New Syllabus NESA Questions:

1) D
2) C
3) C
4) B
5)

Marking guidelines (a):

Criteria	Marks
• Correctly calculates the time of flight	3
• Shows some relevant calculation steps	2
• Provides some relevant information	1

Sample answer:

Initial vertical velocity $(u) = 28 \times \sin 30°$

$= 14$

$$s = ut + \frac{1}{2}at^2$$

$$0 = 14t + \frac{1}{2} \times (-9.8) \times t^2$$

$$0 = 14t - 4.9 \times t^2$$

$$0 = t(14 - 4.9t)$$

$$t = 0 \text{ or } 2.86$$

$$t = 2.9 \text{ s}$$

Marking guidelines (b):

Criteria	Marks
• Correctly calculates the magnitude of the acceleration	4
• Provides the main steps of the calculation	3
• Shows some relevant calculations	2
• Provides some relevant information	1

Sample answer:

$$v^2 = u^2 + 2as$$

$$v^2 = 14^2 + 2(-9.8)(-0.50)$$

$$v = 14.3457$$

$$v = u + at$$

$$t = \frac{-14.3457 - 14}{-9.8}$$

$$t = 2.8924 \text{ s}$$

Range $= u_x t$

Range $= 28 \cos 30° \times 2.8924$

Range $= 70.1370$ m

Distance fielder travels $= 85 - 70.1370$

$= 14.863$ m

$$s = ut + \frac{1}{2}at^2$$

$$14.863 = 0 + \frac{1}{2} \times a \times 2.8924^2$$

$$a = 3.6 \text{ m s}^{-2}$$

Past HSC Questions:

2018:

19) B

Question 27 (a)

Criteria	Marks
• Identifies an error • Describes the effect	3
• Identifies an error • Identifies the effect	2
• Identifies an error or and effect	1

Sample answer:

Error: The camera is off centre

Effect: When the object is closer to the camera, it will appear to be moving faster than when it is further away, therefore it will give an incorrect measurement of velocity.

Answers could include:

Error: Ruler closer to the camera than the trajectory

Effect: Distance calculated on the trajectory using the ruler will be greater than the true distance and hence the calculated velocity will be greater than the true value.

Others: Camera too close/non-linearity of distances etc; ruler off centre/non-linearity of distances etc.

Question 27 (b)

Criteria	Marks
• Describes quantitatively and qualitatively the velocity and acceleration related to the graphs	3
• Describes the velocity and acceleration related to the graphs	2
• Identifies features of the motion related to the graph(s) OR • Describes the velocity or acceleration related to the graph(s)	1

Sample answer:

The first graph shows that the ball is moving horizontally at a constant speed of 1.6 m s^{-1}. The second graph shows that the ball is accelerating at a constant rate in the vertically downward direction.

Answers could include:

$$\text{velocity} = \frac{-1.1-(-0.3)}{0.5} = \frac{-0.8}{0.5} = -1.6 \text{ m s}^{-1}$$

$$\text{acceleration} = \frac{-2.4-2.4}{0.5} = -9.6 \text{ m s}^{-2}$$

2017:

Question 29 (a)

Criteria	Marks
• Applies correct process to calculate the launch velocity with appropriate units	4
• Applies conservation of energy law to calculate the launch velocity with a minor error	3
• Shows some relevant calculation steps	2
• Substitutes into a relevant formula	1

Sample answer:

$$k = \frac{24}{0.08} = 300$$

$$\frac{1}{2}mv^2 = \frac{1}{2}kx^2$$

$$\frac{1}{2} \times 0.04 \times v^2 = \frac{1}{2} \times 300 \times 0.08^2$$

$$v^2 = 300 \times 0.08 \times 2$$

$$v = 6.9 \text{ ms}^{-1}$$

Answers could include:

Calculating the area under the curve for work done.

Question 29 (b)

Criteria	Marks
• Applies correct process to calculate the range	3
• Shows some relevant calculation steps	2
• Provides some relevant information	1

Sample answer:

The range is equal to the horizontal velocity component $\times$ the time of flight.

The time of flight is twice the time taken to reach the highest point.

Since $v = u + at$, at the highest point $v = 0 = 10 \sin 60° - 9.8\, t$

Hence time of flight $t = \dfrac{20 \sin 60°}{9.8} = 1.77 \text{s}$.

