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**EASTERN CAPE**  
EDUCATION

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**GRADE/GRAAD 12**

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**TECHNICAL SCIENCES P1/TEGNIESE  
WETENSKAPPE V1  
MARKING GUIDELINE/NASIENRIGLYN**

**MARKS/PUNTE: 150**

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This marking guideline consists of 10 pages/.  
*Hierdie nasienriglyn bestaan uit 10 bladsye.*

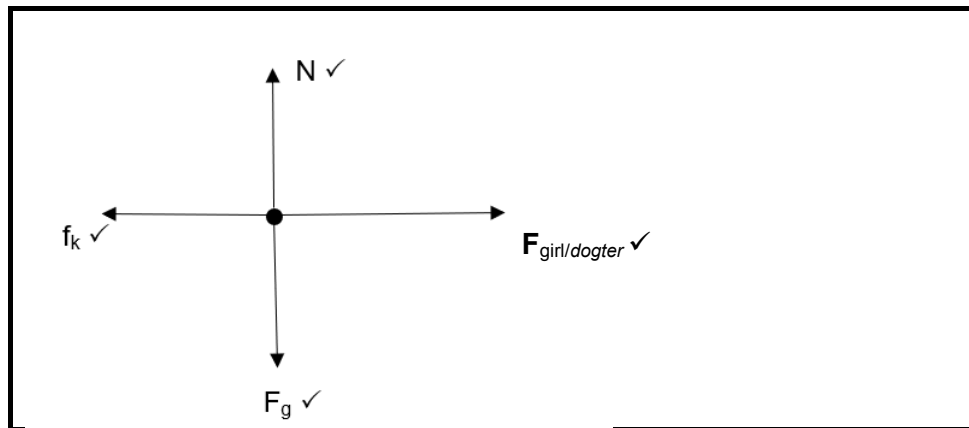
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**QUESTION/VRAAG 1**

- 1.1 B ✓✓ (2)
- 1.2 C ✓✓ (2)
- 1.3 B ✓✓ (2)
- 1.4 C ✓✓ (2)
- 1.5 A ✓✓ (2)
- 1.6 B ✓✓ (2)
- 1.7 C ✓✓ (2)
- 1.8 A ✓✓ (2)
- 1.9 D ✓✓ (2)
- 1.10 C ✓✓ (2)
- [20]**

## QUESTION/VRAAG 2

2.1 2.1.1



(4)

$$\begin{aligned}
 2.1.2 \quad f_k &= \mu_k N \quad \checkmark \\
 f_k &= (0,2)(20)(9,8) \quad \checkmark \checkmark \\
 &= 39,2 \text{ N West/Wes} \quad \checkmark
 \end{aligned}$$

(4)

$$\begin{aligned}
 2.1.3 \quad F_{\text{net}} &= f_k + F_{\text{girl/dogter}} \quad \checkmark \\
 &= (-39,2) \quad \checkmark + (50) \quad \checkmark \\
 &= 10,8 \text{ N east/oos} \quad \checkmark
 \end{aligned}$$

(4)

2.1.4 When a net force acts on an object of mass  $m$ , it accelerates the object in the direction of the net force. This acceleration is directly proportional to the net force and inversely proportional to the mass of the object.  $\checkmark \checkmark$

*Indien 'n netto krag op 'n voorwerp met massa  $m$  inwerk, versnel die voorwerp in die rigting van die netto krag. Hierdie versnelling is direk eweredig aan die netto krag en omgekeerd eweredig aan die massa van die voorwerp.  $\checkmark \checkmark$*

(2)

$$\begin{aligned}
 2.1.5 \quad F_{\text{net}} &= ma \quad \checkmark \\
 10,8 &= (20)a \quad \checkmark \\
 a &= 0,54 \text{ m}\cdot\text{s}^{-2} \quad \checkmark
 \end{aligned}$$

(3)

2.2 2.2.1 Decreases/*Verminder*  $\checkmark$ 

(1)

2.2.2 Increases/*Vermeerder*  $\checkmark$ 

(1)

2.2.3 Increases/*Vermeerder*  $\checkmark$ 

(1)

