1. Name of the concept : Force

2. Essential Attributes :
   1. Force can change the state of rest of a body (changes position)
   2. It can change the speed of the body.
   3. It can change the direction of motion.
   4. Force tends to change the state of rest of a body.
   5. Force tends to change the state of motion of a body in a straight line.
   6. Force is necessary to stop motion.

3. Non Essential Attributes :
   The state, size, weight, shape, colour etc. of the body.

4. Positive Exemplars :
   1. Lifting up of a ball
   2. Kicking a football
   3. Pulling a cart
   4. Pushing a car
   5. Kicking a rolling ball in another direction
   6. Kicking a rolling ball in the same direction
5. Negative exemplars

1. a ball placed still on the floor
2. a cart in the state of rest
3. a car in the state of rest
4. movement of a ball on a surface without friction.

Rule: Force is that which changes or tends to change the state of rest or of uniform motion of a body in a straight line.

* Type of model : Reception oriented CAM
* Type of concept : Conjunctive
* Mode of presentation : Verbal example, simple experiments and explanation
* Thinking strategy : Wholistic strategy

Syntax

Phase I

Presentation of data and Identification of the Concept

Teacher : Today we are going to play a game. I will give you some examples of a particular concept that I have in mind. If the example contains the concept I have in mind, I will say 'Yes' and otherwise I will say 'No'. You will have to identify the particular concept I have in mind. You will have to cite more examples, test the characteristics of the concept and give a definition of that concept according to its characteristics

Orientation to Programme
Let us see an example which is an 'Yes'.

Lifting up of a ball.

Can you say what my concept is?

Students : No

Teacher : See the next example. It is a 'No'. A ball placed still on the floor. Can you guess what my concept is?

Students : Something related with rest and motion

Teacher : That is not a clear answer. Here is another example which is a 'Yes'.

Kicking a football.

Now can you say what my concept is?

Students : In your 'yes' examples the position of the object is changed while in the 'No' example there is no change of position.

Teacher : You are correct. Let me give you another 'Yes' example.

Pulling a cart

Students : Work has to be done to pull a cart

Students : The cart is moving because of the work done

Teacher : Good. But the concept is not clear enough. Look at this example. A cart in the state of rest. It is a 'No' example.
<table>
<thead>
<tr>
<th>Students</th>
<th>The cart is not moving because nobody is pulling it.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>Very good. Can you name the concept now?</td>
</tr>
<tr>
<td>Students</td>
<td>Something related to doing work.</td>
</tr>
<tr>
<td>Teacher</td>
<td>'Yes'. It is a 'Force'. Now look at another 'Yes' example.</td>
</tr>
<tr>
<td></td>
<td>Pushing a car.</td>
</tr>
<tr>
<td></td>
<td>What is happening here?</td>
</tr>
<tr>
<td>Student</td>
<td>Force is applied on car. But it is not moving.</td>
</tr>
<tr>
<td>Student</td>
<td>Car is not actually moving because force is not enough.</td>
</tr>
<tr>
<td>Teacher</td>
<td>Correct. Now let me give you another 'No' example.</td>
</tr>
<tr>
<td></td>
<td>Movement of a ball in a surface without friction.</td>
</tr>
<tr>
<td></td>
<td>What can you say about it?</td>
</tr>
<tr>
<td>Student</td>
<td>The ball continues to roll because there is no friction.</td>
</tr>
<tr>
<td>Student</td>
<td>The ball will stop if the ground exerts force on it.</td>
</tr>
<tr>
<td>Teacher</td>
<td>Very good. Now let me give you another 'Yes' example.</td>
</tr>
<tr>
<td></td>
<td>Kicking a rolling ball in another direction.</td>
</tr>
<tr>
<td></td>
<td>What is happening here?</td>
</tr>
<tr>
<td>Student</td>
<td>The direction of motion of the ball changes due to application of force</td>
</tr>
<tr>
<td>Teacher</td>
<td>Correct. Now can you give the characteristics or essential attributes of force?</td>
</tr>
</tbody>
</table>
Student : Force can change the state of rest of a body.
Student : Force can change the direction of motion of a body.
Student : Force can change the speed of a body.
Student : Force tends to change the state of rest of a body
Student : Force is necessary to stop motion
Teacher : Very good.

Force is that which changes or tends to change the state of rest or of uniform motion of a body in a straight line.

Now can you name the non-essential attributes?

Students : No
Teacher : The weight of the object. It does not determine the force applied on it. Anything more?
Students : The size of the object, the shape of the object, the state of the object etc.
Teacher : Very correct.

Phase II

Testing the Attainment of the Concept

Teacher : Now I am going to test whether you have understood the concept of force. I shall give you some examples. You have to say whether it is a 'Yes' example or a 'No' example.

Lifting up of a book.

Students : 'Yes'
Teacher : A car in the state of rest.
Students: 'No'
Teacher: Kicking a rolling ball in the same direction.
Students: 'Yes'
Teacher: A book placed still on the table.
Students: 'No'.
Teacher: Stopping a moving ball.
Students: 'Yes'
Teacher: You are correct. Then can you define force.
Students: Force is that which changes or tends to change the state of rest or of uniform motion of a body in a straight line.

Teacher: Good. Give some more examples of force.
Student: Pushing a table
Student: Pushing a wall
Student: Lifting a stone
Student: Stopping a rolling wheel
Student: Changing direction of motion of a rolling wheel
Teacher: Very good.

Phase III
Analysis of Thinking Strategies

Teacher: Can you explain how you came to the conclusion of our concept.
Student: The first 'yes' example was lifting up of a ball and the first 'No' example was a ball placed still on the floor. Then I thought that it is something related with rest and motion. Then you gave the second and third 'Yes' examples. I thought that it is something related with doing work.

Students states the concept rule.

Students describes thoughts
Teacher: What about other examples?

Student: When you gave the sixth labelled example I thought that application of force always do not change position. But it can produce a tendency to change state.

Teacher: Then how did you arrive at the conclusions about the essential attributes of force?

Student: When you gave the seventh labelled example I thought that force is necessary to stop motion. From the 8th 'Yes' example I found that force can change the direction of motion of a body along a straight line. Then once more I went through all the 'Yes' and 'No' examples and analysed the essential attributes of force. Thus I arrived at the concept of force.
APPENDIX IB  
DEPARTMENT OF EDUCATION  
UNIVERSITY OF CALICUT  

LESSON TRANSCRIPT FOR CONCEPT ATTAINMENT MODEL-No.VI  
(Standard IX)  

Dr. P. Usha  Ampili Aravind  

Time: 45 minutes  

1. Name of the concept : Inertia of rest and Inertia of motion  
2. Essential Attributes :  

(1) an object at rest cannot move by itself.  
(2) an object at rest continues to be in its state of rest.  
(3) application of an external force is necessary for the change of state of rest  
[for Inertia of rest]  
(1) An object in linear motion cannot come to rest by itself.  
(2) It continues to be in its state of motion in a straight line.  
(3) Application of an external force is necessary for the change of state of motion.  
[for Inertia of motion]  
3. Non-essential attributes :  
The size, weight, shape etc. of the object.  
4. Positive examplars:  
(1) Falling forward of a standing passenger, when a fast moving bus is suddenly stopped.  
(2) Athletes running some distance before making a long jump.
(3) Rabbits running in a zig-zag manner if chased by dog.
(4) Running of a man in a zig-zag manner if chased by an elephant.

[for Inertia of Motion]

(1) The falling backward of a standing passenger when a bus stands moving suddenly.
(2) Beating of a carpet with a stick to clean it.
(3) Shaking of the branches of a mango tree to pluck mangoes.
(4) Remaining intact of a pile of coins placed one over another, even if we strike the lowest coin.

[for Inertia of rest]

5. Negative exemplars

(1) The falling backward of a standing passenger when a bus starts moving suddenly.
(2) Beating of a carpet with a stick to clean it.
(3) Shaking of the branches of a mango tree to pluck mangoes.
(4) Remaining intact of a pile of coins placed one over another, even if we strike the lowest coin.

[for Inertia of Motion]

(1) Falling forward of a standing passenger, when a fast moving bus is suddenly stopped.
(2) Athletes running some distance before making a long jump.
(3) Rabbits running in a zig-zag manner if chased by dog.
(4) Running of a man in a zig-zag manner if chased by an elephant.

[for Inertia of Rest]

Rule: 'Inertia of rest' is the incapability of a body to change by itself its state of rest.
'Inertia of Motion' is the incapability of a body to change by itself its state of uniform motion along a straight line.

* Type of model : Reception Oriented CAM

* Type of concept : Conjunctive

* Mode of presentation: Verbal example, simple experiments and explanation.

* Thinking strategy : Wholistic strategy

### Syntax

#### Phase I

**Presentation of data and Identification of the Concept**

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Orientation to programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Today we are going to play a game. I will give you some examples of a particular concept that I have in mind. If the example contains the concept that I have in mind, I will say 'Yes' or otherwise I will say 'No'. You will have to identify the particular concept I have in mind. You will have to cite more examples, test the characteristics of the concept and give a definition of the concept according to its characteristics.</td>
<td>Teacher presents first labelled example</td>
</tr>
<tr>
<td>Let us see an example which is an 'Yes'. When a fast moving bus is suddenly stopped, a standing passenger tends to fall forward. Can you say what I have in mind?</td>
<td>Students forms first hypothesis</td>
</tr>
<tr>
<td>Moving passenger cannot stop easily.</td>
<td>Teacher presents the second</td>
</tr>
<tr>
<td>Your idea is correct. But the concept is not clear. See the next example. It is a 'No'.</td>
<td>Teacher presents the second example</td>
</tr>
</tbody>
</table>
When a bus starts moving suddenly, a standing passenger tends to fall backwards.

