PHYSICAL SCIENCES GRADE 12

QUESTION 1

1.1 work (1)

1.2 gravitational force (1)

1.3 inelastic (1)

1.4 Diffraction (1)

1.5 Node (1)

[5]

QUESTION 2

2.1 land on the man (2)

2.2 greater impulse (2)

2.3 no work .... or ... move parallel to force of gravity (2)

2.4 transmit green and BLUE and absorb RED (2)

2.5 all have different intensities (decreasing intensity from the central band) (2)

[10]

QUESTION 3

3.1	A	B	C	D
3.2	A	B	C	D
3.3	A	B	C	D
3.4	A	B	C	D
3.5	A	B	C	D

[5 X 2 = 10]

TOTAL SECTION A : 25 MARKS

QUESTION 4

4.1 $v_f^2 = v_i^2 + 2a\Delta x$ ✓

$v_f^2 = (0)^2 + 2(-9,8)(25)$ ✓

$v_f = -22,13$ or $22,13\ m\cdot s^{-1}$ down/*afwaarts* ✓

OR

E_t(top/*bo*) = E_t(bottom/*onder*)

$E_p + E_k = E_p + E_k$

$mgh + 0 = 0 + \frac{1}{2}mv_f^2$ ✓

$(0,3)(9,8)(25) + 0 = 0 + \frac{1}{2}(0,3)v_f^2$ ✓

$v_f = 22,13\ m\cdot s^{-1}$ downward/*afwaarts* ✓ [12.2.3] (4)

4.2 Consider upward motion as positive:/ *Beskou opwaartse beweging as positief:*

$v_f^2 = v_i^2 + 2a\Delta x$ ✓

$0 = v_i^2 + 2(-9,8)(6)$ ✓

$v_i = 10,84\ m\cdot s^{-1}$ ✓

Impulse/*Impuls* $= \Delta p$ ✓

$= [(0,3)(10,84) - (0,3)(-22,13)]$ ✓

$= +9,89\ N\cdot s$ ✓ i.e. 9,89 N·s upward/*opwaarts* ✓

OR

Consider upward motion as negative:/*Beskou opwaartse beweging as negatief*

$v_f^2 = v_i^2 + 2a\Delta x$ ✓

$0 = v_i^2 + 2(9,8)(-6)$ ✓

$v_i = -10,84\ m\cdot s^{-1}$ ✓

Impulse/*Impuls* $= \Delta p$ ✓

$= [(0,3)(-10,84) - (0,3)(22,13)]$ ✓

$= -9,89\ N\cdot s$ ✓ i.e. 9,89 N·s upward/*opwaarts* ✓

OR

E_t(top/*bo*) = E_t(bottom/*onder*)

$E_p + E_k = E_p + E_k$

$mgh + 0 = 0 + \frac{1}{2}mv_f^2$ ✓

$(0,3)(9,8)(6) + 0 = 0 + \frac{1}{2}(0,3)v_f^2$ ✓

$v_f = 10,84\ m\cdot s^{-1}$ upward/*opwaarts* ✓

Impulse/*Impuls* $= \Delta p$ ✓

$= [(0,3)(10,84) - (0,3)(-22,13)]$ ✓

$= +9,89\ N\cdot s$ ✓ i.e. 9,89 N·s upward/*opwaarts* ✓ [12.1.3] (7)

4.3 Take upward as positive:/*Neem opwaarts as positief:*

$F_{net}\Delta t = \Delta p$✓

$F_{net} = \frac{\Delta p}{\Delta t} = \frac{+9,89}{0,9}$ ✓ =+ 10,99 N✓i.e.10,99 N (11 N) upward/*opwaarts*

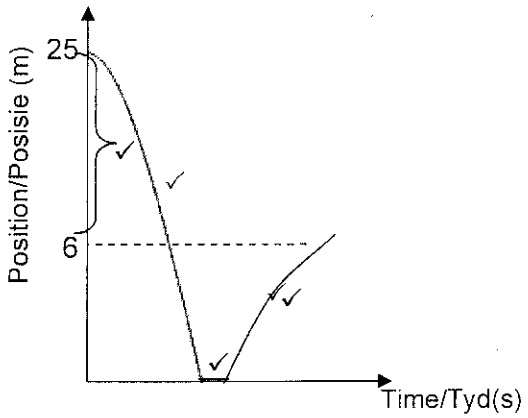
Take upward as negative:/*Neem opwaarts as negatief:*

$F_{net}\Delta t = \Delta p$✓

$F_{net} = \frac{\Delta p}{\Delta t} = \frac{-9,89}{0,9}$ ✓ = - 10,99 N ✓i.e. 10,99 N (11 N)

upward/*opwaarts* [12.2.3] (3)