Hence the range $= 10 \times \cos 60° \times 1.77 = 8.8 \text{ m}$.

2016:

17) C

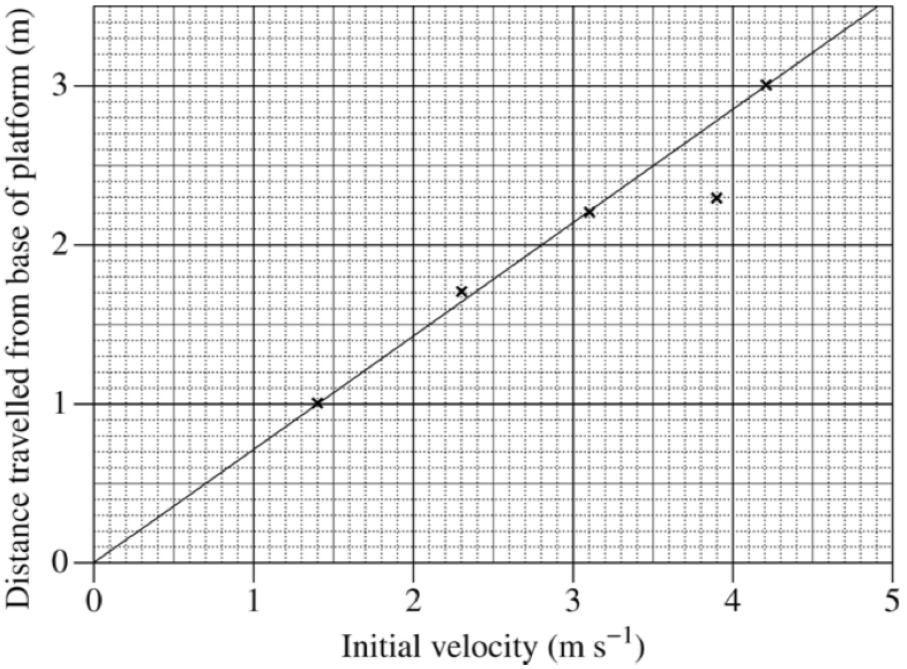
2015:

4) D

20) B

Question 21 (a)

Criteria	Marks
• Plots all points correctly • Draws appropriate line of best fit	2
• Plots the majority of the points correctly	1



Question 21 (b)

Criteria	Marks
• Applies correct processes to calculate the height of the platform	2
• Applies correct process to determine slope of graph/time of flight OR • Applies correct process to calculate the height of the platform using incorrectly obtained time	1

Sample answer:

Since

$$\triangle x = u_x t$$

Slope of graph $= t$

$$= \frac{2.5-0}{3.5-0} \quad \text{(values of slope will vary depending on line of best fit)}$$

$$= 0.714$$

$$\triangle y = ut + \frac{1}{2}at^2$$

$$= 0 + 0.5 \times 9.8 \times (0.714)^2$$

$$= 2.5$$

$\therefore$ Height of platform = 2.5 m

2014:

20) D

2013:

