Appendix 1

Summary of the topics dealt with during the session:

1. Measurements
   - Units and Dimensions
   - Newton’s Laws of Motion
   - Forces of Friction
   - Conservation of Mechanical Energy
   - Linear Momentum
   - Simple Harmonic Motion
   - The Pendulum

2. Fluids
   - Pressure of Liquids
   - Pascal’s Law
   - Pressure Measurement
   - Equation of Continuity
   - Archimedes Principle
   - Bernoulli’s Equation

3. Heat
   - Temperature and Thermometers
   - Absolute Temperature
• Thermal Expansion
• Specific Heat
• Phase Transitions
• Thermal Conduction
• Thermal Convection
• Thermal Radiation

4. Waves and radiation
• Transverse and Longitudinal Waves
• Standing Waves
• Interference
• Intensity of Sound Waves
• Doppler Effect

5. Images
• Flat Mirror
• Spherical Mirror
• Thin Lenses
• Images formed by Flat Mirrors
• Images formed by Spherical Mirrors
## Appendix 2

### LIST OF PROJECTS

#### 2 Matter Properties

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Unit and Type</th>
<th>Suggested Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inventions</td>
<td>Simple Anemometer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Simple rockets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stability toys</td>
</tr>
<tr>
<td>2</td>
<td>Environment</td>
<td>Recycling Paper</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plastics</td>
</tr>
<tr>
<td>3</td>
<td>Electronic learning</td>
<td>Calculation of ‘g’</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy used in climbing a flight of stairs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>density of irregular solid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C.G. of irregular solid</td>
</tr>
<tr>
<td>4</td>
<td>Society</td>
<td>Drag- car shape vs speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Study of Parachutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Collision Study</td>
</tr>
<tr>
<td>5</td>
<td>Making educational films</td>
<td>Newton’s Laws</td>
</tr>
<tr>
<td>6</td>
<td>Preparing booklets and reports</td>
<td>Air resistance Investigation</td>
</tr>
<tr>
<td>7</td>
<td>Distance learning</td>
<td>Instrumentation-NPL</td>
</tr>
<tr>
<td>8</td>
<td>Student Seminar /workshops</td>
<td>measurements and units</td>
</tr>
</tbody>
</table>
### LIST OF PROJECTS

#### 1 Mechanics

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Unit and Type</th>
<th>Suggested Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inventions</td>
<td>Musical Glasses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green house</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sound proofing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Swinging Pendulums</td>
</tr>
<tr>
<td>2</td>
<td>Environment</td>
<td>Ozone depletion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Global warming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harmful effects of communication devices</td>
</tr>
<tr>
<td>3</td>
<td>Electronic learning</td>
<td>Touch the scientists</td>
</tr>
<tr>
<td>4</td>
<td>Society</td>
<td>Non-Smokers smoking.</td>
</tr>
<tr>
<td>5</td>
<td>Making educational films</td>
<td>Transverse and Longitudinal Waves</td>
</tr>
<tr>
<td>6</td>
<td>Preparing booklets and reports</td>
<td>Interference</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standing Waves</td>
</tr>
<tr>
<td>7</td>
<td>Distance learning</td>
<td>knowledge transfer between universities on uses of Doppler Effect</td>
</tr>
<tr>
<td>8</td>
<td>Student Seminar /workshops</td>
<td>radar</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sonar</td>
</tr>
<tr>
<td></td>
<td></td>
<td>infra-red imaging</td>
</tr>
</tbody>
</table>
### LIST OF PROJECTS
#### 3 HEAT

<table>
<thead>
<tr>
<th>S. No</th>
<th>Unit and Type</th>
<th>Suggested Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inventions</td>
<td>Solar cooker</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Solar bathtub</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conversion of furnace heat to voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bimetallic fire alarm</td>
</tr>
<tr>
<td>2</td>
<td>Environment</td>
<td>Solar cells</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green buildings</td>
</tr>
<tr>
<td>3</td>
<td>Electronic learning</td>
<td>Touch the scientists</td>
</tr>
<tr>
<td>4</td>
<td>Society</td>
<td>Investigation: Are more expensive batteries better?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Importance of specific heat of water</td>
</tr>
<tr>
<td>5</td>
<td>Making educational films</td>
<td>Heat Engines</td>
</tr>
<tr>
<td>6</td>
<td>Preparing booklets and reports</td>
<td>Specific heat investigations</td>
</tr>
<tr>
<td>7</td>
<td>Distance learning</td>
<td>knowledge transfer between universities on Green Buildings</td>
</tr>
<tr>
<td>8</td>
<td>Student Seminar /workshops</td>
<td>Change of states</td>
</tr>
</tbody>
</table>
## LIST OF PROJECTS - Unit 4 Waves

### 5 Images

<table>
<thead>
<tr>
<th>S. No</th>
<th>Unit and Type</th>
<th>Suggested Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inventions</td>
<td>Telescope</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kaleidoscope</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Periscope</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mirror Playroom</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual and vibrating fire alarm</td>
</tr>
<tr>
<td>2</td>
<td>Environment</td>
<td>Neon vs ordinary light bulb.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automatic night lamp.</td>
</tr>
<tr>
<td>3</td>
<td>Electronic learning</td>
<td>Touch the scientists</td>
</tr>
</tbody>
</table>