4.4



Checklist/*Kontrolelys* Criteria for graph/*Kriteria vir grafiek*	Marks/ *Punte*
Maximum original height indicated as 25 m and height of 2nd bounce as 6 m *Maksimum oorspronklike hoogte aangedui as 25 m en hoogte van tweede hop as 6 m*	✓
Correct shape between 25 m and 0 m *Korrekte vorm tussen 25 m en 0 m*	✓
Graph on x-axis between first reaching the floor and 2nd bounce *Grafiek op x-as wanneer dit die vloer tref en die 2de hop*	✓
Correct shape between 0 m and 6 m. *Korrekte vorm van grafiek tussen 0 m en 6 m.*	✓

[12.1.2] (4)

4.5 Smaller ✓

Contact time for softer ball is longer ✓than for rigid ball

According to $F_{net}\Delta t = \Delta p$, the force exerted by floor on softer ball is smaller than on the rigid ball. ✓.

[12.3.2] (3)

[20]

QUESTION 5

5.1.1 $W_{net} = \Delta E_p + \Delta E_k$ ✓

$\therefore W_{net} = (mgh_f - mgh_i) + (\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2)$

$\therefore 7 \times 10^5$ ✓ $- 8,5 \times 10^4$ ✓ $= 10\,000(9,8)(h_f - 0)$ ✓ $+ 0$ ✓

$\therefore 6,15 \times 10^5 = 10\,000(9,8)h_f$

$\therefore h_f = 6,28$ m ✓

OR/*OF*

Useful work done = gain in Ep ✓ = mgh ✓

Bruikbare arbeid verrig = wins aan Ep ✓ = mgh ✓

$\therefore 7 \times 10^5$ ✓ $- 8,5 \times 10^4$ ✓ $= 10\,000(9,8)h$ ✓

$\therefore 6,15 \times 10^5 = 10\,000(9,8)h_f$

$\therefore h = 6,28$ m ✓ [12.1.3] (6)

5.1.2 $W = F\Delta x \cos\theta$ ✓

$\therefore 7 \times 10^5 = F(23)(1)$ ✓

$\therefore F = 3,04 \times 10^4$ N ✓

$P = Fv$ ✓

$= (3,04 \times 10^4)(\frac{20\,000}{60 \times 60})$ ✓

$= 1,6 \times 10^5$ W ✓ [12.1.3] (6)

5.2 Any TWO/*Enige TWEE:*

Surface must provide sufficient friction like sand ✓

Must be long enough for vehicle to stop. ✓

(2)

[12.3.2] **[14]**

QUESTION 6

6.1 $P_{before} = P_{after}$

$m_1v_{i1} + m_2v_{i2} = (m_1 + m_2)v_f$

$(3500 \times 15) + (1600 \times -30) = (3500+1600)v$

$52500 - 48000 = 5100\,v$

$v = 0,88$ m.s^{-1} in direction of minibus (6)

6.2 Law of Conservation of momentum

In an isolated system the TOTAL momentum before a collision is equal to the TOTAL momentum after a collision **OR**

The total momentum in a closed system is conserved in both magnitude and direction. (3)

6.3 $E_{k(before)} = {}^1/_2m_mv^2 + {}^1/_2m_cv^2$

$= {}^1/_2(3500)(15)^2 + {}^1/_2(1600)(30)^2$

$= 393750 + 720000$

$= 1113750$ J

$E_{k(after)} = {}^1/_2m_mv^2 + {}^1/_2m_cv^2$

$= {}^1/_2(3500)(0,88)^2 + {}^1/_2(1600)(0,88)^2$

$= 1355,2 + 619,52$

$= 1974,72$ J

$E_{k(before)} \neq E_{k(after)}$

Therefore the collision is INELASTIC (6)

QUESTION 7

7.1) Destructive interference from wavelets originating from different points on the slit (2)

7.2)

$$\sin\theta = \frac{m\lambda}{a}$$

$$= \frac{(1)(700\times10^{-9})}{0.9\times10^{-4}}$$

$$= 0{,}0078$$

$$\therefore \theta = 0.45^{O}$$

$$\tan 0.45 = \frac{y}{0.5}$$

$$y = 0.5\tan 0.45$$

$$y = 0.0039$$

$$\therefore 2y = 0.0078m \text{ or } 7.8mm \quad (6)$$

7.3) Decreases (2)

7.4) Increases (2)

7.5) 1) The width of the bands would be less

2) The colour of the bright bands would now be blue. (4)

QUESTION 8

8.1) 1000Hz (2)

8.2)

$$f_L = \left(\frac{v + v_L}{v - v_s}\right) f_s$$

$$\frac{f_L}{f_s} = \left(\frac{v + v_L}{v - v_s}\right) = \left(\frac{340 + 0}{340 - v_s}\right) = 1.25$$

$$340 = 1.25(340 - v_s)$$

$$340 = 425 - 1.25v_s$$

$$\therefore v_s = 68m.s^{-1} \quad (5)$$

8.2) 1000Hz (2)

TOTAL : 100 MARKS