) Gall bladder, b) gastric gland, c) duodenum

7) The common chamber for food and air-
   a) Auricle, b) pharynx c) Aveoli

8) A hormone secreted by pancreas-
   a) Insulin  b) thyroxin, c) oxytocin

9) Cerebrum helps in-
   a) Thinking, b) balance, c) breathing

10) The role of spinal cord is -
    a) Reflex action b) balance c) memory
IV. Differentiate between the following pairs as indicated in brackets.(10)

1) Right lung and left lung (number of lobes)
2) Inhaled air and exhaled air (percentage of oxygen present)
3) Right auricle and left auricle (nature of blood)
4) Arteries and veins (function)
5) Sebaceous gland and sweat gland (function)
6) Cranial nerves and spinal nerves (origin)
7) Sensory nerves and motor nerves (function)
8) Salivary gland and Liver (secretion produced)
9) Sperm and Ova (site of their Production)
10) Lungs and kidney (the waste removed)
APPENDIX C.8  MODIFIED ACHIEVEMENT TEST(UNIT TEST I)-BIOLOGY

BIOLOGY
UNIT TEST
STD: VII
MKS: 40

Instruction: Answer the questions in the space provided.

I. Give one term (Name) for the following:- (9)
   11) A group of cells performing the same function. ------------------------------
   12) The process of breaking up food into simpler, soluble substances. ---------------
       ----
   13) The canal from mouth to rectum ----------------------------------------
   14) The secretion of liver ----------------------------------------------
   15) The total number of cranial nerves.---------------------------
   16) The largest bone in the body.--------------------------------------
   17) Region in the brain which controls Body temperature ----------------------

II Choose the odd one out.(5)
   12) Spinal Cord, Cerebrum, Cerebellum, Medulla Oblongata.
   13) Larynx, Ureter, Trachea, Bronchi.
   14) Oesophagus, Large intestine, Small intestine, Liver.
   15) Arteries, Capillaries, Heart, Veins

III Fill in the blanks with suitable terms given.(10)
(Skeletal, Manometer, sympathetic, parasympathetic, brain, Vertebra, Malphigian, hormones, Keratin, sweat)
   11) Epidermis contains water proof protein called ------------------
   12) When you are afraid (abnormal body condition) the body adjusts itself with the help of ------------- system.
13) Normal body condition is restored with the help of -------------- system.
14) -------------- protects the spinal cord.
15) Skull protects the --------------.
16) Movements are coordinated by several --------------Muscles of the body.
17) The instrument used for measuring blood pressure is --------------
18) Endocrine system produces --------------
19) Vasoconstriction results in less --------------production.
20) The -------------- layer of the skin protects the body against the harmful effects of UV rays.

III. Choose the correct answer (10) circle the correct answer.

11) When a boy runs he feels warm this is because-
    a) His Muscles produce heat
    b) His Heart produces heat
    c) His Brain produces heat

12) During Summer we tend produce more sweat because-
    a) The blood vessels in the skin are dilated
    b) The blood vessels in the skin are constricted
    c) The blood vessels in the stomach are dilated.

13) The sole of the feet has thick epidermis because-
    a) The friction to the sole is more
    b) The friction to the sole is less
    c) The friction to the sole is medium.

14) The curved vertebral column helps in-
    a) Flexibility to the backbone
    b) Stiffness to the back bone
    c) None of the above

15) Platelets helps in-
    a) Blood clotting, b)carrying of oxygen, c)fighting against germs.

16) The site were bile is stored-
    a) Gall bladder, b) gastric gland, c) duodenum

17) The common chamber for food and air-
    a) Auricle, b)pharynx c) Aveoli

18) A hormone secreted by pancreas-
    a) Insulin b)thyroxin, c) oxytocin

19) Cerebrum helps in-
    a) Thinking, b) balance, c) breathing

20) The role of spinal cord is -
    a) Reflex action b) balance c) memory
IV. Differentiate between the following pairs as indicated in brackets.(6)

11) Right lung and left lung (number of lobes)

12) Inhaled air and exhaled air (percentage of oxygen present)

13) Arteries and veins (function)

14) Salivary gland and Liver (secretion produced)

15) Sperm and Ova (site of their Production)

16) Lungs and kidney (the waste removed)
INSTRUCTIONS

The main purpose of the test is to measure the Higher Mental Abilities in Science.
You are requested to read the instructions given in each questions carefully.