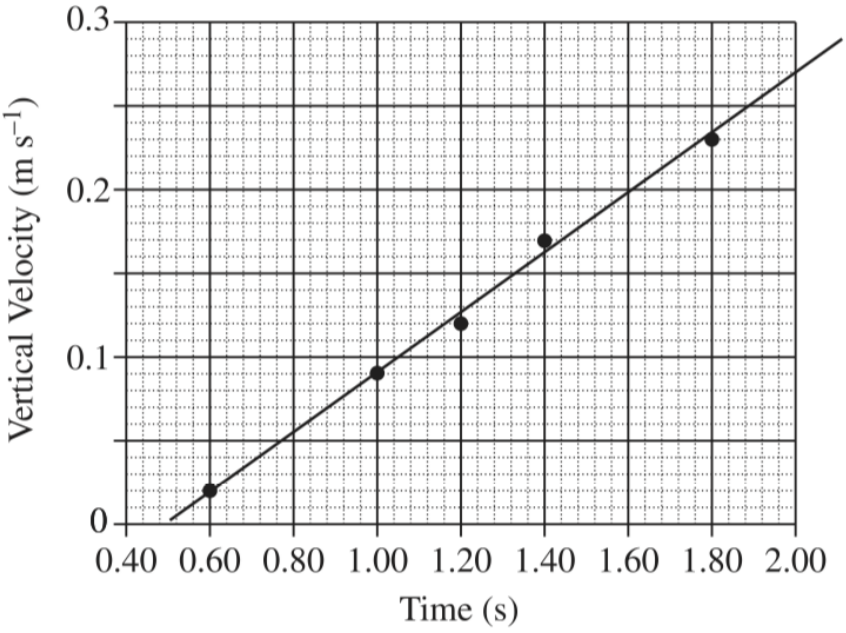
4) A

6) C

Question 22

Criteria	Marks
• Correctly plots points and draws line of best fit • Correct substitution to determine the acceleration	3
• Correctly plots points and attempts to determine the acceleration OR • Correctly plots points and draws line of best fit	2
• Shows a basic understanding of graphing	1

Sample answer



Acceleration

$$= \frac{0.235 - 0.02}{1.80 - 0.60}$$

$$= \frac{0.215}{1.20}$$

$$= 0.18 \text{ m s}^{-2}$$

2012:

Question 27

Sample answer:

$$u_x = u\cos 60° = \frac{u}{2}$$

$$u_y = u\sin 60° = \frac{\sqrt{3}u}{2}$$

$$45 = \left(u_x\right) t \Rightarrow t = \frac{45}{u_x} = \frac{90}{u}$$

$$\Delta y = \left(u_x\right)t - \frac{1}{2}at^2 = 34$$

$$\rightarrow 34 = \left(\frac{\sqrt{3}}{2}u\right)\left(\frac{90}{u}\right) - \frac{1}{2}(9.8)\left(\frac{90}{u}\right)^2$$

$$34 = 45\sqrt{3} - \frac{39690}{u^2}$$

$$\rightarrow u = \sqrt{\frac{39690}{45\sqrt{3} - 34}}$$

$$= 30m / s$$

2010:

2) D

4) B

Question 22 (a)

Sample answer:

Initial horizontal velocity component is constant: $u_x = x/t = 300/21 = 14.3 \text{ ms}^{-1}$

Question 22 (b)

Sample answer:

Initial vertical velocity: $y = u_y t + \frac{1}{2} a_y t^2$

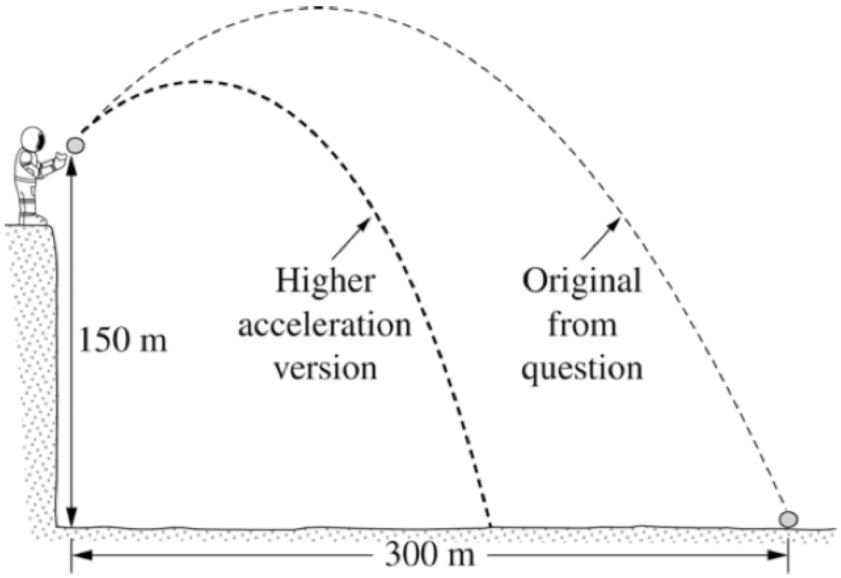
$$150 = u_y \times 21 + \frac{1}{2} \times 1.6 \times 21^2$$

$$\therefore u_y = 9.7 \text{ ms}^{-1}$$

Question 22 (c)

Sample answer:

The heavy line is a possible path of the stone in a stronger gravitational field.



2009:

4) D

Before 2009 there were no answers given for short answer please use a book like Excel Physics

2008:

3) B

4) A

2007:
5) D

2006:
4) B

2005:
1) A
5) C

2004:
1) B

2002:
1) B

2001:
7) B