Can you guess what my concept is?

Students : No

Teacher : Look at this example now.

Athletes run some distance before making a long jump.

It is an 'yes' example.

Students : To increase the speed of jumping

Teacher : That is not a clear answer. Here is another example which is a 'No'.

Beating of a carpet with a stick to make it clean.

Students : Give some more examples

Teacher : Here is another 'yes' example. Running of rabbits in zig-zag manner if chased by dog.

Students : It may be because dog cannot easily run in a zig-zag manner.

Teacher : See this 'yes' example. A man chased by an elephant runs in a zig-zag manner.

Students : In your 'yes' examples a moving object cannot stop easily.

Teacher : Good. Anything more?

Students : In your 'yes' example a moving object cannot change its direction easily.
Teacher : Very good. Can you name the concept?

Students : No

Teacher : It is 'inertia of motion'. Now, can you give the characteristics or essential attributes of Inertia of motion?

Students : An object in motion cannot come to rest by itself.

Students : An object in motion has a tendency to continue in its state of motion.

Students : An object moving in straight line cannot change its direction of motion easily.

Students : Application of an external force is necessary for the change of state of motion.

Teacher : Very good.

Inertia of motion is the incapability of a body to change its state of uniform motion along a straight line.

Teacher : Now look at the 'No' examples. Is there any concept in it?

Students : In your 'No' example an object in a state of rest cannot move by itself.

Teacher : Correct. Anything more?

Students : In your 'No' example an object at rest has a tendency to continue in its state of rest.

Teacher : Can you give any other characteristics?

Students : An external force is needed to change state of rest.

Teacher : Very good. Can you name this concept?

Students : Yes. It is 'Inertia of rest'.

Teacher : Very good. Now let us put all the essential attributes together.
Students : An object at rest cannot move by itself.

Students : It continues to be in its state of rest.

Students : Application of an external force is necessary for the change of state of rest

Teacher : Good. Now can you define 'inertia of rest'?

Students : 'Inertia of rest' is the incapability of a body to change by itself, its state of rest.

Teacher : Can you name the non-essential attributes of these concepts?

Students : No

Teacher : Consider the weight of the object. It does not determine 'inertia of rest' or 'inertia of motion'. Anything more?

Students : The size of the object, the shape of the object etc.

Teacher : Very correct.

Phase II

Testing the Attainment of the Concept

Teacher : Now I am going to test whether you have understood the concepts 'inertia of rest' and 'inertia of motion'. I shall give you some examples. If it is 'inertia of motion' you have to say 'yes' and if it is 'inertia of rest' you have to say 'No'.

Teacher : When a fast moving train is suddenly stopped, a standing passenger falls forward.

Students : 'Yes'

Teacher : To pluck mangoes we sometimes shake the branches of the tree.

Students : 'No'

Teacher : I will show you an experiment now.
Teacher places a number of coins one over another and forms a pile. Then she strikes the lowest coin. The students observe that the pile of coins remain intact.

Teacher : If we strike the lowest coin of a number of coins placed one over another, the pile of coins remain intact. If this a 'Yes' or 'No' example?

Students : 'No'.

Teacher : Right. Then can you define 'inertia of motion'.

Students : Inertia of motion is the incapability of a body to change by itself its state of uniform motion along a straight line.

Teacher : Then what is 'inertia of rest'.

Students : Inertia of rest is the incapability of a body to change by itself its state of rest.

Teacher : Give some more examples of 'inertia of motion'.

Students : Sportsman running some distance before throwing a javelin.

Students : Deer running in zig-zag manner when chased by Lion.

Teacher : Good. Give some more examples of 'inertia of rest'.

Students : When a train starts moving suddenly a standing passenger tends to fall backwards.

Students : If we strike the lowest card of a pile of cards placed one over other, the pile of cards remain intact.

Teacher : Very good.
Phase III

Analysis of Thinking Strategies

Teacher : Can you explain how you came to the conclusion of our concepts.

Students : The first 'yes' example was falling forward of a standing passenger, when a fast moving bus is suddenly stopped. I thought that moving objects cannot stop easily. Then you gave the example of Athletes running some distance before making a long jump. Then I thought that a moving body continues to move for sometime.

Teacher : What about other examples?

Students : When you gave the first two 'No' examples I thought it was something concerned with remaining in whatever state the object was. Then you gave the other 'yes' examples. This helped me in formulating our initial hypotheses.

Teacher : Then how did you arrive at the conclusion?

Students : Once more I went through both the 'Yes' and 'No' examples and found that in the 'Yes' examples objects in state of motion were having a tendency to continue in their motion along the same direction and in the 'No' examples the objects in the state of rest were having a tendency to remain in their state of rest. Thus I arrived at the concepts of 'inertia of motion' and 'inertia of rest'.

Students describes thoughts.
APPENDIX IC

OBSERVATION PROFORMA FOR CONCEPT ATTAINMENT
MODEL OF TEACHING

Name of the teacher: Name of the Institution:
Designation: Experience in teaching:

For each of the 18 statements in the proforma, circle the term that best describes the teacher's behaviour.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Statements</th>
<th>Level of Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Did the teacher state the purpose of the game?</td>
<td>T (Thoroughly)</td>
</tr>
<tr>
<td>2.</td>
<td>Did the teacher explain the procedure of the game? (How the 'Yeses' and 'Nos' function?)</td>
<td>P (Partially)</td>
</tr>
<tr>
<td>3.</td>
<td>Did the initial 'Yes' clearly contain the essential attributes?</td>
<td>M (Missing)</td>
</tr>
<tr>
<td>4.</td>
<td>If teaching a conjunctive concept, did the teacher begin with a 'Yes' exemplar?</td>
<td>NN (Not Needed)</td>
</tr>
<tr>
<td>5.</td>
<td>Did the teacher ask questions that focused students thinking on the essential attributes?</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Did the teacher ask the students to compare the 'Yes' exemplars?</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Did the teacher ask the students to contrast the attributes of the 'Yes' exemplars with those of the 'No' exemplars?</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Did the teacher present labelled exemplars?</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Did the teacher ask the students to generate and test hypothesis about the identity of the concept?</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Did the teacher ask the students to name the concept?</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Did the teacher ask the student to state the essential attributes of the concept?</td>
<td></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Statements</td>
<td>Level of Effectiveness</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>12.</td>
<td>After the concept was agreed upon, did the teacher present additional exemplars and ask whether they contained the concept?</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Did the teacher ask the students to justify their answers?</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Were the students able to supply their own exemplars to fit the concept?</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Did the teacher ask the students to justify their exemplars by identifying the essential attributes?</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Did the teacher ask the students to describe the thinking process they used in attaining the concept?</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Did the teacher ask the students to reflect on the role of attributes and concepts in their teaching strategies?</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Did the teacher ask the students to evaluate the effectiveness of their strategies?</td>
<td></td>
</tr>
</tbody>
</table>

19. **Explain your overall judgement of the teacher's effectiveness:**

__________________________________________________________________________

__________________________________________________________________________

20. **Suggestions for Improvement:**

__________________________________________________________________________

__________________________________________________________________________
**APPENDIX II A**

**DEPARTMENT OF EDUCATION**

**UNIVERSITY OF CALICUT**

**LESSON TRANSCRIPT FOR OBJECTIVE BASED INSTRUCTION-IV**

<table>
<thead>
<tr>
<th>Name of the teacher</th>
<th>Ampili Aravind</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the School</td>
<td>NSSKPTHSS Ottapalam</td>
</tr>
<tr>
<td>Standard and division</td>
<td>IX A₁</td>
</tr>
<tr>
<td>Subject</td>
<td>Physics</td>
</tr>
<tr>
<td>Strength</td>
<td>40</td>
</tr>
<tr>
<td>Unit</td>
<td>Force</td>
</tr>
<tr>
<td>Period</td>
<td>IV</td>
</tr>
<tr>
<td>Topic</td>
<td>Force</td>
</tr>
<tr>
<td>Date</td>
<td>19.07.2005</td>
</tr>
</tbody>
</table>

**Content overview**

| Force |

**Content Analysis**

**Scientific terms**


**Scientific facts**

1. A moving object will continue to move if not stopped.
2. A book in a state of rest continues to be in that state, if an external force is not applied.

**Scientific Concepts**

- Force is that which moves or tends to move an object.

**Instructional Objectives**

1. The pupil acquires knowledge about the above terms, facts and concept.
2. The pupil develops comprehension of the concept force.
3. The pupil applies knowledge in daily life situations.
4. The pupil analyses the different types of forces.
5. The pupil synthesises the properties of force.
6. The pupil evaluates the effects of force.

**Previous knowledge**

- The pupil knows that when an object is pushed or pulled, it moves.