1) YOU HAVE TO SOLVE ALL THE QUESTIONS. KEEP IN MIND THAT NONE OF
   THE QUESTIONS SHOULD REMAIN UNANSWERED
2) YOU ARE PROVIDED WITH SEPARATE ANSWER SHEET, FILL IN THE
   ANSWER IN THE SHEET PROVIDED.
3) WRITE THE TIME WHEN YOU START THE TEST AND FINISH THE TEST ON
   THE SIDE OF THE ANSWER SHEET.
4) CHECK AGAIN AT THE END OF THE TEST WHETHER YOU MISSED ANY
   QUESTIONS

Read carefully and properly the questions. Do not spend too much time on any
questions. Go to the next question and come back to the questions which you have
not solved.

Thank you for your co-operation.

---

1) Collect garden soil in a glass vessel to about 1/3 of its capacity, taking care
   that you do not pack it tightly. Pour water in this vessel by the side of the
   vessel till the soil is fully covered and water stands well above it. What
   will you observe? A; 4
   a) Air bubbles coming out showing water displaces the air in the soil
   b) Air bubbles coming out showing water releases the air present in the
      water
   c) Air bubbles coming out showing air is dissolved in water
   d) None of the above reason

2) If two parts of pure hydrogen and one part of pure oxygen are kept
   together how can you prepare water from them? A; 9
   a) Leave them together
   b) Pass an electric arc through them
   c) Keep them in the refrigerator
   d) Mix them thoroughly
3) The shape of the cell is determined by the function it performs. Which of these best represent the shape of a red blood cell? A;14

4) Which of the following is the correct sequence in the formation of an organism? A;15
   a) Organ → System → Tissue → Cell → Organism
   b) Cell → Tissue → Organ → System → Organism
   c) Tissue → Cell → System → Organ → Organism
   d) System → Cell → Organ → Tissue → Organism

5) What is the chemical formula of pure steam? B;28
   a) CO
   b) H2O
   c) O2
   d) (Pure steam does not have a chemical formula

6) Can we observe plant movement by keeping a well watered plant on the window sill for 10-15 days? A;39
   a) No, it will not show movement of plant towards light.
   b) Yes, we can see the plant bend towards the light.
   c) No, it can kill the plant for lack of light.
   d) Yes, if we only water the plant in excess

7) Why do we see mist on cold mornings? A;35
   a) The water vapour in the air condenses to give mist
   b) The smoke in the air forms the mist
   c) The dust particles in the air produces the mist
   d) The carbondioxide in the air forms the mist.
8) What is the BEST reason for including fruits and leafy vegetables in a healthy diet? **B;24**

   a) They have high water content.
   b) They are the best source of protein
   c) They are rich in minerals and vitamins
   d) They are the best source of carbohydrates.

9) Ria wanted to design an experiment to demonstrate germination to her friend which set up should she choose for her experiment? **A;18**

10) Filtration using the equipment shown below can be used to separate which materials? **C;28**

   A. A solution of milk and water
   B. A solution of table salt and water
   C. A solution of sugar and water
   D. A mixture of mud and water.
APPENDIX C.10

QUESTIONNAIRE FOR CHECKING THE ATTITUDE OF STUDENTS TOWARDS CONCEPT MAPPING. (TRIFONE -2006)

OPINIONNAIRE

NAME:--------------------------- SEX-------- DATE. --------- CLASS --------- SEC: --

Please answer each question as truthfully as possible. Put an X in the column that best suits your opinion.