**[20]**

**QUESTION/VRAAG 3**

- 3.1 3.1.1 When object **A** exerts a force on object **B**, object **B** simultaneously exerts an oppositely directed force of equal magnitude on object **A**. ✓✓  
*Indien voorwerp **A** 'n krag op voorwerp **B** uitoefen, sal voorwerp **B** gelyktydig dieselfde krag in die teenoorgestelde rigting op voorwerp **A** uitoefen.* ✓✓ (2)
- 3.1.2 100 N due west / wes ✓✓ (2)
- 3.2 3.2.1 Box thrown backward / Houer word terugwaarts gegooi. ✓✓ (2)
- 3.2.2 The box opposes a change in its state of rest ✓ due to its inertia ✓ according to Newton's first law of motion. ✓  
*Die houer sal sy toestand van rus teenwerk ✓ as gevolg van sy traagheid ✓ volgens Newton se eerste bewegingswet.* ✓ (3)
- [9]**

## QUESTION/VRAAG 4

- 4.1 4.1.1 Impulse is the product of the net force acting on an object and the time the net force acts on the object. ✓✓  
*Dit is die produk van die netto krag wat op 'n voorwerp toegepas word en die tyd wat die netto krag op die voorwerp inwerk.* ✓✓ (2)
- 4.1.2 Vector/Vektor ✓ (1)
- 4.1.3 Impulse =  $\Delta p$  or/of Impulse =  $m\Delta v$  ✓  
 Impulse =  $(1\,500)(0 - 14)$  ✓✓  
 =  $-21\,000\text{ N}\cdot\text{s}$  ✓ ( $\text{kg}\cdot\text{m}\cdot\text{s}^{-1}$ )  
 =  $21\,000\text{ N}\cdot\text{s}$  away from the barrier/  
*weg van die versperring.* (4)
- 4.1.4  $F_{\text{net}} = \frac{\Delta p}{\Delta t}$  ✓  
 $F_{\text{net}} = \frac{-21\,000}{0,5}$  ✓  
 $F_{\text{net}} = -42\,000\text{ N}$  ✓ (3)
- 4.1.5 Crumple zone helps the car to take a longer time to come to a stop ✓.  $F_{\text{net}}\Delta t = \Delta p$ , the longer the time interval, the smaller the net force acting for the same  $\Delta p$  ✓.  
 $\therefore$  the injuries are minimised. ✓  
*Die frommelsone help dat die voertuig langer neem om te stop.* ✓  
 $F_{\text{net}}\Delta t = \Delta p$ . *Hoe langer die tydinterval, hoe kleiner die netto krag wat vir dieselfde  $\Delta p$  toegepas word.* ✓  
 $\therefore$  die beserings is minder. ✓ (3)
- 4.2 4.2.1 Momentum is defined as the product of an object's mass and its velocity. ✓✓  
*Momentum word gedefinieer as die produk van 'n voorwerp se massa en sy snelheid.* ✓✓ (2)
- 4.2.2 Elastic collision: A collision in which both the momentum and kinetic energy are conserved. ✓✓  
 Inelastic collision: A collision in which only the momentum is conserved. ✓✓  
*Elastiese botsing: 'n Botsing waar beide die momentum en kinetiese energie behoue bly.* ✓✓  
*Onlastiese botsing: 'n Botsing waar slegs die momentum behoue bly.* ✓✓ (4)
- 4.2.3 The total linear momentum of an isolated system remains constant (is conserved). ✓✓  
*Die totale lineêre momentum van 'n geïsoleerde sisteem bly konstant (bly behoue).* ✓✓ (2)

## OR/OF

Total linear momentum before collision is equal to the total linear momentum after the collision in an isolated system. ✓✓  
Total lineêre momentum voor 'n botsing is gelyk aan die totale lineêre momentum na die botsing in 'n geïsoleerde sisteem. ✓✓