**Teaching aids**

- Chart.
42. Water is taken in a vessel and heated. The temperature is measured using a thermometer. It is observed that temperature increased gradually as water is heated. But when water begins to boil there is no rise in temperature even though it is heated continuously.

   This is because:
   A. No heat is absorbed when water boils.
   B. Thermometer becomes insensitive to temperature.
   C. Temperature of water vapour cannot be noted using a thermometer.
   D. Heat is absorbed by water to change into water vapour.

43. The property by which a liquid produces a force in order to reduce the relative motion between its different layers is called:
   A. Viscosity
   B. Surface tension
   C. Friction
   D. Capillarity.

44. You are to conduct an experiment to find out whether the electrical conductivity of a substance depends on the number of free electrons in the substance.

   If the electrical conductivity depends on the number of free electrons, what should be done to find this out accurately?
   A. Find the electrical conductivity of an insulator and check if it is proportional to the number of free electrons.
   B. Find the electrical conductivity of a good conductor and check if it is proportional to the number of free electrons.
   C. Find the electrical conductivity of a semi-conductor and check if it is proportional to the number of free electrons.
   D. Find the electrical conductivity of different insulators, conductors and semi conductors and check accurately the relationship between conductivity and the number of free electrons.

45. Which of the following is an example of a viscous liquid?
   A. Water
   B. Coltar
   C. Petrol
   D. Kerosine

46. In an experiment a 100 g weight is placed on a dial balance and the reading is noted. Now the weight is placed 30 cm above the balance and dropped. The reading is noted again. Then a 200 g weight is dropped on the balance from the same height and reading is noted. The reading is different in each case.

   Which of the following statements are implicit in the experiment?
   A. The balance show different reading because different weights are dropped.
   B. The weights strike the dial with different velocity.
<table>
<thead>
<tr>
<th>CONTENT</th>
<th>SPECIFICATION</th>
<th>LEARNING EXPERIENCE</th>
<th>EVALUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>When an object is pushed it moves.</td>
<td>recalls</td>
<td>The teacher asks the pupils what will happen if we push an object. The pupil answers.</td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>An object moves if we push it because we apply force on it.</td>
<td>recognises</td>
<td>Through discussion pupil comes to the conclusion that an object moves when we push it because we are applying force on it.</td>
</tr>
<tr>
<td></td>
<td>Force is that which moves or tends to move an object</td>
<td>observes the experiment. notes minute details. defines.</td>
<td>The teacher asks a pupil to push a toy car. When the pupil applies a little force it tends to move. When he pushes it harder, the car moves forward. Through observation and discussion pupils comprehend the meaning of force.</td>
</tr>
<tr>
<td></td>
<td>An object cannot move if an external force is not applied on it.</td>
<td>Performs experiment finds out reason</td>
<td>Pupil places a ball on the floor. The pupils observe that if no force is applied the ball will remain still. When it is kicked it moves. Through this experiment pupil understands that an object cannot move if an external force is not applied on it.</td>
</tr>
<tr>
<td></td>
<td>If a rolling object is kicked again it moves faster.</td>
<td>realises</td>
<td>Through experiment pupil realises that a rolling object will move faster if it is kicked again.</td>
</tr>
</tbody>
</table>

**EVALUATION**

- Why does an object move when we push it?
- What is force?
- What happens to object if an external force is not applied on it?
- If we kick a rolling ball again what will happen?
If a rolling ball is kicked in another direction its direction of motion changes. Force is need to stop motion.

Through experiments pupil recognises that when a rolling ball is kicked in another direction its direction of motion changes.

What happens to a moving ball if it is kicked in another direction?

Through experiment pupil recognises that when a rolling ball is kicked in another direction its direction of motion changes.

Why does a rolling ball stop after sometime?

Force is that which changes or tends to change the state of rest or that of uniform motion of an object in a straight line.

Define force?

With the help of the teacher the pupil defines force.

CONTENT REVIEW

1. Why does an object move when we push it?
2. What happens to an object if a force is not applied on it?
3. If we kick a rolling ball in the same direction what will happen?
4. If we kick a rolling ball in another direction what will happen?
5. What all changes can be done on a body applying force?
6. Define force.

HOME ASSIGNMENT

1. Define force.
2. Observe the different instances of force in your day to day life and note them down.
## Lesson Transcript for Objective Based Instruction-VI

### Name of the teacher: Ampili Aravind
### Name of the school: NSSKPTHSS Ottapalam
### Subject: Physics
### Unit: Force
### Topic: Inertia of Rest and Inertia of Motion

### Content Overview
- **Inertial of Rest and Inertia of Motion**

### Content Analysis

**Scientific terms:** Force, State of rest, state of motion, Inertia, Inertia of rest, Inertia of motion

**Scientific Facts:**
1. A body cannot change the state of rest by itself
2. A body moving in a straight line cannot change the direction or speed of motion by itself

**Scientific Concepts:**
1. Inertia of rest is the tendency of a body to continue in its state of rest
2. Inertia of motion is the tendency of a body to continue in its state of uniform motion along a straight line.

### Instructional Objectives:
1. The pupil acquires knowledge about the above terms, facts and concepts
2. The pupil develops comprehension of the concepts Inertia of rest and inertia of motion.
3. The pupil applies knowledge in daily life situations.
4. The pupil analyses the different instances of inertia of rest and inertia of motion in daily life.
5. The pupil synthesises the properties of inertia of rest and inertia of motion.
6. The pupil evaluates the effects of inertia of rest and inertia of motion.

### Previous knowledge
- The pupil knows that an object continues in its state of rest or uniform motion along a straight line, unless a force is applied on it.

### Teaching aids
- Charts, Carrom coins,
<table>
<thead>
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<th>CONTENT</th>
<th>SPECIFICATION</th>
<th>LEARNING EXPERIENCE</th>
<th>EVALUATION</th>
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<tr>
<td><strong>INTRODUCTION</strong>&lt;br&gt;When force is applied on a moving ball it will stop. When force is applied on a ball at rest it will move</td>
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<td><strong>PRESENTATION</strong>&lt;br&gt;An object continues in its state of rest if no force is acting on it.</td>
<td>recalls</td>
<td>The teacher kicks a ball on ground. The pupil observes that the ball moves. The teacher applies force on the moving ball. It stops. The pupil recalls that force is needed to start motion and stop motion</td>
<td>What happens to an object in a state of rest when no force is applied on it?</td>
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<td>recognises</td>
<td>Through discussion pupils come to the conclusion that an object continues in its state of rest if no force is acting on it. (State of rest (B.B.)</td>
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<td>observes the experiment</td>
<td>The teacher asks a pupil to observe a moving ball on ground. Through observation and discussion pupils comprehend that the ball slows down and comes to rest after some time because of the force exerted on it by the ground. Through discussion pupils realise that the ball will move on infinitely in the same direction with the same speed on a friction less surface. Pupils infer that if an external force is not applied, an object continues in its state of uniform motion along a straight line (State of uniform motion (B.B.)</td>
<td>What happens to an object in a state of uniform motion along a straight line when no external force is applied on it?</td>
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<td>notes minute details</td>
<td>With the help of the teacher the pupil defines inertia of rest (Inertia of rest (B.B.)</td>
<td>Define Inertia of rest?</td>
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<td>finds out reason</td>
<td>The teacher arranges a pile of carrom coins on the table. The teacher asks a pupil to strike off the lowest coin from the pile of coins without disturbing other coins. Pupils observe that other coins remain undisturbed. Pupil infers that this is due to inertia of</td>
<td>Cite examples for inertial of rest.</td>
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<td>infers</td>
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<tr>
<td><strong>Examples of Inertia of rest</strong>&lt;br&gt;1. We can strike off the lowest coin form a pile of carrom coins without disturbing other coins</td>
<td>defines</td>
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2. Mangoes detach from the stalk when we violently shake the branch of a mango tree.

Inertia of motion is the tendency of a body to continue in its uniform motion along a straight line.

Examples of Inertia of motion

1. A person stepping out of a moving bus has to run forward a few steps.
2. The fan continues to rotate for sometime even after it is switched off.

A standing person tends to fall backward when a bus at rest is moved forward quickly due to inertia of rest.

A standing person tends to fall forward when a moving bus comes to rest quickly.

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<th>SPECIFICATION</th>
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<tbody>
<tr>
<td>draws inferences</td>
<td>rest of the coins. Through discussion pupil finds that mangoes fall down when we shake the branch of a mango tree due to inertia of rest.</td>
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<td>Define inertia of motion?</td>
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<td>compares and contrasts defines</td>
<td>Pupils defines inertia of motion Inertia of motion (B-B) With the help of the teacher pupil realises that a body moving in a straight line also has inertia</td>
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<td>identifies life situations performs experiment observes</td>
<td>The teacher explains the instance of a person stepping out of a moving bus. The pupil realises that the person has to run forward a few steps. The teacher asks a pupil to stop the fan in the classroom. Pupils observe that fan continues to rotate for sometime even after it is switched off. Pupil identifies these instances as daily life examples of Inertia of motion?</td>
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<td>Compare inertia of rest and inertia of motion with the help of daily example.</td>
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<tr>
<td>draws inference realises cites examples explains compares</td>
<td>Teacher describes the instance of a standing person when a bus at rest is moved forward quickly. Pupil comprehends this is an example of Inertia of rest Pupils explains that a standing person tends to fall forward when sudden break is applied on a moving</td>
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<td>Cite daily life examples for inertia of motion?</td>
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<td>due to inertia of motion</td>
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<td>bus due to inertia of motion</td>
<td>Pupil compares Inertia of rest and Inertia of motion.</td>
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**CONTENT REVIEW**

1. What happens to an object in a state of rest when no external force is applied on it?
2. What happens to an object in a state of uniform motion along a straight line when no external force is applied on it?
3. Define Inertia of rest.
4. Define Inertia of motion
5. Cite examples for inertia of rest and inertia of motion

**Home Assignment**

1. Define Inertia of rest and Inertia of motion
2. Find out different instances of inertia of rest and Inertia of motion from daily life situations and note them down.
INSTRUCTIONS

For each of the following statements three alternative responses- 'Agree', 'disagree' and 'not sure' - are given. Read the statements carefully and select the most appropriate response. Put a 'X' in the relevant circle provided in the response sheet against each statement number. Do not write anything in the question booklet. Kindly answer all the questions.