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<th>Strongly a hindrance</th>
<th>hindrance</th>
<th>neither</th>
<th>An aid or help</th>
<th>Strongly an aid or help</th>
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<td>1</td>
<td>Has concept mapping served as an aid or hindrance to your understanding of science concepts?</td>
<td>Decreased the score very much</td>
<td>Decreased the score</td>
<td>No effect</td>
<td>Increased the score</td>
<td>Increased the score very much</td>
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<td>What effect do you think concept mapping has had on your level of achievement in science?</td>
<td>Decreased the level of effort very much</td>
<td>Decreased the level of effort</td>
<td>No effect</td>
<td>Increased the level of effort</td>
<td>Increased the level of effort very much</td>
</tr>
<tr>
<td>3.</td>
<td>To what extent has your level of effort in learning science changed as a result of concept mapping?</td>
<td>Decreased the level of effort very much</td>
<td>Decreased the level of effort</td>
<td>No effect</td>
<td>Increased the level of effort</td>
<td>Increased the level of effort very much</td>
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<tr>
<td>4.</td>
<td>To what extent do you feel that you now reflect on or think about science concepts as a consequence of using concept mapping?</td>
<td>Reflect or think less very less</td>
<td>Reflect or think less</td>
<td>No difference</td>
<td>Reflect or think more</td>
<td>Reflect or think very much</td>
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<tr>
<td>5.</td>
<td>To what extent has concept mapping affected your interest to learn science?</td>
<td>decreased</td>
<td>decreased</td>
<td>No effect</td>
<td>increased</td>
<td>Increased</td>
</tr>
<tr>
<td>6.</td>
<td>To what extent has concept mapping enhanced your perception of being able to learn science?</td>
<td>Very little</td>
<td>little</td>
<td>Some what</td>
<td>better</td>
<td>Very much</td>
</tr>
<tr>
<td>7.</td>
<td>To what extent has concept mapping encouraged you to take a more active role in learning science?</td>
<td>Very little</td>
<td>little</td>
<td>somewhat</td>
<td>better</td>
<td>Very much.</td>
</tr>
<tr>
<td>8.</td>
<td>To what extent has concept mapping affected the pace at which you spend learning and understanding science?</td>
<td>Cram at end of unit</td>
<td>Not so much cramming</td>
<td>No effect</td>
<td>better</td>
<td>Spread out more evenly over unit.</td>
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How much time in an average you spend to study biology, physics, chemistry every day? And every week?
APPENDIX – D

LETTERS

APPENDIX D.1

LETTER TO THE EXPERTS TO ASCERTAIN THE MARKS REQUIRED TO BE GIVEN TO EACH LEVEL

June 2007

Prof: Smt/Shri --------------,

I am pursuing my PhD studies in Education. I wish to collect data to ascertain relative significance and importance attached by the teacher community to each of the levels of instructional objectives based on Bloom’s taxonomy for a seventh standard student. I am sure your knowledge, experience and opinion will be useful for the purpose.

I request you to assign marks for each of the four levels indicated in the table, and it should add up to 20. The marking should be according to the importance and significance you attach to each level for the construction of the Test for Higher Mental Abilities in Science for Standard Seven.(age group 11 -13 years)

The information provided in the opinionnaire will be used for the research alone and your opinion will be treated as confidential matter.

With kind regards.

Yours faithfully,

Sheela Chacko
APPENDIX D.1  

OPINIONNAIRE

NAME: PROF: SMT/SHRI----------------------------------------

COLLEGE/SCHOOL---------------------------------------------

ADDRESS--------------------------------------------------------

(Please put + mark in the correct box)

B.Ed Teacher Educator  -------
School Teacher  -------
M.Ed Teacher Educator  -------
Research Guide  -------

Educational qualifications  ---------------
Total teaching experience  ---------------

Kindly assign marks for each of the four levels indicated in the table, and it should add up to 20. The marking should be according to the importance and significance each level holds for a standard seven student (age group 11-13 years)

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<td>Analysis</td>
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<td>3</td>
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<td></td>
<td>Total</td>
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Signature.
### APPENDIX D.2

**KINDLY ASSIGN EACH QUESTION INTO ONE OF THE LEVELS**

**DENOTE WITH A ‘X’ MARK**

A = FOR SET A  B = FOR SET B  C = FOR SET C

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<th>Analysis</th>
<th>synthesis</th>
<th>evaluation</th>
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<td>A B C</td>
<td>A B C</td>
<td>A B C</td>
<td>A B C</td>
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Name:---------------------------
College/School-----------------
Address-----------------------

(Please put + mark in the correct line)

B.Ed Teacher Educator-------
M.Ed Teacher Educator-------
Research Guide         -------
Educational qualifications:---------------------
Total teaching experience:---------------------

Signature------------------------

303
To Whom It May Concern

This is to certify that Mrs. Sheela Chacko conducted tests for Std VII Students in this school in August 2007 for the purpose of constructing questionnaire for her Ph.D research titled –

"The Effect Of Concept Mapping On The Cognitive Processes And Scholastic Achievement Of Standard Seven Students Of Pune City."