## LIST OF PROJECTS

<table>
<thead>
<tr>
<th>S. No</th>
<th>Unit and Type</th>
<th>Suggested Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Society</td>
<td>Design and make a lie detector</td>
</tr>
<tr>
<td>2</td>
<td>Making educational films</td>
<td>Lenses and Images</td>
</tr>
<tr>
<td>3</td>
<td>Preparing booklets and reports</td>
<td>Infra red photography</td>
</tr>
<tr>
<td>4</td>
<td>Distance learning</td>
<td>knowledge transfer between universities on uses of Astronomical telescope</td>
</tr>
<tr>
<td>5</td>
<td>Student Seminar/workshops</td>
<td>Multiple images</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digital imaging – infrared imaging</td>
</tr>
</tbody>
</table>
Appendix 3

DRAFT QUESTIONS FOR ITEM ANALYSIS – FINAL EXAM

1. As temperature increases, volume ____________________
   a) Increases   b) Decreases   c) No Change   d) Neutral

2. The temperature in a certain town is \(25^\circ\)C. Its equivalent in Kelvin scale would be ___________.
   a) 300 K   b) 298 K
   c) 273 K   d) 332 K

3. Scientific notation of 0.001834 is _____________
   a) \(1.84 \times 10^{-8}\)   b) \(1.834 \times 10^{-3}\)   c) \(1.834 \times 10^{3}\)   d) \(1.834 \times 10^{-4}\)

4. The unit of work is _____________
   a) Newton   b) Kilogram   c) Joule   d) Kelvin

5. \(1 \text{N/m}^2 = \) ____________
   a) 1 Joule   b) 1 Watt
   c) 1 Pascal   d) 1 Ampere

6. The time period of a wave moving with a frequency of 20 Hz is ____________
   a) 0.005 s   b) 0.0005 s
   c) 0.5 s   d) 0.05 s
7. The total amplitude of the resultant wave will be __________

\[ Y_1 \pm Y_2 \]

8. The transfer of energy that needs a direct contact between objects is known as __________

a) Radiation  
   b) Conduction  
   c) Convection  
   d) Rarefaction

9. A wave with a power of 8 W and an intensity of 2 W/m\(^2\) would be in an area of __________

a) 4 m\(^2\)  
   b) 16 m\(^2\)  
   c) 10 m\(^2\)  
   d) 6 m\(^2\)

10. The length of a table can be found using __________

a) Weighing scale  
   b) Ruler  
   c) Thermometer  
   d) Spring Balance

11. The amount of heat required to raise the temperature of 1 Kg of a material by 1\(^\circ\)C is called __________
a) Conduction  b) Lateral Inversion  
c) Specific Heat  d) Radiation

12. Maximum displacement in the wave is called _____________
   
   a) Frequency  b) Amplitude  
c) Wavelength  d) Height

13. If the wave number of a wave is $200m^{-1}$, then the wavelength is _____________
   
   a) 0.00314 m  b) 3.14 m  
c) 31.4 m  d) 0.0314 m

14. Friction in _____________ is called drag force
   
   a) Solids  b) Liquids  c) Gases  d) Both (b) & (c)

15. If a ray of light is incident at an angle of $60^0$, then the angle of reflection would be _____________
   
   a) $90^0$  b) $120^0$  
c) $30^0$  d) $60^0$

16. When an object is moving $f_k$ is ________________than $f_s$
   
   a) Less  b) More  c) No change  d) Both a & b

17. Law of Inertia is the _________________
   
   a) Newton’s First Law of Motion  b) Newton’s Second Law of Motion
c) Newton’s Third Law of Motion d) Law of Gravity

18. The mass of an object can be found using ______________
   a) Weighing scale b) Ruler c) Thermometer d) calculator

19. Volume of a body ____________ as the temperature increases
   a) Decreases b) Increases
c) No change d) Both a & b

20. Displacement is a ____________ quantity
   a) Scalar b) Vector c) Magnitude
d) Both a & b

21. A body floats in a fluid when:
   a) \( F_b = F_g \) b) \( F_b \neq F_g \)
c) \( F_b < F_g \) d) \( F_b > F_g \)

22. If the temperature of an Aluminum rod is \((\alpha = 2.34 \times 10^{-5} \text{ C}^{-1})\) of length 3m is raised by an amount of \(10 \text{ } ^{0}\text{C}\), its length will increase by an amount of __________
   a) \(7.02 \times 10^{-4} \text{ m}\) b) \(20 \times 10^{-5} \text{ m}\)
c) \(10 \times 10^{-5} \text{ m}\) d) \(77 \times 10^{-4} \text{ m}\)

23. Points along the string vibrating with maximum amplitude is called __________
   a) Nodes b) Anti nodes
c) Crests d) Trough

24. The unit of Sound is ______________
   a) dB b) GB
25. Convex lens is also called ___________________________ lens
   a) Diverging  b) Bifocal  c) Converging  d) Mirror

26. The amount of heat (Q) required to change the temperature of a bucket of water of mass 50kg from 60 degree Celsius to 100 degree Celsius (C_water = 4184 J / kg °C) is ___________________________
   a) 4184 KJ  b) 8368 KJ  c) 2092J  d) 8368 J

27. The amplitude (A) of the wave in the diagram below equals to:
   ![Wave Diagram]
   a) 0.06 m  b) 0.04m  c) 0.08m  d) 0.02m

28. The time period of a simple pendulum of length 40 cm, given that g= 10 m/s² equals to:
   a) 5 s  b) 2 s  c) 1.25 s  d) 0.5 s
29. Friction in _____________ is called contact force
   a) Solids       b) Liquids       c) Plasma       d) None

30. Magnification produced by a plane mirror is ________________
   a) 2           b) 1
   c) 5           d) 10

31. According to the equation of continuity in an ideal fluid, if the cross-sectional area increases, the speed of flow increases. (    ).