For Example, Item No.3 is:

3. I wonder whether the activities provided in the school are relevant.
   If your response is 'Agree' put a 'X' in the response sheet as shown here.

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
<th>Not sure</th>
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<tbody>
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1. While studying, I try to find out for myself the meaning of the prescribed lessons.
2. I analyze the content critically, while reading a book.
3. I wonder whether the activities provided in the school are relevant.
4. I like to analyze the reason behind things.
5. I come across really gripping ideas while studying.
6. I am in the habit of reading without thinking much about the content.
7. During night I lie awake worrying about assignments I have to submit.
8. It is difficult for me to prepare study notes on my own.

9. I somehow find suitable learning environment to get on with my studies.

10. I abide by instructions given by my teachers.

11. I accept, what is being told to me, only after elaborate thinking and analysis.

12. Much of my learning involves rote memorization.

13. I really enjoy studying the academic topics.

14. I think about how to get the appreciation of the teacher while doing projects and assignments.

15. I think about what I want to get out of my studies to keep my studying well oriented.

16. I prepare models and charts as a part of class project works and not because I am interested.

17. While studying, I can easily remember bits and pieces but cannot present it as a whole concept.

18. Though uninterested in studying, I have to study because of many other reasons.

19. I write everything I hear in classes as it is difficult for me to grasp the important points.

20. I am in the habit of going over my work again and again to find out whether there are any mistakes.

21. I put a lot of effort to make sure that I have all the important study material with me.

22. I find myself attached to certain subjects and would like to study those subjects more.

23. I like teachers to give guidelines while assigning the projects or duties.

24. To memorize the study materials, I have to write or repeat it quite a number of times.

25. I follow a timetable while revising for examinations.
26. I think about how to present an assignment or answer a question in an impressive manner before starting work on it.

27. My mind questions the facts presented in lectures or in books.

28. While writing an assignment, I try to incorporate the viewpoints of the teacher who is going to value it.

29. While reading a text book I think a lot about ideas presented in them.

30. My life experiences influence the way I absorb new ideas.

31. When I am learning from text books, I try to get an insight of curricular objectives.

32. I generally utilize my day time effectively.

33. I learn by heart because I don't understand much of what is taught.

34. I study really hard because I am determined to do well.

35. While revising for examinations, I concentrate on portions highlighted as important by the teachers.

36. My mind follows the idea from classroom teaching even while doing other things.

37. I wonder what prompted me to go to school.

38. I analyse the details to know about the author's ideas while reading a book or an article.

39. I keep in mind teacher's comments on my previous work to get higher marks next time.

40. While studying, I concentrate fully on what I am doing.

41. I plan my study time to make use of it effectively.

42. I am in the habit of planning my work in advance.

43. It is important for me to try my level best to be successful in my studies.

44. While studying, I take short breaks to review and recollect the material already learned.

45. I go through the fundamentals before solving a problem or taking up an assignment.
46. While studying a new topic, I try to get an overview of the ideas presented.

47. While studying, I examine the portion carefully to reach my own conclusions.

48. I use to analyse new ideas by linking it with my previous knowledge.

49. I like to play around with ideas of my own, even though they are not connected with my studies.

50. I try to relate the learning materials with other topics studied.

51. It is difficult for me to understand the meaning of the topics as they are presented in a manner beyond my comprehension.

52. I am anxious whether I will be able to attain the expected standard while doing the assigned work.

53. I have definite purpose behind my studies and know how to achieve it.

54. It is very easy for me to motivate myself.

55. I worry a lot about whether I will be able to complete my studies successfully.

56. I can get down to work whenever I need to.

57. I am always up to date in my studies and work.

58. I find nothing in the syllabus quite interesting.
APPENDIX III B
DEPARTMENT OF EDUCATION
UNIVERSITY OF CALICUT
STUDYING APPROACH INVENTORY
RESPONSE SHEET

Name: ____________________________  Boy/Girl: ____________________________
Name of school: ___________________  Rural/Urban: ________________________
Standard: _________________________  Division: ____________________________

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APPENDIX III C
DEPARTMENT OF EDUCATION
UNIVERSITY OF CALICUT

DETAILS OF ITEM ANALYSIS OF STUDYING APPROACH INVENTORY

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APPENDIX III D

DEPARTMENT OF EDUCATION
UNIVERSITY OF CALICUT

STUDYING APPROACH INVENTORY
(Final Version)

Dr. P. USHA
Reader
Department of Education
University of Calicut

AMPILI ARAVIND
Research Scholar

INSTRUCTIONS

For each of the following statements three alternative responses- 'Agree', 'disagree' and 'not sure' - are given. Read the statements carefully and select the most appropriate response. Put a 'X' in the relevant circle provided in the response sheet against each statement number. Do not write anything in the question booklet. Kindly answer all the questions.

For Example, Item No.3 is:

3. I wonder whether the activities connected with the course are relevant. If your response is 'Agree' put a 'X' in the response sheet as shown here.

<table>
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1. While studying, I try to find out for myself the meaning of the prescribed lessons.

2. I analyze the content critically, while reading a book.

3. I like to analyze the reason behind things.

4. I come across really gripping ideas while studying.

5. I am in the habit of reading without thinking much about the content.

6. I somehow find suitable learning environment to get on with my studies.
7. I abide by instructions given by my teachers.
8. I accept, what is being told to me, only after elaborate thinking and analysis.
9. Much of my learning involves rote memorization.
10. I really enjoy studying the academic topics.
11. I think about how to get the appreciation of the teacher while doing projects and assignments.
12. I think about what I want to get out of my studies to keep my studying well oriented.
13. While studying, I can easily remember bits and pieces but cannot present it as a whole concept.
14. I write everything I hear in classes as it is difficult for me to grasp the important points.
15. I am in the habit of going over my work again and again to find out whether there are any mistakes.
16. I put a lot of effort to make sure that I have all the important study material with me.
17. I find myself attached to certain subjects and would like to study those subjects more.
18. I like teachers to give guidelines while assigning the projects or duties.
19. To memorize the study materials, I have to write or repeat it quite a number of times.
20. I follow a timetable while revising for examinations.
21. I think about how to present an assignment or answer a question in an impressive manner before starting work on it.
22. My mind questions the facts presented in lectures or in books.
23. While writing an assignment, I try to incorporate the view points of the teacher who is going to value it.
24. While reading a text book I think a lot about ideas presented in them.
25. My life experiences influence the way I absorb new ideas.
26. When I am learning from text books, I try to get an insight of curricular objectives.

27. I generally utilize my day time effectively.

28. I learn by heart because I don't understand much of what is taught.

29. I study really hard because I am determined to do well.

30. While revising for examinations, I concentrate on portions highlighted as important by the teachers.

31. My mind follows the idea from classroom teaching even while doing other things.

32. I wonder what prompted me to go to school.

33. I analyse the details to know about the author's ideas while reading a book or an article.

34. I keep in mind teacher's comments on my previous work to get higher marks next time.

35. While studying, I concentrate fully on what I am doing.

36. I plan my study time to make use of it effectively.

37. I am in the habit of planning my work in advance.

38. It is important for me to try my level best to be successful in my studies.

39. While studying, I take short breaks to review and recollect the material already learned.

40. I go through the fundamentals before solving a problem or taking up an assignment.

41. While studying a new topic, I try to get an overview of the ideas presented.

42. While studying, I examine the portion carefully to reach my own conclusions.

43. I use to analyse new ideas by linking it with my previous knowledge.

44. I like to play around with ideas of my own, even though they are not connected with my studies.

45. I try to relate the learning materials with other topics studied.
46. I am anxious whether I will be able to attain the expected standard while doing the assigned work.

47. I have definite purpose behind my studies and know how to achieve it.

48. It is very easy for me to motivate myself.

49. I worry a lot about whether I will be able to complete my studies successfully.

50. I can get down to work whenever I need to.

51. I am always uptodate in my studies and work.

52. I find nothing in the syllabus quite interesting.
APPENDIX IV

DEPARTMENT OF EDUCATION
UNIVERSITY OF CALICUT

STANDARD PROGRESSIVE MATRICES SETS A, B, C, D & E

RESPONSE SHEET

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Tested by ___________________________
APPENDIX V A
UNIVERSITY OF CALICUT
DEPARTMENT OF EDUCATION

ACHIEVEMENT TEST IN PHYSICS
(Standard IX)
(Draft Version)

Dr. P. Usha
Reader
Department of Education
University of Calicut

Ampili Aravind
Research Scholar

Instructions:

This is a Physics test paper. Do not write anything on the question paper. You are given separate sheets to write answers. For each question four answers are given marked by A, B, C and D. Mark the correct answer by putting an 'X' mark on the letter denoting the correct answer. Each question carries one mark.