Sincerely,

Nalini Sengupta
Principal

30th August 2007

Vidya Valley School
S. No. 94/1/1, Sus Village, Pune - 411 021,
Tel.: 6533 9984 / 6533 9985 • www.vidya-valley.com • e-mail: info@vidya-valley.com
From Headmaster's Desk:

TO WHOMSOEVER IT MAY CONCERN

30-07-2007

This is to certify that Mrs. Sheela Chacko has conducted the questionnaire for Std VII, Sections A, B and C, which is required for her PhD Studies.

Thanking You

Regards,

(Mr. John Kothaniah)
Headmaster

"Commit to the Lord and your plans will succeed."

- Bible
September 11, 2007

TO WHOM IT MAY CONCERN

This is to certify that Mrs. Sheela Chacko conducted a Questionnaire for her research in preparation for the PhD.

The Questionnaire was conducted in Class VII totaling approximately 150 students.

Geoffrey Aviet
Headmaster
St. Helena’s School
8, Susie Sorabji Road, Pune 411 001. Website: www.helenas-school.org
Affiliated to the Council for the Indian School Certificate Examination, New Delhi

FROM THE PRINCIPAL / VICE PRINCIPAL

Phone : 26124384

10th September 2007

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Mrs. Sheela Chacko has conducted a test for the students of class VII based on her research on 22nd August 2007.

Ms. C. Ellis
Principal
St. Helena’s School

Date: 09-09-07
January 25, 2008

To Whom It May Concern:

This is to certify that Mrs. Sheela Chacko, for the completion of her research work, was granted permission to conduct the study in our school. She taught standard VII (section A & B) with pupil strength of 42 in each section. The study commenced on Oct 22 (Monday) 2007 and culminated on January 18 (Friday) 2008. She has been teaching Chemistry and Biology subjects for both sections.

Milon Rana
Principal
7th August'2007

TO WHOMSOEVER IT MAY CONCERN

Mrs. Sheela Chacko has constructed a test to Measure the higher mental abilities of standard seven students in Hutchings High School on 6th August-2007.

Mrs. M. S. Bhosle
Principal
APPENDIX- E

CALCULATIONS

APPENDIX E.1

PGTI

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Sample standard deviation = \( \sqrt{\frac{(X - \bar{X})^2}{n-1}} \) or \( \sqrt{\frac{x^2}{n-1}} \) p.367 Best & Kahn,(2003)

(Experimental) \hspace{1cm} (Control)

SD = \( \sqrt{\frac{6556.79}{29}} \) =15.04 \hspace{1cm} SD = \( \sqrt{\frac{6873.2}{29}} \) =15.39

Pearson’s Product- Moment Coefficient of Correlation(r) = \( \frac{\sum xy}{\sqrt{(\sum x^2)(\sum y^2)}} \)


\[ r = \frac{6679}{\sqrt{(6556.79)(6873.2)}} \] = 0.994

Significance of the difference between the means of two matched or Correlated Groups p.419 Best & Kahn (2003)

\[ t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2} - 2r \left( \frac{S_1}{\sqrt{N_1}} \left( \frac{S_2}{\sqrt{N_2}} \right) \right)}} \]
\[
t = \frac{69.73 - 69.6}{\sqrt{\frac{15.04^2}{30} + \frac{15.39^2}{30} - 2 \times 0.994 \left( \frac{15.04}{\sqrt{30}} \right) \left( \frac{15.39}{\sqrt{30}} \right)}}
\]

\[
t = 0.393
\]

E-2

**THAMGS – PRE**

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Experimental

\[
SD = \sqrt{\frac{\sum x^2}{n-1}} \quad \sqrt{\frac{91.9}{29}} = 1.78
\]

\[
(r) = \frac{\sum xy}{\sqrt{(\sum x^2)(\sum y^2)}} \quad (r) = \frac{3.9}{\sqrt{(91.9)(57.9)}} = 0.05
\]

\[
t = \frac{4.7 - 4.7}{\sqrt{\frac{1.7^2}{30} + \frac{1.41^2}{30} - 2 \times 0.05 \left( \frac{1.7}{\sqrt{30}} \right) \left( \frac{1.41}{\sqrt{30}} \right)}}
\]

\[
t = \frac{4.7 - 4.7}{\sqrt{\frac{1.7^2}{30} + \frac{1.41^2}{30} - 2 \times 0.05 \left( \frac{1.7}{\sqrt{30}} \right) \left( \frac{1.41}{\sqrt{30}} \right)}}
\]

\[
t = 0
\]
THAMGS – POST

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SD = $\sqrt{\frac{\sum x^2}{n-1}}$