32. Bouncing back of the light from the surface is called reflection. (    ).

33. The ability to do work is called energy. (    ).

34. The unit of force is grams. (    ).

35. In a Transverse wave, the waves travel parallel to the disturbance. (    ).

36. Focal length of a lens is +20 cm. The lens is a convex lens. (    ).

37. Heat always flows from a body at lower temperature to a body at higher temperature. (    ).

38. The to and fro motion of a pendulum is called Amplitude. (    ).
   I. Sketch and list the characteristics of image formed by an object kept between the focus (f) and the centre of curvature (C) of a Concave Mirror.

39. The image formed is ________________.
   a) Real and Inverted       b) Virtual and Erect

40. Describe the steps of drawing the diagram.

41. The size of the image is ________________.
   a) Larger than the object       b) Same size as that of the object
42. Determine the image distance \( i \) when the object \( p \) is kept at a distance of 0.4 m. Focal length \( f \) of lens is equal to 0.2m.

43. A cumin canister of mass \( m=0.40 \text{kg} \) slides across a horizontal frictionless counter with a speed \( v=0.50 \text{ m/s} \). It then runs into a compress a spring of spring constant \( k=750 \text{ N/m} \). When the canister is momentarily stopped by the spring, by what distance \( d \) is the spring compressed?

44. An elevator cab of mass \( m=500 \text{kg} \) is descending with speed \( v_i=4.0 \text{m/s} \) when its supporting cable begins to slip, allowing it to fall with constant acceleration \( a=g/5 \).

   b. During the fall through a distance \( d=12 \text{m} \), what is the work done on the cab by the gravitational force?

45. The frequency of a wave is 20 Hz and its speed is 80m/s. Find its wavelength in meters.
### Appendix 4

**ITEM ANALYSIS – FINAL EXAMINATION**

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>DP</th>
<th>DI</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0.13</td>
<td>0.92</td>
<td>Rejected</td>
</tr>
<tr>
<td>2.</td>
<td>0.25</td>
<td>0.321</td>
<td>Selected</td>
</tr>
<tr>
<td>3.</td>
<td>0.09</td>
<td>0.901</td>
<td>Rejected</td>
</tr>
<tr>
<td>4.</td>
<td>0.054</td>
<td>0.741</td>
<td>Rejected</td>
</tr>
<tr>
<td>5.</td>
<td>0.464</td>
<td>0.321</td>
<td>Selected</td>
</tr>
<tr>
<td>6.</td>
<td>0.25</td>
<td>0.321</td>
<td>Selected</td>
</tr>
<tr>
<td>7.</td>
<td>0.285</td>
<td>0.286</td>
<td>Selected</td>
</tr>
<tr>
<td>8.</td>
<td>0.267</td>
<td>0.437</td>
<td>Selected</td>
</tr>
<tr>
<td>9.</td>
<td>0.232</td>
<td>0.508</td>
<td>Selected</td>
</tr>
<tr>
<td>10.</td>
<td>0.017</td>
<td>0.098</td>
<td>Rejected</td>
</tr>
<tr>
<td>11.</td>
<td>0.392</td>
<td>0.732</td>
<td>Selected</td>
</tr>
<tr>
<td>12.</td>
<td>0.267</td>
<td>0.3666</td>
<td>Selected</td>
</tr>
<tr>
<td>13.</td>
<td>0.553</td>
<td>0.66</td>
<td>Selected</td>
</tr>
<tr>
<td>14.</td>
<td>0.196</td>
<td>0.223</td>
<td>Rejected</td>
</tr>
<tr>
<td>SL. No.</td>
<td>DP</td>
<td>DI</td>
<td>Remarks</td>
</tr>
<tr>
<td>--------</td>
<td>-----</td>
<td>------</td>
<td>---------</td>
</tr>
<tr>
<td>15.</td>
<td>0.517</td>
<td>0.389</td>
<td>Selected</td>
</tr>
<tr>
<td>16.</td>
<td>0.017</td>
<td>0.080</td>
<td>Rejected</td>
</tr>
<tr>
<td>17.</td>
<td>0.089</td>
<td>0.125</td>
<td>Rejected</td>
</tr>
<tr>
<td>18.</td>
<td>0</td>
<td>0.107</td>
<td>Rejected</td>
</tr>
<tr>
<td>19.</td>
<td>0.321</td>
<td>0.4</td>
<td>Selected</td>
</tr>
<tr>
<td>20.</td>
<td>0.089</td>
<td>0.116</td>
<td>Rejected</td>
</tr>
<tr>
<td>21.</td>
<td>0.303</td>
<td>0.313</td>
<td>Selected</td>
</tr>
<tr>
<td>22.</td>
<td>0.303</td>
<td>0.47</td>
<td>Selected</td>
</tr>
<tr>
<td>23.</td>
<td>0.59</td>
<td>0.491</td>
<td>Selected</td>
</tr>
<tr>
<td>24.</td>
<td>0.446</td>
<td>0.491</td>
<td>Selected</td>
</tr>
<tr>
<td>25.</td>
<td>0.196</td>
<td>0.29</td>
<td>Selected</td>
</tr>
<tr>
<td>26.</td>
<td>0.375</td>
<td>0.526</td>
<td>Selected</td>
</tr>
<tr>
<td>27.</td>
<td>0.34</td>
<td>0.455</td>
<td>Selected</td>
</tr>
<tr>
<td>28.</td>
<td>0.5</td>
<td>0.446</td>
<td>Selected</td>
</tr>
<tr>
<td>29.</td>
<td>0.126</td>
<td>0.384</td>
<td>Rejected</td>
</tr>
<tr>
<td>30.</td>
<td>0.54</td>
<td>0.313</td>
<td>Selected</td>
</tr>
<tr>
<td>31.</td>
<td>0.410</td>
<td>0.699</td>
<td>Selected</td>
</tr>
<tr>
<td>SL. No.</td>
<td>DP</td>
<td>DI</td>
<td>Remarks</td>
</tr>
<tr>
<td>--------</td>
<td>-------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>32.</td>
<td>0.535</td>
<td>0.437</td>
<td>Selected</td>
</tr>
<tr>
<td>33.</td>
<td>0.303</td>
<td>0.669</td>
<td>Selected</td>
</tr>
<tr>
<td>34.</td>
<td>0.142</td>
<td>0.304</td>
<td>Rejected</td>
</tr>
<tr>
<td>35.</td>
<td>0.267</td>
<td>0.544</td>
<td>Selected</td>
</tr>
<tr>
<td>36.</td>
<td>0.660</td>
<td>0.562</td>
<td>Selected</td>
</tr>
<tr>
<td>37.</td>
<td>0.534</td>
<td>0.34</td>
<td>Selected</td>
</tr>
<tr>
<td>38.</td>
<td>0.607</td>
<td>0.464</td>
<td>Selected</td>
</tr>
<tr>
<td>39.</td>
<td>0.535</td>
<td>0.428</td>
<td>Selected</td>
</tr>
<tr>
<td>40.</td>
<td>0.017</td>
<td>0.008</td>
<td>Rejected</td>
</tr>
<tr>
<td>41.</td>
<td>0.410</td>
<td>0.544</td>
<td>Selected</td>
</tr>
<tr>
<td>42.</td>
<td>0.464</td>
<td>0.285</td>
<td>Selected</td>
</tr>
<tr>
<td>43.</td>
<td>0.533</td>
<td>0.62</td>
<td>Selected</td>
</tr>
<tr>
<td>44.</td>
<td>0.035</td>
<td>0.035</td>
<td>Rejected</td>
</tr>
<tr>
<td>45.</td>
<td>0.019</td>
<td>0.007</td>
<td>Rejected</td>
</tr>
</tbody>
</table>
## Appendix 5