1. Which of the following is the product of mass and velocity of a body?
   A. Force
   B. Momentum
   C. Weight
   D. Energy

2. The property of a body by which it continues in its state of rest is:
   A. Momentum
   B. Inertia of rest
   C. Inertia of motion
   D. Weight

3. The splitting up of composite light into its component colours is known as:
   A. Reflection
   B. Refraction
   C. Dispersion
   D. Scattering

4. The ability to do work is known as:
   A. Force
   B. Inertia
5. Which of the following statement is true about circular motion?
   A. Work done by centripetal force is always zero.
   B. Work done by centripetal force is sometimes zero.
   C. Work done by centripetal force is never zero.
   D. Work done by centripetal force is always one.

6. Which of the following colour deviates more when composite light is split up into its component colours
   A. Violet.
   B. Red
   C. Green
   D. Blue

7. Total effect produced by a force on a body is known as:
   A. Impulse
   B. Impulsive force
   C. Momentum
   D. Inertia

8. What happens to the force of attraction between two objects when the distance between them is increased?
   A. Increases
   B. Decreases
   C. Remains the same
   D. None of the above.

9. Which of the following colour has minimum deviation when composite light is split up into its component colours.
   A. Violet
   B. Red
   C. Green
   D. Blue

10. Statement 1. A stone is being dropped from a height.
    Statement 2. A stone is being released from a catapult.
    Which of the following is true regarding the above statements?
    A. In both cases work is done by Potential Energy.
    B. In both cases work is done by Kinetic Energy.
    C. Work is done by P.E. in the first case and K.E. in the second case.
    D. Work is done by K.E. in the first case and P.E. in the second case
11. The highest limit of friction just before and object starts moving is:
   A. rolling friction
   B. sliding friction.
   C. Pulling friction
   D. limiting friction

12. A man was firing a bullet from a rifle supporting it with his shoulder. When the bullet was fired from the rifle he felt pain on his shoulder. This is because:
   A. The rifle moved backwards due to the force of reaction exerted by the bullet.
   B. The rifle moved backwards due to the force of action exerted by the bullet
   C. The rifle moved forward due to the force of action it was exerting on the bullet.
   D. The rifle moved forward due to the force of reaction it was exerting on the bullet.

13. What happens when break is applied to a fast moving bicycle?
   A. It comes to rest immediate
   B. It moves forward for sometime and gradually comes to rest.
   C. It goes on moving
   D. It moves forward faster.

14. A parachute can slowly land on ground because of:
   A. friction of atmospheric air.
   B. density of atmospheric air.
   C. pressure of atmospheric air
   D. gravitational attraction of earth.

15. The phenomenon of capillarity is caused by:
   A. Cohesion
   B. Adhesion
   C. Surface tension
   D. Viscosity

16. Irregular and partial reflection of light during its passage through a medium is known as:
   A. refraction
   B. defraction
   C. dispersion
   D. scattering

17. In an experiment a rope is inserted through a glass tube and a stone is tiled on the tope end of the rope. A weight hanger with a few weights on it is tied to the lower
end of the rope. When the glass tube is rotated, the stone begins to rotate in a circular path.

If the radius of the circular path of the stone is directly proportional to the speed of rotation, which of the following would you expect to observe as the speed of rotation is increased.

A. The stone moves away from the tube and the weight hanger moves up.
B. The stone comes closer to the tube and the weight hanger moves down.
C. The stone remains rotating through the same circular path.
D. The stone breaks away from the thread and flies off.

18. Liquids having low viscosity are known as:
   A. Viscous
   B. Mobile liquids
   C. Dense liquids.
   D. Oily liquids.

19. Property of certain materials by virtue of which light of longer wavelength is emitted by absorbing light of shorter wavelength:
   A. Fluorescence
   B. Conductivity
   C. Phosphorescence
   D. Colour sensitivity

20. We know that sky is blue. But often the sky in the urban area is grey in colour. This may be because:
   A. Red light is scattered ten times more intensely than blue light.
   B. Blue light is scattered ten times more intensely than red.
   C. Scattering is same for all colours.
   D. Scattering is not happening in urban sky.

21. What happens to viscosity when temperature is increased?
   A. Increases
   B. Decreases
   C. Remains the same
   D. None of the above

22. The name given to the force of attraction between the same kind of molecules is:
   A. Cohesion
   B. Adhesion
   C. Fricton
   D. Viscous force
23. A brush is being immersed in water. Then which of the following statements is correct?
   A. Its bristles will remain in the same position.
   B. Its bristles will come close together because of surface tension of water.
   C. Its bristles will come close together because of viscosity of water.
   D. Its bristles will spread out.

24. The sky appears blue because:
   A. Red light is scattered more
   B. Blue light is scattered more
   C. Scattering is same for all colours
   D. Scattering is not happening.

25. Acceleration of a body in a state of uniform circular motion is known as:
   A. Centrifugal acceleration.
   B. Linear acceleration.
   C. Diametric acceleration.
   D. Radial acceleration.

26. The rising and setting sun appears red because during sunrise and sunset:
   A. The sunlight is not scattered.
   B. All the colours are equally scattered.
   C. Sunlight has to traverse great distance through the earth's atmosphere so blue colour is lost due to scattering.
   D. Sunlight has to traverse great distance through the earth's atmosphere and red colour is lost due to scattering.

27. When a boy observed the sky in a rainy evening, he saw a rainbow in the sky. But when he did the same observation on a sunny evening he could not see the rainbow. Which of the following conclusions do you think, can be justified?
   A. During summer season sunlight is dispersed by water drops in the atmosphere.
   B. During rainy reason sunlight is dispersed by water drops in the atmosphere.
   C. During summer season sunlight is not dispersed in the atmosphere.
   D. During rainy season sunlight is not dispersed in the atmosphere.

28. (i) A blotting paper absorbs ink.
   (ii) A burning lamp absorbs oil
   The above statements are daily life examples of:
   A. Capillarity
   B. Gravity
   C. Surface tension
   D. Viscosity
29. In an experiment, a boy pulled a table along a rough surface. He found it hard to pull it. He repeated the experiment by pulling it along a smooth surface. Less force was necessary for this. He repeated the experiment pulling the table along surfaces having different smoothness and concluded that as the smoothness of the surface increases, less force is needed to pull the table.

Which of the following statements is true with respect to the above experiment?

A. Friction is caused by the smoothness of the surfaces in contact.
B. Friction is caused by the roughness of the surfaces in contact.
C. Friction is caused by the similarity of the surfaces in contact.
D. Friction is caused by the difference of the substances in contact.

30. Plants can absorb water from soil because:

A. Capillary force is doing work against gravity.
B. Surface tension is doing work against gravity.
C. Frictional force is doing work against gravity.
D. Viscosity is doing work against gravity.

31. The force of attraction between a proton and an electron is:

A. gravitational force.
B. nuclear force
C. electrostatic force
D. magnetic force

32. Consider an experiment where an object of mass 2 kg is hung from the hook of a spring balance. The reading of the spring balance is 2 kg. Now the balance is allowed to fall such that the object and balance falls simultaneously. The balance shows zero reading.

Which of the conclusions do you think, is justified?

A. The balance shows zero reading because the object is detached from it.
B. The balance shows zero reading because work is done against gravitational attraction.
C. The balance shows zero reading because the object and balance is falling towards the earth.
D. The balance shows zero reading because freely falling bodies experience weightlessness.

33. In an experiment a loop of wire is immersed in soap solution in a beaker. When it is taken out a layer of soap solution is formed on it. A piece of wet thread with both ends tied together is placed on it. The thread is shapeless. But when the soap layer inside the thread is pricked with a needle, the thread become circular in shape. This is because:

A. The thread exerts equal force on all sides of the soap layer.
B. The thread exerts unequal force on all sides of the soap layer.
C. The soap layer exerts equal force on all sides of the thread.
34. The root cause of surface tension is:
   A. Cohesion
   B. Adhesion
   C. Friction
   D. Viscosity

35. A book is placed on a table. It was observed that the book rotates when the table is rotated. In this experiment centripetal force for rotation of the book is given by frictional force between the book and the table. The book was found to be thrown away when the speed of rotation of the table was increased.
   Which of the conclusions can be justified based on the above experiment?
   A. The book rotates slowly when the table is rotated faster.
   B. The book rotates faster when the table is rotated slowly.
   C. The book was thrown away because the centripetal force was balanced by friction.
   D. The book was thrown away because beyond a speed limit centripetal force cannot be balanced by friction.

36. The ability of liquids to rise through small holes against gravity is known as:
   A. Viscosity
   B. Capillarity
   C. Surface tension
   D. Super fluidity

37. Consider the case of a ball rolling on an imaginary road. The road considered here is supposed to be frictionless. Which of the following statements is correct?
   A. It comes to rest after sometime.
   B. It goes on moving infinitely with the same speed.
   C. It slows down but goes on moving.
   D. It speeds up and goes on moving.