4.2.4  $\Sigma p_{\text{before}} = \Sigma p_{\text{after}}$  ( $\Sigma p_{\text{voor}} = \Sigma p_{\text{na}}$ )  
 $m_A v_{A\text{initial}} + m_B v_{B\text{initial}} = m_A v_{A\text{final}} + m_B v_{B\text{final}}$  } ✓ Any ONE  
 ( $m_A v_{A\text{begin}} + m_B v_{B\text{begin}} = m_A v_{A\text{eind}} + m_B v_{B\text{eind}}$ )  
 (800)(0) + (1000)(33) ✓ = (800)(17) + (1000)(v) ✓  
 $v = 19,4 \text{ m}\cdot\text{s}^{-1}$  ✓ (4)

4.2.5 Inelastic/Onelasties ✓ (1)  
**[26]**

### QUESTION/VRAAG 5

5.1 5.1.1 Work done is defined as the product of the force acting on an object and the displacement in the direction of the force. ✓✓  
*Arbeid word gedefinieer as die produk van die krag wat op 'n voorwerp toegepas word en die verplasing in die rigting van die krag.* ✓✓ (2)

5.1.2  $W = F \Delta x \cos \theta$  ✓  
 $W = (200)(5) \cos 20^\circ$  ✓  
 $W = 939,69 \text{ J}$  ✓ (3)

5.1.3  $0$  ✓ (J) (1)

5.1.4 Box moves with constant velocity. ✓ Net force is zero. ✓ (Hence the net work done is 0 J.)  
*Die houer beweeg teen 'n konstante snelheid. Netto krag is nul.*  
*Die netto arbeid verrig is dus 0 J.* ✓✓ (2)

5.1.5 No. ✓ Force of gravity is perpendicular to the direction of motion. ✓✓  
*Nee. ✓ Swaartekrag is loodreg tot die rigting van beweging.* ✓✓  
**OR/OF**  
 $W = F \Delta x \cos \theta$  ✓  
 $= F \Delta x \cos 90^\circ$  ✓  
 $= 0 \text{ J}$  ✓ (3)

5.2 5.2.1 Power is defined as the rate at which work is done OR rate at which energy is expended. ✓✓  
*Drywing word gedefinieer as die tempo waarteen arbeid verrig word OF tempo waarteen energie verbruik word.* ✓✓ (2)

5.2.2  $P = \frac{W}{\Delta t}$  ✓  
 $P = \frac{(2000)(9,8)(20)}{60}$  ✓  
 $P = 6533,33 \text{ W}$  ✓  
 $P = \frac{6533,33}{746} = 8,76 \text{ hp / pk}$  ✓ (4)

- 5.3 5.3.1 Sum of gravitational potential energy and kinetic energy. ✓✓  
*Som van gravitasie potensiele energie en kinetiese energie.* ✓✓ (2)
- 5.3.2 Energy possessed by an object due to its position above the ground. ✓✓  
*Energie wat 'n voorwerp besit as gevolg van sy posisie bokant die grond.* ✓✓ (2)
- 5.3.3 (a) Increases/*Vermeerder* ✓ (1)  
 (b) Remains the same/*Bly dieselfde* ✓ (1)
- 5.3.4 The total mechanical energy in an isolated system remains constant. ✓✓  
*Die totale meganiese energie in 'n geïsoleerde sisteem bly konstant.* ✓✓ (2)
- 5.3.5  $M_{E(B)} = mgh + \frac{1}{2}mv^2$  ✓  
 $= m(9,8)(1,5) + \frac{1}{2}m(8)^2$  ✓  
 $= 46,7 m$  ✓  
 $M_{E(A)} = mgh + \frac{1}{2}mv^2$   
 $= m(9,8)h + 0$  ✓  
 $= 9,8 mh$  ✓  
 $M_{E(A)} = M_{E(B)}$  ✓  
 $9,8 mh = 46,7 m$   
 $h = 4,77 m$  ✓

(7)  
[32]

## QUESTION/VRAAG 6

- 6.1 A perfectly elastic body: A body which regains its original shape and size completely when the deforming force is removed. ✓✓  
 A perfectly plastic body: A body that does not show a tendency to regain its original shape and size when the deforming force is removed. ✓✓  
*Volkome elastiese voorwerp: 'n Liggaam wat sy oorspronklike grootte en vorm volkome herwin as die vervormingskrag verwyder word. ✓✓*  
*Volkome plastiese voorwerp: 'n Liggaam wat nie 'n neiging toon om sy oorspronklike vorm en grootte te herwin nie wanneer die vervormingskrag verwyder word. ✓✓* (4)