### BLUE PRINT - FINAL EXAMINATION

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Unit</th>
<th>Multiple Choice Questions (MCQ)</th>
<th>True/False</th>
<th>Short Answer (SA)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Measurements &amp; Newton’s Laws of Motion</td>
<td>1(1)</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Momentum &amp; Oscillation</td>
<td>1(1)</td>
<td>1(1)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Energy</td>
<td></td>
<td>1(1)</td>
<td>1 (2.5)</td>
<td>2.5</td>
</tr>
<tr>
<td>4</td>
<td>Fluids I&amp;II</td>
<td>3 (1)</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Heat</td>
<td>5 (1)</td>
<td>1(1)</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Waves</td>
<td>7 (1)</td>
<td>1(1)</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>Images I &amp;II</td>
<td>4 (1)</td>
<td>3(1)</td>
<td>1(5.5)</td>
<td>12.5</td>
</tr>
</tbody>
</table>

**BLUE PRINT** | **TOTAL** | **35**
Appendix 6

QUESTION PAPER - FINAL EXAMINATION

Question One: Choose the Correct Answer (1 Mark each):

1. The temperature in a certain town is 25°C. Its equivalent in Kelvin scale would be ______________________.
   a) 300 K  
   b) 298 K  
   c) 273 K  
   d) 332 K

2. $1 \text{N/m}^2 = $ ____________________.
   a) 1 Joule  
   b) 1 Watt  
   c) 1 Pascal  
   d) 1 Ampere

3. The time period of a wave moving with a frequency of 20 Hz is ____________.
   a) 0.005 s  
   b) 0.0005 s  
   c) 0.5 s  
   d) 0.05 s

4. The total amplitude of the resultant wave will be ____________________.
   a) $Y_1 \times Y_2$  
   b) $Y_1/Y_2$  
   c) $Y_1 + Y_2$  
   d) $Y_1 - Y_2$
5. The transfer of energy that needs a direct contact between objects is known as ______________.
   a) Radiation       b) Conduction
   c) Convection      d) Rarefaction

6. A wave with a power of 8 W and an intensity of 2 W/m^2 would be in an area of ______________.
   a) 4 m^2      b) 16 m^2
   c) 10 m^2     d) 6 m^2

7. The amount of heat required to raise the temperature of 1 Kg of a material by 1^0C is called ______________.
   a) Conduction      b) Lateral Inversion
   c) Specific Heat   d) Radiation

8. Maximum displacement in the wave is called ______________.
   a) Frequency      b) Amplitude
   c) Wavelength     d) Height

9. If the wave number of a wave is 200m^{-1}, then the wavelength is ____________.
   a) 0.00314 m      b) 3.14 m
   c) 31.4 m        d) 0.0314 m
10. If a ray of light is incident at an angle of $60^0$, then the angle of reflection would be ______________.
   a) $90^0$  
   b) $120^0$  
   c) $30^0$  
   d) $60^0$

11. Volume of a body _____________ as the temperature increases
   a) Decreases  
   b) Increases  
   c) No change  
   d) Both a & b

12. A body floats in a fluid when ________________.
   a) $F_b=F_g$  
   b) $F_b\neq F_g$  
   c) $F_b<F_g$  
   d) $F_b>F_g$

13. If the temperature of an Aluminum rod is $(\alpha=2.34 \times 10^{-5} \text{ C}^{-1})$ of length 3m is raised by an amount of $10^0 \text{ C}$, its length will increase by an amount of ____________.
   a) $7.02 \times 10^{-4} \text{ m}$  
   b) $20 \times 10^{-5} \text{ m}$  
   c) $10 \times 10^{-5} \text{ m}$  
   d) $77 \times 10^{-4} \text{ m}$

