

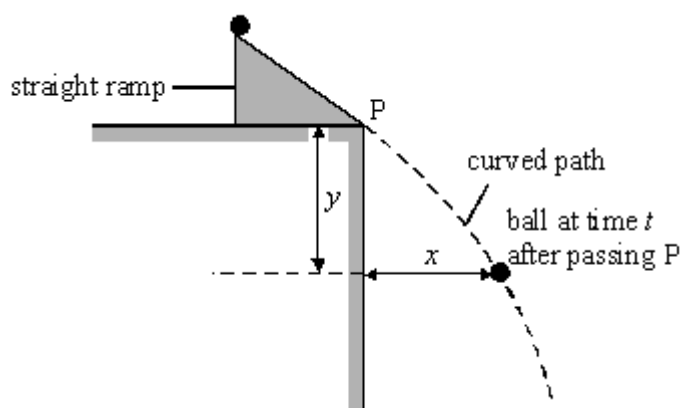
Name of the Student: _____

Max. Marks : 22 Marks

Time : 22 Minutes

Q1.

While investigating projectile motion, a student used stroboscopic photography to determine the position of a steel ball at regular intervals as it fell under gravity. With the stroboscope flashing 20 times per second, the ball was released from rest at the top of an inclined track, and left the foot of the track at P, as shown in the diagram below.



For each of the images on the photograph, the student calculated the horizontal distance, x , and the vertical distance, y , covered by the ball at time t after passing P. Both distances were measured from point P. He recorded his results for the distances x and y in the table.

image	x/cm	y/cm	t/s	$(y/t)/\text{cm s}^{-1}$
1	11.6	9.3	0.05	
2	22.0	21.0	0.10	
3	32.4	35.0	0.15	
4	44.2	51.8	0.20	
5	54.8	71.0	0.25	
6	66.0	92.2	0.30	

- (a) Using two sets of measurements from the table, calculate the horizontal component of velocity of the ball. Give a reason for your choice of measurements.

(2)

(b) The student worked out that the variables y and t in the experiment could be represented by

$$\frac{y}{t} = u + kt$$

where u and k are constants.

- (i) Complete the table above.
- (ii) Use the data in the table to plot a suitable graph to confirm the equation.
(Allow one sheet of graph paper)
- (iii) Use your graph to find the values of u and k .

(9)

(c) State the physical significance of

u _____

k _____

(2)

(d) Calculate the magnitude of the velocity of the ball at point P.

(2)

(Total 15 marks)

Q2.

(a) Draw a ray diagram to show the paths of **two** rays travelling parallel to the principal axis through a Cassegrain telescope, as far as the eyepiece.

(3)

- (b) With the aid of a ray diagram explain what is meant by *spherical aberration* when applied to a concave mirror.

(2)

- (c) With the aid of a ray diagram explain what is meant by *chromatic aberration*.

(2)
(Total 7 marks)