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GRADE/GRAAD 12

SEPTEMBER 2020

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

MARKS/PUNTE: 150

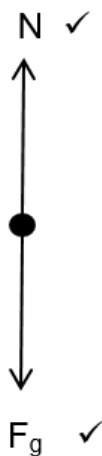
This marking guideline consists of 8 pages./
Hierdie nasienriglyn bestaan uit 8 bladsye.

QUESTION/VRAAG 1

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

QUESTION/VRAAG 2

2.1



(2)

- 2.2 An object will continue its state of rest or uniform motion in a straight line unless it is acted upon by a net force. ✓✓
'n Voorwerp sal is sy toestand van rus bly of aanhou beweeg met uniforme beweging in 'n reguitlyn tensy 'n netto krag daarop inwerk. ✓✓ (2)
- 2.3 Block will continue its state of uniform motion (constant velocity). ✓✓
Die blok sal aanhou beweeg met uniforme beweging (konstante snelheid). ✓✓ (2)

[6]

QUESTION/VRAAG 3

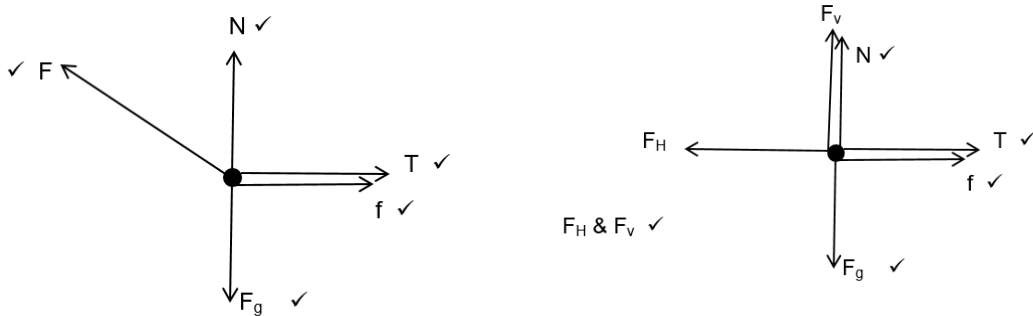
3.1 When a net force acts on an object, the object will accelerate in the direction of the force. This acceleration is directly proportional to the net force and inversely proportional to the mass of the object. ✓✓

Indien 'n netto krag op 'n voorwerp inwerk, sal die voorwerp in die rigting van die krag versnel. Die versnelling is direk eweredig aan die netto krag en omgekeerd eweredig aan die massa van die voorwerp. ✓✓ (2)

3.2 No net external force act on the system. ✓✓

Daar is geen eksterne krag wat op die stelsel inwerk nie. ✓✓ (2)

3.3



(5)

3.4.1 Fnet = ma ✓ } Any one / Enige een

T - f = ma

50 - (0,2)(20)(9,8) ✓ = 20a ✓

a = 0,54 m.s⁻² left/west / links/ wes ✓

(Positive marking from QUESTION 3.4.1)(Positiewe merk vanaf VRAAG 3.4.1) (4)

3.4.2 OPTION/OPSIE 1

Fnet = ma

Fcosθ - T - μkN = ma } Any one / Enige een ✓

FH - T - f = ma

Fcos 30° ✓ - 50 - (0,2)(30x9,8 - Fsin30) ✓ = (20)(0,54) ✓

F(cos30° + (0,2) sin30°) = 125

F = 129,4 N ✓

OPTION/OPSIE 2

Fnet = ma ✓

FH - f1 - f2 = ma } Any one / Enige een

Fcos30° - (0,2)[(30x9,8) - Fsin30] ✓ - (0,2)(20)(9,8) = (20)(0,54) ✓✓

F = 129,4 N ✓

(5)

3.5 3.5.1 Decreases / Neem af ✓

(1)

3.5.2 Decreases / Neem af ✓

(1)

3.6 Fnet decreases, therefore acceleration decreases. ✓✓

Fnet neem af, dus neem die versnelling ook af. ✓✓

(2)

[22]

QUESTION/VRAAG 4

- 4.1 Momentum is the product of mass of the object and its velocity. ✓✓
Momentum is die produk van die massa van die voorwerp en sy snelheid. ✓✓ (2)
- 4.2 Momentum (1)
- 4.3 $\sum p_i = \sum p_f$ East = +ve)(Oos = +) } Any ONE / Enige EEN ✓
 $m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$
 $(5)(4) + (3)(0) \checkmark = (5)(-0,25) \checkmark + (3)(v_{2f})$
 $v_{2f} = 7,08 \text{ m}\cdot\text{s}^{-1}$ east / oos ✓ (4)
- 4.4 Law of conservation of momentum / *Wet van behoud van momentum* ✓
 (Negative marking)(Negatiewe merk)
Total linear momentum in a closed system remains constant. ✓✓
Totale lineêre momentum in 'n geslote sisteem bly konstant. ✓✓ (3)
- [10]**