14. Points along the string vibrating with maximum amplitude is called ____________.
   a) Nodes  
   b) Anti nodes  
   c) Crests  
   d) Trough

15. The unit of Sound is ________________.
   a) dB  
   b) GB  
   c) KB  
   d) MB
16. Convex lens is also called ________________ lens.

a) Diverging  b) Bifocal  
c) Converging  d) Mirror

17. The amount of heat (Q) required to change the temperature of a bucket of water of mass 50kg from 60 degree Celsius to 100 degree Celsius \( (C_{water} = 4184 \text{ J/kg } ^\circ \text{C}) \) is:

a) 4184 KJ  b) 8368 KJ  
c) 2092J  d) 8368 J

18. The amplitude (A) of the wave in the diagram below equals to:

\[ \text{Amplitude} = 0.08 \text{ m} \]

a) 0.06 m  b) 0.04m  
c) 0.08m  d) 0.02m

19. The time period of a simple pendulum of length 40 cm, given that \( g = 10 \text{ m/s}^2 \) equals to:

a) 5 s  b) 2 s  
c) 1.25 s  d) 0.5 s

20. Magnification produced by a plane mirror is ________________

a) 2  b) 1  c) 5  d) 10
Question Two: State TRUE (A) or FALSE (B) : (1 Mark Each)

21. According to the equation of continuity in an ideal fluid, if the cross-sectional area increases, the speed of flow increases. ( ).

22. Bouncing back of the light from the surface is called reflection. ( ).

23. The ability to do work is called energy. ( ).

24. In a Transverse wave, the waves travel parallel to the disturbance. ( ).

25. Focal length of a lens is +20 cm. The lens is a convex lens. ( ).

26. Heat always flows from a body at lower temperature to a body at higher temperature. ()

27. The to and fro motion of a pendulum is called Amplitude. ( ).

Question Three:

Sketch and list the characteristics of image formed by an object kept between the focus (f) and the centre of curvature (C) of a Concave Mirror.

28. The image formed is __________________
   a) Real and Inverted   b) Virtual and Erect

29. The size of the image is __________________
   a) Larger than the object   b) Same size as that of the object

Question Four: Solve the following Problems (2.5 Marks Each)

30. Determine the image distance (i) when the object (p) is kept at a distance of 0.4 m. Focal length (f) of lens is equal to 0.2m.
31. A cumin canister of mass $m = 0.40 \text{kg}$ slides across a horizontal frictionless counter with a speed $v = 0.50 \text{ m/s}$. It then runs into a compress a spring of spring constant $k = 750 \text{ N/m}$. When the canister is momentarily stopped by the spring, by what distance $d$ is the spring compressed?
Appendix 7

DRAFT QUESTIONS FOR MID TERM EXAM

1. The force that causes the moon to orbit the earth is _________________.
   a) Frictional force b) Nuclear Force c) Gravitational force d) Normal force

2. Scientific notation of 0.001834 is _____________.
   a) $1.84 \times 10^{-8}$ b) $1.834 \times 10^{-3}$ c) $1.834 \times 10^{-3}$ d) $1.834 \times 10^{-4}$

3. Friction in ______________ is called drag force.
   a) Solids b) Liquids c) Gases d) Both (b) & (c)

4. Which of the following is NOT a derived unit?
   a) m b) m/s$^2$ c) m/s d) m$^2$

5. A net force of 50 N is applied on a cart to make it accelerate at a rate of 2 m/s$^2$.
   The mass of the cart is _________________.
   a) 600g b) 25kg c) 150Kg d) 10Kg

6. The force required to move a body of 5 Kg accelerating at the rate of 5 m/s$^2$ is ________
   a) 10 N b) 25 N c) 15 N d) 20 N
7. In scientific notations 560.423 is ________________.
   a) 5.60423 x 10^5    b) 5.60423 x 10^{-4}
   c) 5.60423 x 10^{-2}  d) 5.60423 x 10^2

8. The weight of an object immersed in water is 0.9 N. When taken out in air, its weight ________________.
   a) Increases  b) Decreases
   c) No change  d) First decrease, then increase.

9. Scalar quantities have ________________.
   a) Magnitude and direction.  b) Magnitude only.
   c) Direction only.  d) None.

10. The unit of work is ________________.
   a) Newton  b) Kilogram  c) Joule
   d) Kelvin

11. Work done by a man carrying a mass of 25 kg standing on the top of a building is ________________.
    a) 10 J  b) 0 J
    c) 20 J  d) 5 J

12. ________________ is the unit of temperature.
    a) Cm  b) Kelvin  c) Joule  d) Kilogram

13. If the distance between two objects decreases, then, the force of gravity ________________.
14. When an object is moving $f_k$ is ________________ than $f_s$
   a) Less   b) More   c) No change   d) Both (a) & (b)

15. The weight of a 2 kg mass on the surface of moon would be ___________.
   (g= 1.6 m/s$^2$)
   a) 23N   b) 3.2 N   c) 0.32N   d) 2.3 N

16. Newton’s first law of motion is also called law of ________________.
   a) Momentum   b) Reaction
   c) Inertia   d) Action

17. Airplanes get a part of their lift by taking advantage of ________________.
   a) Archimedes's Principle   b) Pascal’s Law
   c) Bernoulli’s Principle   d) Law of Conservation of Energy

18. 30 m = _______ km
   a) 3   b) 0.0003   c) 0.03   d) 0.000003

19. The to and fro motion of a pendulum is called ____________.
   a) Amplitude   b) Oscillation   c) Animation   d) Expulsion

20. Hertz is the unit of ________________.
   a) Frequency   b) Force
   c) Distance   d) Velocity

21. Mass per unit volume is called ________________.
   a) Pressure   b) Force
   c) Density   d) Work

22. If the length of a simple pendulum is increased, the time period Decreases. (  ).
23. The magnitude of the buoyant force always equals the weight of the fluid displaced by the object. ( ).