Experimental:

$\sqrt{\frac{124}{29}} = 2.06$

Control:

$\sqrt{\frac{77.9}{29}} = 1.6$

$r = \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}}$

Experimental:

$r = \frac{91.2}{\sqrt{124} \sqrt{77.9}} = 0.93$

Control:

$t = \frac{6.00 - 4.7}{\sqrt{\frac{2.06^2}{30} + \frac{1.6^2}{30} - 2 \times 0.93 \left( \frac{2.06}{\sqrt{30}} \right) \left( \frac{1.6}{\sqrt{30}} \right)}}$

$t = 9.89$
E-3

UNIT TEST II – GENERAL SCIENCE

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Experimental

$$\text{SD} = \sqrt{\frac{x^2}{n-1}}$$

$$\sqrt{\frac{675.2}{29}} = 4.83$$

$$\sqrt{\frac{775.9}{29}} = 5.17$$

$$r = \frac{\sum xy}{\sqrt{\left(\sum x^2\right)\left(\sum y^2\right)}}$$

$$r = \frac{-9.2}{\sqrt{(675.2)(775.9)}} = 0.012$$

Control

$$t = \frac{18.60 - 13.7}{\sqrt{\frac{4.83^2}{30} + \frac{5.17^2}{30} - 2 \times 0.012 \left(\frac{4.83}{\sqrt{30}}\right) \left(\frac{5.17}{\sqrt{30}}\right)}}$$

$$t = 3.83$$
# UNIT TEST II – CHEMISTRY

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<td>df</td>
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</table>

Experimental

Control

SD = \sqrt{\frac{x^2}{n-1}}

\sqrt{\frac{237.5}{29}} = 2.86

\sqrt{\frac{220.8}{29}} = 2.7

\frac{r}{(r)} = \frac{\sum xy}{\sqrt{(\sum x^2)(\sum y^2)}}

\frac{31}{\sqrt{(237.5)(220.8)}} = 0.135

\[ t = \frac{10.50 - 7.8}{\sqrt{\frac{2.86^2}{30} + \frac{2.7^2}{30} - 2 \times 0.0135 \left(\frac{2.86}{\sqrt{30}}\right) \left(\frac{2.7}{\sqrt{30}}\right)}} \]

\[ t = 4.054 \]
UNIT TEST II – BIOLOGY

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**Experimental**

\[ SD = \sqrt{\frac{x^2}{n-1}} \]

\[ \sqrt{\frac{158.7}{29}} = 2.34 \]

\[ \sqrt{\frac{249.87}{29}} = 2.94 \]

\[ (r) = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}} \]

\[ (r) = \frac{32.8}{\sqrt{(158.7)(249.87)}} = 0.165 \]

\[ t = \frac{8.10 - 5.93}{\sqrt{\frac{2.34^2}{30} + \frac{2.94^2}{30} - 2 \times 0.0135 \left( \frac{2.34}{\sqrt{30}} \right) \left( \frac{2.94}{\sqrt{30}} \right)}} \]

\[ t = 3.46 \]
UNIT TEST I – ACHIEVEMENT TEST – GENERAL SCIENCE

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\[
\text{Experimental} \quad \text{Control}
\]

\[
\text{SD} = \sqrt{\frac{x^2}{n-1}} = \sqrt{\frac{4592.97}{29}} = 12.58 \quad \sqrt{\frac{2335.87}{29}} = 8.97
\]

\[
( r) = \frac{\sum xy}{\sqrt{\left(\sum x^2\right)\left(\sum y^2\right)}} = \frac{6.573}{\sqrt{(4592.97)(2335.87)}} = 0.18
\]

\[
t = \sqrt{\frac{59.36 - 47.93}{\frac{12.58^2}{30} + \frac{8.97^2}{30} - 2 \times 0.18 \left(\frac{12.58}{\sqrt{30}}\right)\left(\frac{8.97}{\sqrt{30}}\right)}} = 4.33
\]
**UNIT TEST I – ACHIEVEMENT TEST – CHEMISTRY**