38. What happens to surface tension when temperature of a liquid increases?
   A. Increases
   B. Decreases
   C. Remains the same
   D. None of the above

39. Why does a person riding a bicycle tilt it while moving on a curved road?
   A. to obtain speed
   B. to obtain energy
   C. to obtain centripetal force
   D. to obtain centrifugal force
40. An electric bell is placed inside a bell jar. We can hear the sound of the bell when current is passed through the circuit. However, when air is gradually removed from the bell jar, sound decreases even though we can see the gong vibrating at the same speed.

A statement is given below concerning the above experiment.
'Air is required for the sound waves to travel'.
Which of the following should be done to verify this statement?
A. Place the jar at a distance and find out if sound can be heard.
B. Bring the jar closer and find out if sound can be heard more clearly.
C. Evacuate the jar completely and find out if sound can be heard.
D. Fill the jar again with air and find out if sound can be heard.

41. A big explosion is taking place in the moon. Then which of the following statement is correct?
A. We can hear the sound
B. We cannot hear the sound
C. We can hear the sound partially.
D. We can hear the sound only when we are looking at the moon.

42. The lowest value of relative density is:
A. Zero
B. One
C. Less than one
D. Greater than one.

43. You are to conduct an experiment to determine whether an iron nail kept in contact with any pole of a magnet will acquire magnetism.
If the iron nail gets magnetised when touched by a bar magnet, you would expect to observe that:
A. The iron nail attracts iron filings if touched.
B. The iron nail repels iron filings if touched.
C. The iron nail attracts iron filings kept at a distance.
D. The iron nail repels iron filings kept at a distance.

44. When a man is riding a bicycle, the back wheel of the bicycle is rotated and the bicycle moves forward. But if the back wheel is rotated with the bicycle placed on its stand, it will not move forward. Again, the moment the wheel touches the ground, the bicycle moves forward.
This is because:
A. When the wheel rotates in contact with the ground, gravitational force acts in the opposite direction of motion.
B. When the wheel rotates in contact with the ground the gravitational force acts in the same direction of motion.
C. When the wheel rotates in contact with the ground the frictional force of the ground acts in the opposite direction of motion.
D. When the wheel rotates in contact with the ground the frictional force acts in the same direction of motion.

45. Capillary fall occurs when:
A. Cohesion is greater than adhesion.
B. Adhesion is greater than cohesion.
C. Both cohesion and adhesion are the same.
D. Cohesion is different from adhesion.

46. A liquid drop is always spherical because:
A. A spherical drop will have more freedom of movement.
B. A spherical drop will have minimum surface area.
C. A spherical drop will have maximum surface area.
D. A spherical drop will have less freedom of movement.

47. In an experiment, a scientist placed an object at the equator and found its weight. Then he placed it at the poles and found its weight. From the data he found the weight of the object when it is placed at the centre of the earth. He concluded that the object had different weights in the three instances.

Which of the following assumptions is implicit in this experiment?
A. The weight of the object is negligible at the centre of the earth.
B. Acceleration due to gravity is the same at all places on the earth's surface.
C. Acceleration due to gravity is different at different places.
D. Weight is not determined by acceleration due to gravity.

48. Which of the following is the phenomenon occurring when the natural frequency of the body undergoing forced vibration is equal to the natural frequency of the forcing body.
A. Natural vibration
B. Forced vibration
C. Resonance
D. Echo

49. In a wave motion (i) crest and trough are produced (ii) the particles of the medium move perpendicular to the direction of wave motion (iii) there is no pressure difference in the medium. Then the wave is a:
A. Transverse wave
B. Longitudinal wave
C. Electro magnetic wave
D. Radio wave
50. While travelling on top of a bus, a man accidentally touched a live electric wire passing over him and got severe shock. Another man purposefully touched a live electric cable from his television but got no shock at all. This may be because:
A. The current through household appliances are at very low voltage.
B. The household cable had a plastic covering over it.
C. The second man was resistant to electric shock.
D. A man will not get electric shock inside his house.

51. A cotton cloth was dipped in water and allowed to dry in summer season. The time taken by the cloth to dry completely was noted. This experiment was repeated in rainy season. It was observed that the cloth took less time to get dried.

Which of the following conclusions do you think, can be justified?
A. In summer season atmospheric air is saturated with water vapour.
B. In rainy season atmospheric air is saturated with water vapour.
C. In summer season atmospheric temperature is low.
D. In rainy season atmospheric temperature is high.

52. You are to conduct an experiment to determine whether the rate of evaporation of a liquid is affected by an increase in the amount of heat given. You have the relevant apparatus to conduct the experiment.

If the increase in the amount of heat has an observable effect on the rate of evaporation in liquids, almost immediately after increasing the amount of heat you would expect to observe a notable change in the:
A. Temperature of liquid molecules.
B. Motion of liquid molecules
C. Amount of liquid vapour over the liquid surface.
D. Pressure of the liquid.

53. Water is taken in a vessel and heated. The temperature is measured using a thermometer. It is observed that temperature increased gradually as water is heated. But when water begins to boil there is no rise in temperature even though it is heated continuously.

This is because:
A. No heat is absorbed when water boils.
B. Thermometer becomes insensitive to temperature.
C. Temperature of water vapour cannot be noted using a thermometer.
D. Heat is absorbed by water to change into water vapour.

54. The property by which a liquid produces a force in order to reduce the relative motion between its different layers is called:
A. Viscosity
B. Surface tension
C. Friction
D. Capillarity.

55. You are to conduct an experiment to find out whether the electrical conductivity of a substance depends on the number of free electrons in the substance. If the electrical conductivity depends on the number of free electrons, what should be done to find this out accurately?
   A. Find the electrical conductivity of an insulator and check if it is proportional to the number of free electrons.
   B. Find the electrical conductivity of a good conductor and check if it is proportional to the number of free electrons.
   C. Find the electrical conductivity of a semi-conductor and check if it is proportional to the number of free electrons.
   D. Find the electrical conductivity of different insulators, conductors and semi conductors and check accurately the relationship between conductivity and the number of free electrons.

56. Which of the following is an example of a viscous liquid?
   A. Water
   B. Coltar
   C. Petrol
   D. Kerosine

57. In an experiment a 100 g weight is placed on a dial balance and the reading is noted. Now the weight is placed 30 cm above the balance and dropped. The reading is noted again. Then a 200g weight is dropped on the balance from the same height and reading is noted. The reading is different in each case.
   Which of the following statements are implicit in the experiment?
   A. The balance show different reading because different weights are dropped.
   B. The weights strike the dial with different velocity.
   C. Force of a moving body depends on mass and velocity
   D. All the above assumptions are implicit in the experiment.

58. When a person get electric shock, his heart tends to stop. This is because:
   A. He is having tension
   B. Viscosity of blood decreases
   C. Viscosity of blood increases
   D. Pressure of blood decreases.

59. The constant temperature at which a liquid boils is called its:
   A. boiling point
   B. melting point
   C. freezing point
   D. temperature of inversion
60. Water is taken in a glass tumbler and level of water is observed. It is seen that water level is slightly high where water touches glass. If the water is placed in a flat vessel the rise of water is less than if it is placed in a narrow vessel. If water is taken in a thin capillary tube the rise will be maximum.

Which of the following inference can be considered true with respect to the above experiment.
A. The rise of water depends on 'g'.
B. The rise of water depends on the surface area of water.
C. The rise of water depends on the viscosity of water.
D. The rise of water depends on the density of water.

61. The process by which liquid molecules escape from the liquid surface when heated is known as:
A. Boiling
B. Sublimation
C. Evaporation
D. Melting

62. Three statements regarding the properties of liquid molecules are given below:
(i) Liquid molecules have freedom of movement.
(ii) Liquid molecules cannot escape the liquid surface due to force of cohesion.
(iii) When heated, they get kinetic energy to overcome the force of cohesion.

Consider the above statements and find out which of the following are correct:
A. All the above statements are true.
B. All the above statements are false.
C. Statements (i) and (ii) are true.
D. Statements (ii) and (iii) are true.

63. The ratio of the density of a substance to the density of water is known as:
A. Humidity
B. Density
C. Relative humidity
D. Relative density.

64. "Soldiers do not march over hanging bridges"
Consider the above statement and find out which of the following is correct?
A. The statement is true because the bridge will collapse due to forced vibrations.
B. The statement is false because the bridge will not collapse due to forced vibrations.
C. The statement is true because the bridge may collapse due to resonance.
D. The statement is false because nothing will happen to the bridge.
65. Violin is called a source of sound because:
A. It is a musical instrument.
B. It produces sound due to mechanical vibrations.
C. It produces melodious sound than a drum.
D. None of the above.

66. A bat can travel safely at night without striking obstacles because:
A. bat can see in darkness.
B. bat can produce sound waves which pass through obstacles.
C. bat's skin is sensitive to obstacles.
D. bat can produce sound waves which reflect from the obstacles and reach back to the bat.

67. To clean a carpet we beat it with a stick. The principle involved here is:
A. Principle of inertia of rest.
B. Principle of momentum.
C. Principle of inertia of motion.
D. Principle of friction.