24. Energy possessed by body due to its motion is potential energy. ( ).

25. Newton’s third law states that: For every action, there is an equal reaction. ( ).

26. If distance between bodies increases, the force of gravity decreases. ( ).

27. Pressure is the force per unit area. ( ).

28. Viscosity is not the resistance of fluids to flow. ( ).

29. If a car’s wheels are locked during emergency breaking, the car slides along the road. Ripped off bits of tire and small melted sections of road form the skid marks. The longest skid marks on a public road was 290m long, reportedly set in 1960 by a Jaguar on M1 highway in England. Assuming that \( \mu_k = 0.60 \) and car’s acceleration was constant during the breaking, how fast was the car going when wheels became locked?

30. Find the time period of a pendulum of length 1m. (g=10m/s\(^2\)).

31. Find the Kinetic Energy possessed by a body of mass 4 Kg, moving with a velocity of 5m/s.

32. A force of 10 N acts on a body and moves it 30m in the direction of force. Calculate the work done.

33. Calculate the potential energy of a body of mass 50 kg at a height of 12m from the ground. (g=9.8m/s\(^2\)).
34. Calculate the mass of an object with a volume of $9 \text{ m}^3$ and a density of $2 \text{ kg/m}^3$.

35. One of the lifts of Paul Anderson in the 1950’s remains a record. Anderson stooped beneath a reinforced wood platform, placed his hands on a short stool to brace himself, and then pushed upwards on a platform with his back, lifting the platform straight up by 1.0cm. The platform held automobile parts and a safe filled with lead, with a total weight of 27900N.

a) As Anderson lifted the load, how much work was done on it by the gravitational force $F_g$?

b) How much work was done by the force Anderson applied to make the lift?
## Appendix 8

### ITEM ANALYSIS – MID TERM EXAMINATION

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>DP</th>
<th>DI</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0.25</td>
<td>0.321</td>
<td>Selected</td>
</tr>
<tr>
<td>2.</td>
<td>0.054</td>
<td>0.741</td>
<td>Rejected</td>
</tr>
<tr>
<td>3.</td>
<td>0.34</td>
<td>0.634</td>
<td>Selected</td>
</tr>
<tr>
<td>4.</td>
<td>0.464</td>
<td>0.321</td>
<td>Selected</td>
</tr>
<tr>
<td>5.</td>
<td>0.232</td>
<td>0.508</td>
<td>Selected</td>
</tr>
<tr>
<td>6.</td>
<td>0.017</td>
<td>0.098</td>
<td>Rejected</td>
</tr>
<tr>
<td>7.</td>
<td>0.392</td>
<td>0.732</td>
<td>Selected</td>
</tr>
<tr>
<td>8.</td>
<td>0.267</td>
<td>0.3666</td>
<td>Selected</td>
</tr>
<tr>
<td>9.</td>
<td>0.553</td>
<td>0.66</td>
<td>Selected</td>
</tr>
<tr>
<td>10.</td>
<td>0.196</td>
<td>0.223</td>
<td>Rejected</td>
</tr>
<tr>
<td>11.</td>
<td>0.517</td>
<td>0.389</td>
<td>Selected</td>
</tr>
<tr>
<td>12.</td>
<td>0.017</td>
<td>0.080</td>
<td>Rejected</td>
</tr>
<tr>
<td>13.</td>
<td>0.089</td>
<td>0.125</td>
<td>Rejected</td>
</tr>
<tr>
<td>14.</td>
<td>0</td>
<td>0.107</td>
<td>Rejected</td>
</tr>
<tr>
<td>15.</td>
<td>0.089</td>
<td>0.116</td>
<td>Rejected</td>
</tr>
<tr>
<td>16.</td>
<td>0.303</td>
<td>0.313</td>
<td>Selected</td>
</tr>
<tr>
<td>17.</td>
<td>0.303</td>
<td>0.47</td>
<td>Selected</td>
</tr>
<tr>
<td>18.</td>
<td>0.2</td>
<td>0.146</td>
<td>Rejected</td>
</tr>
<tr>
<td>19.</td>
<td>0.126</td>
<td>0.384</td>
<td>Rejected</td>
</tr>
<tr>
<td>20.</td>
<td>0.54</td>
<td>0.313</td>
<td>Selected</td>
</tr>
<tr>
<td>21.</td>
<td>0.410</td>
<td>0.699</td>
<td>Selected</td>
</tr>
<tr>
<td>22.</td>
<td>0.535</td>
<td>0.437</td>
<td>Selected</td>
</tr>
<tr>
<td>23.</td>
<td>0.303</td>
<td>0.669</td>
<td>Selected</td>
</tr>
<tr>
<td>24.</td>
<td>0.142</td>
<td>0.304</td>
<td>Rejected</td>
</tr>
<tr>
<td>SL. No.</td>
<td>DP</td>
<td>DI</td>
<td>Remarks</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>25</td>
<td>0.267</td>
<td>0.544</td>
<td>Selected</td>
</tr>
<tr>
<td>26</td>
<td>0.660</td>
<td>0.562</td>
<td>Selected</td>
</tr>
<tr>
<td>27</td>
<td>0.534</td>
<td>0.34</td>
<td>Selected</td>
</tr>
<tr>
<td>28</td>
<td>0.533</td>
<td>0.62</td>
<td>Selected</td>
</tr>
<tr>
<td>29</td>
<td>0.607</td>
<td>0.464</td>
<td>Selected</td>
</tr>
<tr>
<td>30</td>
<td>0.135</td>
<td>0.328</td>
<td>Rejected</td>
</tr>
<tr>
<td>31</td>
<td>0.210</td>
<td>0.105</td>
<td>Rejected</td>
</tr>
<tr>
<td>32</td>
<td>0.207</td>
<td>0.125</td>
<td>Rejected</td>
</tr>
<tr>
<td>33</td>
<td>0.328</td>
<td>0.185</td>
<td>Rejected</td>
</tr>
<tr>
<td>34</td>
<td>0.071</td>
<td>0.125</td>
<td>Rejected</td>
</tr>
<tr>
<td>35</td>
<td>0.125</td>
<td>0.562</td>
<td>Rejected</td>
</tr>
</tbody>
</table>
## Appendix 9 - BLUE PRINT – MID TERM EXAMINATION

