1) What is the value of the distance shown on the vernier caliper below? (Its sensitivity is 0.1mm)

2) What is the value of the distance shown on the vernier caliper below? (Its sensitivity is 0.5mm)

3) What is the value of the distance shown on the vernier caliper below?

4) In a statistical point of view, errors can be classified as systematic errors and random errors. Systematic errors in an experiments usually come from the measurement devices. Which one of the following error can not be classified as a systematic error?

5) Position, \( x \), of a balloon is given by the following equation. Which one is the correct equation for the relative error \( \left( \frac{dx}{x} \right) \) made on the measurement of position of this balloon? \( x(v_r, v_t, t) = \frac{v_t^2 t}{v_r} \)

\( v_r \): wind speed , \( v \): Speed of the balloon , \( t \): Time

6) For a prism of size \( x=0.5 \, \text{m}, y=0.1 \, \text{m}, z=0.25 \, \text{m} \) and mass 0.5 kg calculate the relative error of density where the sensitivity of the ruler is 1 mm and the sensitivity of the electronic balance is 0.1 gr.

7) What is the relative error of measured \( g \) from the speed-time graph below? Take \( g_{\text{real}} = 10 \, \text{m/s}^2 \).
8) A mass makes a projectile motion on a table (like the one in the projectile motion experiment) with inclination angle of the table as $\alpha=6^\circ$. The initial velocity and the initial angle are 100 cm/s and 30$^\circ$ respectively. What is the maximum height $h_{\text{max}}$? ($\sin(6^\circ)=0.1$, $\cos(6^\circ)=0.995$, $\sin(30^\circ)=0.5$, $\cos(30^\circ)=0.87$, $g=10 \text{ m/s}^2$)

9) Which one of the following graphs best illustrates the horizontal displacement of a projectile as a function of time? Ignore friction. (e)

10) After the projectile motion experiment, the output on the carbon paper is given in the figure. The object was sent from left to right. Which one of the followings cannot cause $x_2$ to be smaller than $x_1$?

11) Which one of the following items can be an example of motion with constant acceleration.
   I. Sliding down of an object from inclined plane (no friction).
   II. Free falling of an object.
   III. A string’s stretching under centripetal acceleration caused by an attached pendulum.

12) Think of a projectile motion on an inclined table with the inclination angle $\alpha=6^\circ$. The elevation angle is $\theta=30^\circ$ and $V_0$ is 40 cm/s. What is the percentage error (approximately) in $h_{\text{max}}$ if the measured value of $h_{\text{max}}$ is 5 cm? ($\sin6=0.1$, $g=10 \text{ m/s}^2$)

13) Which one of the following graphs represents the horizontal velocity component ($V_x$) versus time for a projectile thrown horizontally off a cliff? (Ignore air resistance.) (e)
14) In the projectile motion experiment, how will the maximum height, the range and the time of flight change, if we increase the angle between the surface and air table.

15) A disc is thrown horizontally and the height of the disc from the ground is 45 m. Its initial velocity is 40m/s in x axis (V_x= 40 m/s). Find the distance, X, which disc felt to the ground? g: 10 m/s^2

16) Which of the following graphs are correct for acceleration of projectile motion in x and y direction?

17) Imagine that you repeat the experiment “motion with constant acceleration” and you measured the results in the following table. The width of the space Δs (between the end points of the bold lines on the flag of sled) is 1 cm. Find the velocity for x=40cm and acceleration for x=60cm.

<table>
<thead>
<tr>
<th>X (cm)</th>
<th>40</th>
<th>60</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average t (s)</td>
<td>20</td>
<td>32</td>
<td>45</td>
</tr>
<tr>
<td>Average Δt(s)</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>V</td>
<td>?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18) Which equations below can be written for the object sliding from an inclined plane depicted in the figure (N is the normal force, there is no friction between the object and inclined plane).

I. \( m a_x = m g \sin \theta \)

II. \( m a_y = m g \cos \theta \)

III. \( N - m g \cos \theta = m a_x \)
19) Which one of the following cannot be called as a “motion with constant acceleration”?

20) The extension of a spring due to the applied force is plotted in the figure. What is the spring constant?

![Diagram of Force vs. Extension](image)

21) When a simple pendulum swings in simple harmonic motion, which one of the following is correct when the mass is at the maximum displacement.

22) A mass is attached to one end of a spring. The other end of the spring is connected to a wall. Suppose that the spring constant is known. Which one of the following quantities can be determined by a time measurement?

23) A spring is exerted by different forces. Displacement from the equilibrium position for each force is used to obtain the graph below. What is the spring constant according to these data?

![Graph of Force vs. Displacement](image)
24) A mass is attached to one end of a spring. The other end of the spring is connected to a wall. Suppose that only known quantity is spring constant. Which one of the following quantities can be determined by using a ruler?

25) What are the expected forms of the graphs $\Delta x = f(mg)$ and $T^2 = f(m)$ which are plotted according to data obtained in the simple harmonic motion experiment?

26) What is the period of the pendulum depicted in the following diagram?

![Diagram of a pendulum]

27) Consider the two-dimensional elastic collision experiment. If the air table is inclined, what can be said about the energy and momentum conservation right before and right after the collision?

28) In which one of the following collisions, the momentum and the kinetic energy can be transferred completely from one object to the another?

29) How the conservation conditions can be modified in the two-dimensional elastic collision experiment if the air blower (air compressor) do not function properly?

30) The diagram below shows a collision between a 4.0 kg toy car and a stationary 8.0 kg toy truck. After the collision, the car bounces back at 1.0 m/s while the truck goes forward at 2.0 m/s. Based on these values, are momentum and kinetic energy conserved?

![Diagram showing before and after collision]

31) What is the definition of moment of inertia?

32) When is the angular momentum of a system constant? Choose one.

33) “In translational dynamics, a quantity of mass $m$, resists against the translation. Similarly, the ………………… is a quantity for describing the motion of rigid bodies, which resist against the rotation.” Which physical quantity fits the blank.
34) In centripetal acceleration experiment depicted below, which condition causes the maximum spring elongation for same h values?

35) A yo-yo is spun in a vertical circle of radius 0.5 m and at a constant angular speed of 2 revolutions per second. The yo-yo weighs 0.1 kg. What is the magnitude of total acceleration? (Take π=3)

36) Think about a car turning a corner. Under which condition driver does not lose his control over the car and does not pushed away from the road?

37) If Physical Pendulum experiment is done in moon, the period of oscillation..................

38) A simple pendulum of length 0.5 m makes 10 complete swings in 20 s. What is the acceleration of gravity at the location in which pendulum is present? (take π=3)

39) Why did we let the ruler oscillate with small angle in the Physical Pendulum experiment?

40) Pendulums are sometimes used to measure the local acceleration of gravity. Mount Everest in Nepal is approximately 8850 m tall at its peak. Consider a simple pendulum of length 1.75 m set in small oscillations at the top of Mount Everest. If this pendulum has a measured period of 2.64 s, what is the acceleration of gravity at the top of Mount Everest?

41) Write the aim of the simple harmonic motion experiment.

42) Write the aim of the motion with constant acceleration experiment.

43) Write the aim of the projectile motion experiment.

44) Write the aim of the elastic and inelastic collision experiment.

45) Write the aim of the physical pendulum experiments.

46) Write the aim of the centripetal acceleration experiment.

47) Write the aim of the basic measurements experiment.

48) Write the aim of the moment of inertia experiment.