68. When we strike a steel tumbler half filled with water with a rod, sound is produced. Here sound is produced due to:
A. The vibration of steel tumbler
B. The vibration of water
C. The vibration of both steel tumbler and water.
D. The vibration of the rod.

69. 'Action and reaction are equal and opposite'.
Considering the above statement which of the following are correct?
A. They cancel each other because they are equal and opposite.
B. They do not cancel each other because they are equal and opposite.
C. They cancel each other because they are acting on the same object.
D. They do not cancel each other because they are acting on different objects.

70. In a wave motion,
(i) Compressions and rare fractions are produced.
(ii) The particles of the medium travel in the same direction of wave motion.
(iii) The pressure and density of the medium is different at different points.
That wave is a:
A. Transverse wave
B. Longitudinal wave
C. Electro magnetic wave
D. Radio wave.
71. When a person is jumping ashore from a boat, the boat moves backward. This is because of:
   A. The force of reaction applied by the boat
   B. The force of reaction applied by the person
   C. The force of action applied by the boat
   D. The force of action applied by the person.

72. The phenomenon of magnetization of a magnetic substance under the influence of a magnet is called:
   A. Magnetic flux
   B. Magnetic Induction
   C. Magnetic deflection
   D. Electro magnetic relay.

73. Work is said to be done when:
   A. Force is applied on a body but body is not displaced.
   B. Force is applied on a body and body is displaced in the direction of the force.
   C. Force is applied on a body and body is displaced in the opposite direction of force
   D. None of the above.

74. The energy possessed by a body due to its state of strain:
   A. Kinetic energy
   B. Potential energy
   C. Electrical energy
   D. Chemical energy.

75. The relative density of water:
   A. Zero
   B. Less than one
   C. One
   D. Greater than one.
APPENDIX V B
DEPARTMENT OF EDUCATION
UNIVERSITY OF CALICUT

ACHIEVEMENT TEST IN PHYSICS

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APPENDIX V C
DEPARTMENT OF EDUCATION
UNIVERSITY OF CALICUT

ACHIEVEMENT TEST IN PHYSICS
RESPONSE SHEET

Time : 2 hours
Std. : IX
Max. Mark: 75

Name of the student : 
Name of the school : 
Male / Female : 

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DEPARTMENT OF EDUCATION

UNIVERSITY OF CALICUT

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APPENDIX V E
UNIVERSITY OF CALICUT
DEPARTMENT OF EDUCATION

ACHIEVEMENT TEST IN PHYSICS
(Standard IX)
(Final Version)

Dr. P. Usha
Reader
Department of Education
University of Calicut

Ampili Aravind
Research Scholar

Instructions:

This is a Physics test paper. Do not write anything on the question paper. You are given separate sheets to write answers. For each question four answers are given marked by A, B, C and D. Mark the correct answer by putting an 'X' mark on the letter denoting the correct answer. Each question carries one mark.

1. Which of the following is the product of mass and velocity of a body?
   A. Force
   B. Momentum
   C. Weight
   D. Energy

2. The property of a body by which it continues in its state of rest is:
   A. Momentum
   B. Inertia of rest
   C. Inertia of motion
   D. Weight

3. The ability to do work is known as:
   A. Force
   B. Inertia
   C. Energy
   D. Power

4. Which of the following statement is true about circular motion?
   A. Work done by centripetal force is always zero.
   B. Work done by centripetal force is sometimes zero.
C. Work done by centripetal force is never zero.
D. Work done by centripetal force is always one.

5. Which of the following colour deviates more when composite light is split up into its component colours
   A. Violet.
   B. Red
   C. Green
   D. Blue

6. Total effect produced by a force on a body is known as:
   A. Impulse
   B. Impulsive force
   C. Momentum
   D. Inertia

7. What happens to the force of attraction between two objects when the distance between them is increased?
   A. Increases
   B. Decreases
   C. Remains the same
   D. None of the above.

8. Which of the following colour has minimum deviation when composite light is split up into its component colours.
   A. Violet
   B. Red
   C. Green
   D. Blue

9. Statement 1. A stone is being dropped from a height.
   Statement 2. A stone is being released from a catapult.
   Which of the following is true regarding the above statements?
   A. In both cases work is done by Potential Energy.
   B. In both cases work is done by Kinetic Energy.
   C. Work is done by P.E. in the first case and K.E. in the second case.
   D. Work is done by K.E. in the first case and P.E. in the second case.

10. A man was firing a bullet from a rifle supporting it with his shoulder. When the bullet was fired from the rifle he felt pain on his shoulder. This is because:
    A. The rifle moved backwards due to the force of reaction exerted by the bullet.
    B. The rifle moved backwards due to the force of action exerted by the bullet.
C. The rifle moved forward due to the force of action it was exerting on the bullet.
D. The rifle moved forward due to the force of reaction it was exerting on the bullet.

11. What happens when break is applied to a fast moving bicycle?
A. It comes to rest immediately
B. It moves forward for some time and gradually comes to rest.
C. It goes on moving
D. It moves forward faster.

12. A parachute can slowly land on ground because of:
A. friction of atmospheric air.
B. density of atmospheric air.
C. pressure of atmospheric air
D. gravitational attraction of earth.

13. In an experiment a rope is inserted through a glass tube and a stone is tied on the top end of the rope. A weight hanger with a few weights on it is tied to the lower end of the rope. When the glass tube is rotated, the stone begins to rotate in a circular path.

If the radius of the circular path of the stone is directly proportional to the speed of rotation, which of the following would you expect to observe as the speed of rotation is increased.
A. The stone moves away from the tube and the weight hanger moves up.
B. The stone comes closer to the tube and the weight hanger moves down.
C. The stone remains rotating through the same circular path.
D. The stone breaks away from the thread and flies off.

14. Property of certain materials by virtue of which light of longer wavelength is emitted by absorbing light of shorter wavelength:
A. Fluorescence
B. Conductivity
D. Phosphorescence
C. Colour sensitivity

15. We know that sky is blue. But often the sky in the urban area is grey in colour. This may be because:
A. Red light is scattered ten times more intensely than blue light.
B. Blue light is scattered ten times more intensely than red.
C. Scattering is same for all colours.
D. Scattering is not happening in urban sky.

16. What happens to viscosity when temperature is increased?
A. Increases
B. Decreases  
C. Remains the same  
D. None of the above

17. A brush is being immersed in water. Then which of the following statements is correct?  
A. Its bristles will remain in the same position.  
B. Its bristles will come close together because of surface tension of water.  
C. Its bristles will come close together because of viscosity of water.  
D. Its bristles will spread out.

18. The sky appears blue because:  
A. Red light is scattered more  
B. Blue light is scattered more  
C. Scattering is same for all colours  
D. Scattering is not happening.

19. The rising and setting sun appears red because during sunrise and sunset:  
A. The sunlight is not scattered.  
B. All the colours are equally scattered.  
C. Sunlight has to traverse great distance through the earth's atmosphere so blue colour is lost due to scattering.  
D. Sunlight has to traverse great distance through the earth's atmosphere and red colour is lost due to scattering.

20. When a boy observed the sky in a rainy evening, he saw a rainbow in the sky. But when he did the same observation on a sunny evening he could not see the rainbow. Which of the following conclusions do you think, can be justified?  
A. During summer season sunlight is dispersed by water drops in the atmosphere.  
B. During rainy season sunlight is dispersed by water drops in the atmosphere.  
C. During summer season sunlight is not dispersed in the atmosphere.  
D. During rainy season sunlight is not dispersed in the atmosphere.

21. (i) a blotting paper absorbs ink.  
(ii) a burning lamp absorbs oil  
The above statements are daily life examples of:  
A. Capillarity  
B. Gravity  
C. Surface tension  
D. Viscosity

22. In an experiment, a boy pulled a table along a rough surface. He found it hard to pull it. He repeated the experiment by pulling it along a smooth surface. Less force
was necessary for this. He repeated the experiment pulling the table along surfaces having different smoothness and concluded that as the smoothness of the surface increases, less force is needed to pull the table.

Which of the following statements is true with respect to the above experiment?

A. Friction is caused by the smoothness of the surfaces in contact.
B. Friction is caused by the roughness of the surfaces in contact.
C. Friction is caused by the similarity of the surfaces in contact.
D. Friction is caused by the difference of the substances in contact.

23. Plants can absorb water from soil because:
A. Capillary force is doing work against gravity.
B. Surface tension is doing work against gravity.
C. Frictional force is doing work against gravity.
D. Viscosity is doing work against gravity.

24. The force of attraction between a proton and an electron is:
A. gravitational force.
B. nuclear force
C. electrostatic force
D. magnetic force

25. Consider an experiment where an object of mass 2 kg is hung from the hook of a spring balance. The reading of the spring balance is 2 kg. Now the balance is allowed to fall such that the object and balance falls simultaneously. The balance shows zero reading.

Which of the conclusions do you think, is justified?

A. The balance shows zero reading because the object is detached from it.
B. The balance shows zero reading because work is done against gravitational attraction.
C. The balance shows zero reading because the object and balance is falling towards the earth.
D. The balance shows zero reading because freely falling bodies experience weightlessness.