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Unit</th>
<th>Multiple Choice Questions (MCQ)</th>
<th>Objective (True/False)</th>
<th>Short Answer (SA)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Measurements &amp; Newton’s Laws of Motion</td>
<td>6(1)</td>
<td>1(1)</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Friction &amp; Newton’s Law of Gravitation</td>
<td>2(1)</td>
<td>1(1)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Momentum &amp; Oscillation</td>
<td></td>
<td>1(1)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Energy</td>
<td>1(1)</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Fluids I</td>
<td>1(1)</td>
<td>1(1)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Fluids II</td>
<td>2(1)</td>
<td>2(1)</td>
<td>1(2)</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>BLUE PRINT</strong></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>20</strong></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 10

QUESTION PAPER - MID TERM EXAMINATION

Question One: Choose the Correct Answer (1Mark each)

1. The force that causes the moon to orbit the earth is:
   a) Frictional force  b) Nuclear Force
   c) Gravitational force  d) Normal force

2. Friction in ________________ is called drag force
   a) Solids  b) Liquids
   c) Gases  d) Both(b) & (c)

3. Which of the following is NOT a derived unit?
   a) m  b) m/s²
   c) m/s  d) m²

4. A net force of 50 N is applied on a cart to make it accelerate at a rate of 2 m/s².
   The mass of the cart is ________________
   a) 600g  b) 25kg
   c) 150Kg  d) 10Kg

5. In scientific notations 560.423 is:
   a) 5.60423*10⁵  b) 5.60423*10⁻⁴
   c) 5.60423*10⁻²  d) 5.60423*10²
6. The weight of an object immersed in water is 0.9 N. When taken out in air, its weight ____________.
   a) Increases                    b) Decreases
   c) No change                   d) First decrease, then increase.

7. Scalar quantities have:
   a) Magnitude and direction.  b) Magnitude only.
   c) Direction only.           d) None.

8. Work done by a man carrying a mass of 25 kg standing on the top of a building is ____________.
   a) 10 J                        b) 0 J
   c) 20 J                        d) 5 J

9. Newton’s first law of motion is also called law of ________________.
   a) Momentum                    b) Reaction
   c) Inertia                     d) Action

10. Airplanes get a part of their lift by taking advantage of ________________.
    a) Archimedes's Principle  b) Pascal’s Law
    c) Bernoulli’s Principle   d) Law of Conservation of Energy

11. Hertz is the unit of ________________.
    a) Frequency                  b) Force
    c) Distance                   d) velocity
12. Mass per unit volume is called _________________.
   a) Pressure          b) Force
   c) Density          d) Work

Question Two: State True (A) or False (B): (1 Mark each)  / 6

13. If the length of a simple pendulum is increased, the time period Decreases. (  ).

14. The magnitude of the buoyant force always equals the weight of the fluid displaced by the object. (  ).

15. Newton’s third law states that: For every action, there is an equal reaction. (  ).

16. If distance between bodies increases, the force of gravity decreases. (  ).

17. Pressure is the force per unit area. (  ).

18. Viscosity is not the resistance of fluids to flow. (  ).

Question Three: Solve the Following Problems (2 Marks)  / 2

19. If a car’s wheels are locked during emergency breaking, the car slides along the road. Ripped off bits of tire and small melted sections of road form the skid marks.
   The longest skid marks on a public road was 290m long, reportedly set in 1960 by a Jaguar on M1 highway in England. Assuming that $\mu_k = 0.60$ and car’s acceleration was constant during the breaking, how fast was the car going when wheels became locked?
Appendix 11

FINAL PRACTICAL EXAMINATION

1. BOYLE’S LAW

Question One:

1. a. Determine the relationship between pressure and volume using the Boyle’s Law experiment?

Note:

Atmospheric Pressure, \( P_0 = 1011 \text{ Pa} \)

\( \Delta P = 0 \text{ Pa}, -10 \text{ Pa}, -20 \text{ Pa}, -30 \text{ Pa}, -40 \text{ Pa} \)

Pressure of Mercury, \( P_{\text{Hg}} = 15 \text{ Pa} \)

Diameter of gas thermometer, \( d = \) _______ mm

List any two tools used in the experiment

________________________________________
________________________________________

Question Two

2. A thin layer of film is formed on the surface of soup when kept untouched due to ________

   a. Surface tension
b. Buoyant force

c. Up thrust

d. Weightlessness

Question Three

3. The focal length of a concave lens is _____________

a. Positive

b. Negative

c. Zero

d. None

Question Four

4. State whether True or False

Cold liquids flow fast. (            )

2. SIMPLE PENDULUM

Question One:

1. a. Find the acceleration due to gravity using the simple pendulum experiment.

b. List any two tools used in this experiment.