- 6.2 Hooke's law: Within the limit of elasticity, stress is directly proportional to the strain. ✓  
*Hooke se wet: Binne die grense van elasticiteit is druk direk eweredig aan rekking. ✓✓* (2)

- 6.3 6.3.1 Stress is internal restoring force per unit area of a body. ✓✓  
*Druk is die interne herstelkrag per eenheidsoppervlakte van die liggaam. ✓✓* (2)

6.3.2  $\sigma = \frac{F}{A}$  ✓  
 $\sigma = \frac{200}{5 \times 10^{-5}}$  ✓  
 $\sigma = 4\,000\,000 \text{ Pa}$  ✓ (3)

6.3.3  $K = \frac{\sigma}{\varepsilon}$  ✓  
 $4 \times 10^8 \text{ ✓} = \frac{4\,000\,000}{\varepsilon} \text{ ✓}$   
 $\varepsilon = 0,01$   
 $\varepsilon = \frac{\Delta l}{L}$  ✓  
 $0,01 = \frac{\Delta l}{2}$  ✓  
 $\Delta l = 0,02 \text{ m}$  ✓  
 Final length / *Finale lengte* = 2 + 0,02 = 2,02 m ✓ (6)

[17]



## QUESTION/VRAAG 7

- 7.1 Viscosity is defined as the property of a fluid to oppose relative motion between the two adjacent layers. ✓✓  
*Viskositeit word gedefinieer as die eienskap van 'n vloeistof om die relatiewe beweging tussen twee aangrensende vlakke teen te werk.* ✓✓ (2)
- 7.3 7.2.1 Winter ✓✓ (2)
- 7.2.2 10W40 ✓✓ (2)
- 7.2.3 5W40 ✓✓ (2)
- 7.3 7.3.1 Pascal's law: In a continuous liquid at equilibrium, the pressure applied at a point is transmitted equally to the other parts of the liquid. ✓✓ **(2 OR 0)**  
*Pascal se wet: In 'n deurlopende vloeistof in ewewig word die druk wat by enige punt toegepas word eweredig na die ander dele van die vloeistof versprei.* ✓✓ **(2 OF 0)** (2)
- 7.3.2 
$$\frac{F_1}{A_1} = \frac{F_2}{A_2} \checkmark$$

$$\frac{100}{1,2 \times 10^{-3}} = \frac{1200}{A_2} \checkmark$$

$$A_2 = 0,014 \text{ m}^2 \checkmark$$
 (3)
- 7.3.3 Increase the area of piston **B**./Vermeerder die oppervlakte van suier **B**. ✓✓ (2)
- 7.3.4 Bulldozer's working systems, hydraulic power brakes on automobiles, dentists' chairs, hydraulic lifts used to lift heavy loads, car jacks, or any other correct application. (ANY THREE) ✓✓✓  
*Stootskraper se werkende sisteme, hidrouliese kragremme op motors, tandartsstoele, hidrouliese hysers om swaar vragte op te tel, of enige ander korrekte toepassing. (ENIGE DRIE)* ✓✓✓ (3)

**[18]**

**QUESTION/VRAAG 8**

- 8.1 An intrinsic semiconductor is a pure semiconductor. ✓✓  
*'n Intrinsieke halfgeleier is 'n halfgeleier in sy suiwer vorm.* ✓✓ (2)
- 8.2 Doping is the process of adding impurities to intrinsic semiconductors. ✓✓  
*Doktering is die proses waardeur onsuiverhede by intrinsieke halfgeleiers  
gevoeg word.* ✓✓ (2)
- 8.3 Phosphorous or arsenic/*fosfor of arseen* ✓✓ (2)
- 8.4 Negative charge/*negatiewe lading* ✓✓ (2)  
Electron/*elektron* [8]

**TOTAL/TOTAAL: 150**