26. In an experiment a loop of wire is immersed in soap solution in a beaker. When it is taken out a layer of soap solution is formed on it. A piece of wet thread with both ends tied together is placed on it. The thread is shapeless. But when the soap layer inside the thread is pricked with a needle, the thread become circular in shape. This is because:

A. The thread exerts equal force on cell sides of the soap layer.
B. The thread exerts unequal force on all sides of the soap layer.
C. The soap layer exerts equal force on all sides of the thread.
D. The soap layer exerts unequal force on all sides of the thread.
27. A book is placed on a table. It was observed that the book rotates when the table is rotated. In this experiment centripetal force for rotation of the book is given by frictional force between the book and the table. The book was found to be thrown away when the speed of rotation of the table was increased.

Which of the conclusions can be justified based on the above experiment?
A. The book rotates slowly when the table is rotated faster.
B. The book rotates faster when the table is rotated slowly.
C. The book was thrown away because the centripetal force was balanced by friction.
D. The book was thrown away because beyond a speed limit centripetal force cannot be balanced by friction.

28. Consider the case of a ball rolling on an imaginary road. The road considered here is supposed to be frictionless. Which of the following statements is correct?
A. It comes to rest after sometime..
B. It goes on moving infinitely with the same speed..
C. It slows down but goes on moving.
D. It speeds up and goes on moving.

29. What happens to surface tension when temperature of a liquid increases?
A. Increases
B. Decreases
C. Remains the same
D. None of the above

30. Why does a person riding a bicycle tilt it while moving on a curved road?
A. to obtain speed
B. to obtain energy
C. to obtain centripetal force
D. to obtain centrifugal force

31. An electric bell is placed inside a bell jar. We can hear the sound of the bell when current is passed through the circuit. However, when air is gradually removed from the bell jar, sound decreases even though we can see the gong vibrating at the same speed.

A statement is given below concerning the above experiment.
'Air is required for the sound waves to travel'.

Which of the following should be done to verify this statement?
A. Place the jar at a distance and find out if sound can be heard.
B. Bring the jar closer and find out if sound can be heard more clearly.
C. Evacuate the jar completely and find out if sound can be heard.
D. Fill the jar again with air and find out if sound can be heard.
32. The lowest value of relative density is:
   A. Zero
   B. One
   C. Less than one
   D. Greater than one.

33. You are to conduct an experiment to determine whether an iron nail kept in contact with any pole of a magnet will acquire magnetism. If the iron nail gets magnetised when touched by a bar magnet, you would expect to observe that:
   A. The iron nail attracts iron filings if touched.
   B. The iron nail repels iron filings if touched.
   C. The iron nail attracts iron filings kept at a distance.
   D. The iron nail repels iron filings kept at a distance.

34. When a man is riding a bicycle, the back wheel of the bicycle is rotated and the bicycle moves forward. But if the back wheel is rotated with the bicycle placed on its stand, it will not move forward. Again, the moment the wheel touches the ground, the bicycle moves forward.
   This is because:
   A. When the wheel rotates in contact with the ground, gravitational force acts in the opposite direction of motion.
   B. When the wheel rotates in contact with the ground the gravitational force acts in the same direction of motion.
   C. When the wheel rotates in contact with the ground the frictional force of the ground acts in the opposite direction of motion.
   D. When the wheel rotates in contact with the ground the frictional force acts in the same direction of motion.

35. Capillary fall occurs when:
   A. Cohesion is greater than adhesion.
   B. Adhesion is greater than cohesion.
   C. Both cohesion and adhesion are the same.
   D. Cohesion is different from adhesion.

36. A liquid drop is always spherical because:
   A. A spherical drop will have more freedom of movement.
   B. A spherical drop will have minimum surface area.
   C. A spherical drop will have maximum surface area.
   D. A spherical drop will have less freedom of movement.

37. In an experiment, a scientist placed an object at the equator and found its weight. Then he placed it at the poles and found its weight. From the data be found the
weight of the object when it is placed at the centre of the earth. He concluded that the object had different weights in the three instances.

Which of the following assumptions is implicit in this experiment?

A. The weight of the object is negligible at the centre of the earth.
B. Acceleration due to gravity is the same at all places on the earth's surface.
C. Acceleration due to gravity is different at different places.
D. Weight is not determined by acceleration due to gravity.

38. Which of the following is the phenomenon occurring when the natural frequency of the body undergoing forced vibration is equal to the natural frequency of the forcing body.

A. Natural vibration
B. Forced vibration
C. Resonance
D. Echo

39. In a wave motion (i) crest and trough are produced (ii) the particles of the medium move perpendicular to the direction of wave motion (iii) there is no pressure difference in the medium. Then the wave is a:

A. Transverse wave
B. Longitudinal wave
C. Electro magnetic wave
D. Radio wave

40. While travelling on top of a bus, a man accidentally touched a live electric wire passing over him and got severe shock. Another man purposefully touched a live electric cable from his television but got no shock at all. This may be because:

A. The current through household appliances are at very low voltage.
B. The household cable had a plastic covering over it.
C. The second man was resistant to electric shock.
D. A man will not get electric shock inside his house.

41. You are to conduct an experiment to determine whether the rate of evaporation of a liquid is affected by an increase in the amount of heat given. You have the relevant apparatus to conduct the experiment.

If the increase in the amount of heat has an observable effect on the rate of evaporation in liquids, almost immediately after increasing the amount of heat you would expect to observe a notable change in the:

A. Temperature of liquid molecules.
B. Motion of liquid molecules
C. Amount of liquid vapour over the liquid surface.
D. Pressure of the liquid.
The force of action applied by the boat
D. The force of action applied by the person.

58. The phenomenon of magnetization of a magnetic substance under the influence of a magnet is called:
A. Magnetic flux
B. Magnetic Induction
C. Magnetic deflection
D. Electro magnetic relay.

59. Work is said to be done when:
A. Force is applied on a body but body is not displaced.
B. Force is applied on a body and body is displaced in the direction of the force.
C. Force is applied on a body and body is displaced in the opposite direction of force
D. None of the above.

60. The relative density of water:
A. Zero
B. Less than one
C. One
D. Greater than one.
C. Force of a moving body depends on mass and velocity
D. All the above assumptions are implicit in the experiment.

47. When a person get electric shock, his heart tends to stop. This is because:
A. He is having tension
B. Viscosity of blood decreases
C. Viscosity of blood increases
D. Pressure of blood decreases.

48. Water is taken in a glass tumbler and level of water is observed. It is seen that water level is slightly high where water touches glass. If the water is placed in a flat vessel the rise of water is less than if it is placed in a narrow vessel. If water is taken in a thin capillary tube the rise will be maximum.

Which of the following inference can be considered true with respect to the above experiment.
A. The rise of water depends on 'g'.
B. The rise of water depends on the surface area of water.
C. The rise of water depends on the viscosity of water.
D. The rise of water depends on the density of water.

49. Three statements regarding the properties of liquid molecules are given below:
   (i) Liquid molecules have freedom of movement.
   (ii) Liquid molecules cannot escape the liquid surface due to force of cohesion.
   (iii) When heated, they get kinetic energy to overcome the force of cohesion.

Consider the above statements and find out which of the following are correct:
A. All the above statements are true.
B. All the above statements are false.
C. Statements (i) and (ii) are true.
D. Statements (ii) and (iii) are true.

50. "Soldiers do not march over hanging bridges"

Consider the above statement and find out which of the following is correct?
A. The statement is true because the bridge will collapse due to forced vibrations.
B. The statement is false because the bridge will not collapse due to forced vibrations.
C. The statement is true because the bridge may collapse due to resonance.
D. The statement is false because nothing will happen to the bridge.

51. Violin is called a source of sound because:
A. It is a musical instrument.
B. It produces sound due to mechanical vibrations.
C. It produces melodious sound than a drum.
52. A bat can travel safely at night without striking obstacles because:
   A. bat can see in darkness.
   B. bat can produce sound waves which pass through obstacles.
   C. bat's skin is sensitive to obstacles.
   D. bat can produce sound waves which reflect from the obstacles and reach back to the bat.

53. To clean a carpet we beat it with a stick. The principle involved here is:
   A. Principle of inertia of rest.
   B. Principle of momentum.
   C. Principle of inertia of motion.
   D. Principle of friction.

54. When we strike a steel tumbler half filled with water with a rod, sound is produced. Here sound is produced due to:
   A. The vibration of steel tumbler
   B. The vibration of water
   C. The vibration of both steel tumbler and water.
   D. The vibration of the rod.

55. 'Action and reaction are equal and opposite'.
   Considering the above statement which of the following are correct?
   A. They cancel each other because they are equal and opposite.
   B. They do not cancel each other because they are equal and opposite.
   C. They cancel each other because they are acting on the same object.
   D. They do not cancel each other because they are acting on different objects.

56. In a wave motion,
   (i) Compressions and rare fractions are produced.
   (ii) The particles of the medium travel in the same direction of wave motion.
   (iii) The pressure and density of the medium is different at different points.
   That wave is a:
   A. Transverse wave
   B. Longitudinal wave
   C. Electro magnetic wave
   D. Radio wave.

57. When a person is jumping ashore from a boat, the boat moves backward. This is because of:
   A. The force of reaction applied by the boat
   B. The force of reaction applied by the person