___________________________, ___________________________
**Question Two**

Dynamometer is a tool used in __________ experiment

a. Viscosity
b. Sound Velocity
c. Lenses
d. Surface Tension

**Question Three**

Weight of liquid displaced = Buoyant Force, was found out by

a. Issac Newton
b. Archimedes
c. Albert Einstein
d. Stephen Hawking

**Question Four**

State whether True or False

Viscosity of honey is lesser than that of water. (   )
3. VISCOSITY

Question One:

Find the viscosity of glycerin (η) using the apparatus given to you.

Note:

Radius of the ball = r = ____________ m  Height of fall = S = ________ m

Radius of the cylinder = R = ____________ m

Gravitational Acceleration= g = _____ m/s²

Density of the ball = ρ₂=7780 kg/m³

Density of glycerin=ρ₁=1260 kg/m³

Question Two

The exact value of surface tension of water is ________________

a.  87 mN/m

b.  27 mN/m
c. 72 mN/m

d. 99 mN/m

**Question Three**

The relationship between pressure and volume is given by ___________ experiment

a. Viscosity

b. Charles Law

c. Boyle’s Law

d. Surface Tension

**Question Four**

State whether True or False

a. Resonance column is used in finding the specific heat of copper. (  )

b. Cohesive force between water molecules is the reason for surface tension. (  )

c. The amount of heat per unit mass required to raise the temperature by one degree Celsius is called Specific heat. (  )
4. VERNIER AND MICROMETER

**Question One:**

a. Find the **Length** of **cube** and diameter of the given **ball** using vernier **caliper**.

Least count of vernier caliper = ___________ mm

a. the **diameter** of the given **wire** using the **micrometer**.

Least count of micrometer = ___________ mm

**Question Two**

What difference do you observe in the dynamometers used in Archimede’s Principle and surface Tension experiment?

**Question Three**

The graph obtained in Simple Pendulum Experiment is ___________

a. Non-Linear

b. Linear

c. Curved

d. Spherical
**Question Four**

State whether True or False

Focal Length of convex lens is negative. (   ) /1

5. **SURFACE TENSION**

**Question One:**

a. Find the surface tension of water using the apparatus given.

Note:

Diameter of the ring = ___________ m /1.5

Radius of the ring = ________________

Tensile Force, F = _________________ /1.5

Surface Tension, σ = /3

b. List two tools used in this experiment. /1
**Question Two**

The graph in Boyle’s Law experiment is ________________

a. Non-Linear
b. Linear
c. Curved
d. Spherical

- What can you interpret from this?

**Question Three**

Weight of liquid displaced = Buoyant Force, was found out by

a. Issac Newton
b. Archimedes
c. Albert Einstein
d. Stephen Hawking

**Question Four**

State whether True or False

The viscosity of a liquid increases as the temperature of a liquid decreases ( )
6. ARCHIMEDES PRINCIPLE

Question One:

a. Prove **Archimedes Principle** using the apparatus given.

Volume of Cube = ___________  Volume of ball = ______________

Density of water = \( \rho = 1000 \text{ kg/m}^3 \)

Gravitational Acceleration = \( g = ________ \)

b. What conclusion do you derive from this experiment?

Question Two

In the Hooke’s Law experiment the graph between displacement (x) and Force is ___________

a. Linear
b. Non Linear

c. Spiral

d. Elliptic

Question Three

The SI unit of frequency is ______________

a. Pascal (Pa)
b. Hertz (Hz)
c. Millimeter (mm)

d. Celcius (°C)

**Question Four**

**State whether True or False**

Viscosity of Honey is lesser than that of water. (  )

7. **LENSES**

**Question One:**

A. Find the focal length of a **convex lens** using the apparatus given

- What can you interpret from this experiment?

B. List any two tools used in this experiment.

C. The focal length of concave lens is ____________


D. Convex lens is ________________ lens


   d. Both converging and diverging

210
**Question Two**

The formula for finding the surface tension is

a. $F = \alpha / 4\pi R$

b. $\sigma = F / 4 \pi R$

c. $\alpha = F / 4 \pi R$

d. $F = 4R / \pi \alpha$

**Question Three**

_________________________is the resistance to the flow of liquids.

a. Surface Tension

b. Viscosity

c. Vacuum

d. Velocity

**Question Four**

**State whether True or False**

Weight of liquid displaced is equal to the Buoyant Force, was found out by Albert Einstein ( )

7. VELOCITY OF SOUND

**Question One:**
A. Find the velocity of sound using the apparatus given

(Diameter of the resonance column = d = __________)

B. List any two tools used in this experiment.

**Question Two**

The amount of heat per unit mass required to raise the temperature by one degree Celsius is called ________________.

a. Kinetic Energy

b. Potential Energy

c. Specific Heat

d. Contact Force

**Question Three**

Viscosity _________________ as temperature decreases

a. Decreases

b. Increases

c. First increases then decreases

d. No change

**Question Four**

State whether True or False
Weight of liquid displaced is equal to the Buoyant Force, was found out by Albert Einstein ( )

8. HOOKE’S LAW

Question One:

1. Find the spring constant using the Hooke’s Law experiment.

• What can you interpret from this experiment?

Question Two

5. \( c = 4f (\lambda + 0.3d) \) This is the formula to determine___________________________

a. Specific Heat
b. Sound Velocity
c. Surface Tension
d. Kinetic Energy

Question Three

6. Hot liquids flow _____________ than cold liquids

a. Faster
b. Slower
c. With the same speed
d. None
Question Four

1. State whether True or False

   Time period of a pendulum decreases as length increases. (   )