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Experimental

\[ SD = \sqrt{\frac{x^2}{n - 1}} \]

\[ SD = \sqrt{\frac{1013.87}{29}} = 5.91 \]

\[ SD = \sqrt{\frac{726.67}{29}} = 5.01 \]

\[ (r) = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}} \]

\[ (r) = \frac{-10.67}{\sqrt{(1013.87)(726.67)}} = -0.012 \]

\[ t = \frac{26.93 - 20.67}{\sqrt{\frac{5.91^2}{30} + \frac{5.01^2}{30} - 2 \times 0.012 \left( \frac{5.91}{\sqrt{30}} \left( \frac{5.01}{\sqrt{30}} \right) \right)}} \]

\[ t = 3.96 \]
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Experimental

\[
SD = \sqrt{\frac{x^2}{n-1}} = \sqrt{\frac{1579.37}{29}} = 7.38
\]

\[
( r) = \frac{\sum xy}{\sqrt{\left(\sum x^2\right)\left(\sum y^2\right)}} = \frac{264.53}{\sqrt{\left(1579.37\right)\left(767.87\right)}} = 0.24
\]

Control

\[
SD = \sqrt{\frac{y^2}{n-1}} = \sqrt{\frac{767.87}{29}} = 5.15
\]

\[
t = \frac{32.43 - 27.27}{\sqrt{\frac{7.38^2}{30} + \frac{5.15^2}{30} - 2 \times 0.012 \times \frac{7.38}{\sqrt{30}} \times \frac{5.15}{\sqrt{30}}}}
\]

\[t = 3.57\]
APPENDIX F

SAMPLE LESSON PLAN ON AIR & ITS PROPERTIES

STANDARD: SEVEN
SUBJECT: SCIENCE (CHEMISTRY)
OVER VIEW
This lesson introduces the students to air and its properties and extends to its uses.

MATERIALS REQUIRED
The students require paper & pencil and colored pens or pencils for making concept maps. OHP & transparencies or colored chalk and black / white board.

PREPARATION
Before beginning the lesson using concept map the students are given prior practice on the concept of concept map and how to use the concept maps. They are assigned a class work book wherein the instructions to construct a concept map is pasted.

OBJECTIVES & SPECIFICATIONS
Objectives: Knowledge: The pupil acquires knowledge of the properties of air
Understanding: The pupil develops an understanding of the components of air
The pupil develops an understanding of the various phenomena seen in nature related to air.
Application: The pupil applies knowledge & understanding of air to day to day phenomena.

Specific Objectives:
Knowledge: The pupil recalls:
The components of air
The uses of air
The properties of air
Understanding: The pupil
Identifies the components of air
Describes the reactions; eg. Burning
Application: The pupil
Demonstrates air occupies space, weight & is essential for burning.
Analyze: The pupil
Infers the reason of difficulty in breathing at high altitudes.
The student creates concept maps to show the various properties of air and its application.
Evaluation: The pupil Evaluates the concept maps made by himself and others in class on air and its properties.

PHASE – 1: EXPLORE & ENGAGE
(Teacher Activity)
The students are prodded on with a question such as “what is air?” Prior knowledge is elicited by the focus question. The concepts mentioned are written in a group in the ‘parking area’ and later used in the construction of the map. The concept map is drawn on the black board by the teacher with the help of the student.

(Student Activity)
Students’ assists in helping the teacher draw the prior concept map
Students also can draw their individual concept maps in their work book. At this time the text book should remain closed. A sample prior concept map is given in Appendix A.5

PHASE – 2: EXPLAIN & ENGAGE
(Teacher Activity)
Teacher initiates discussion in the class and inquires with students new concepts learned and the concepts that can be used. Teacher with the help of the students develops the concept maps.

(Student Activity)
When the students are exhausted with their stock of concepts (prior knowledge) students are asked to read the passage on Air and its properties. Discussion ensues and important concepts are identified collaboratively and added in the ‘parking area’ of the black board. New connections are drawn preferably with different color pencils to make them differentiate the prior knowledge with the new concepts.

PHASE – 3: EXTEND & CONNECT
(Teacher Activity)
The teacher asks the students to share their individual concept maps and enlarge further the concept map. Further they are probed in such a way to connect and to give a practical dimension

(Student Activity)
Students discuss to find how the map can be extended to everyday living. They also find interconnection to other subjects or areas.

PHASE –4: REFLECTION
(Teacher Activity)
The teacher asks the students to make a concept map on the focus question. This question will encompass the lesson learned. Teacher uses fill in concept maps to analyze the level of attainment.

(Student Activity)
The students collaboratively construct concept maps. They submit the work as assignments. (The weekly assignment. Appendix A.8)