QUESTION/VRAAG 5

- 5.1 100 000 N ✓ due east / *reguit ooswaarts* ✓ (2)
- 5.2 -ve ✓ Newton's Third law of Motion / *Newton se Derde Bewegingswet* ✓
 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, oefen voorwerp **B** 'n krag uit wat in die teenoorgestelde rigting maar van gelyke grootte op voorwerp **A** uit.* ✓✓ (3)
- 5.3 It is the product of the resultant/net force acting on an object ✓ and the time the resultant/net force acts on the object. ✓
Dit is die produk van die resultante/netto krag wat op 'n voorwerp inwerk ✓ en die tyd wat die resultante / netto krag op die voorwerp inwerk. ✓ (2)
- 5.4 **OPTION/OPSIE 1**
 West is taken as positive / *Wes word as positief geneem.*
 $F_{\text{net}} \Delta t = \Delta p$ ✓
 $F_{\text{net(truck)}} \Delta t = (mv_f - mv_i)$
 $(-100000)(0,4) \checkmark = (5000)[(v_f) - 20] \checkmark$
 $v_f = 12 \text{ m}\cdot\text{s}^{-1}$ west / wes ✓
- OPTION/OPSIE 2**
 East is taken as positive / *Oos word as positief geneem.*
 $F_{\text{net}} \Delta t = \Delta p$ ✓
 $F_{\text{net(truck)}} \Delta t = (mv_f - mv_i)$
 $(100000)(0,4) \checkmark = (5000)[(v_f) - (-20)] \checkmark$
 $v_f = -12 \text{ m}\cdot\text{s}^{-1}$
 $v_f = 12 \text{ m}\cdot\text{s}^{-1}$ west / wes ✓ (4)
- [11]**

QUESTION/VRAAG 6

6.1 6.1.1 Work done is defined as the product of the force applied on an object and the displacement in the direction of the force. ✓✓
Die arbeid verrig word gedefinieer as die produk van die toegepaste krag op die voorwerp en die verplasing in die rigting van die krag. ✓✓ (2)

6.1.2 Tension ✓ Force of gravity ✓
Spanning ✓ Gravitasiiekrag ✓ (2)

6.1.3 $F_{net} = 0$ ✓
 Block of bricks is moving with constant velocity
Houer met die bakstene beweeg met konstante snelheid ✓ (2)

6.1.4 $P = Fv$ ✓ $F = mg = (50)(9,8) = 490 \text{ N}$ ✓
 $P = (490)(5)$ ✓
 $P = 2\,450 \text{ W}$ ✓ (4)

6.2 6.2.1 Total mechanical energy of a closed system remains constant.
Totale meganiese energie van 'n geslote sisteem bly konstant. ✓✓ (2)

6.2.2 ME at a height **h** above the ground:
*ME op hoogte **h** bokant die grond:*
 $ME_h = \frac{1}{2}mv^2 + mgh$ ✓
 $ME_h = \frac{1}{2}(0,5)(10)^2 + (0,5)(9,8)h$ ✓ (1)
 $ME_{\frac{2}{3}h} = \frac{1}{2}(0,5)(20,34)^2 + (0,5)(9,8)(\frac{2}{3}h)$ ✓ (2)
 (1) = (2)
 $\frac{1}{2}(0,5)(10)^2 + (0,5)(9,8)h = \frac{1}{2}(0,5)(20,34)^2 + (0,5)(9,8)(\frac{2}{3}h)$
 $(\frac{1}{3}h)(9,8)(0,5) = 78,43$
 $h = 48,02 \text{ m}$ ✓
 $ME = \frac{1}{2}(0,5)(10)^2 + (0,5)(9,8)(48,02)$ ✓
 $ME = 260,3 \text{ J}$ ✓ (6)

6.2.3 $(ME)_{at\ h} = (ME)_{ground}$ ✓
 $260,3 = mgh + \frac{1}{2}mv^2$
 $260,3 = 0 + \frac{1}{2}(0,5)(v^2)$ ✓
 $v = 32,27 \text{ m}\cdot\text{s}^{-1}$ ✓ (3)

6.3 6.3.1 0 J ✓
 Normal force is perpendicular to the direction of the displacement. ✓✓
Normaalkrag is loodreg aan die rigting van verplasing. ✓✓ (3)

6.3.2 $W = F\Delta x \cos\theta$ ✓
 $W = (10)(4)(\cos 0^\circ)$ ✓
 $W = 40 \text{ J}$ ✓ (3)

[27]

QUESTION/VRAAG 7

- 7.1 A body which regains its original shape and size completely when the deforming force is removed. ✓✓
Dit is 'n liggaam wat sy oorspronklike grootte en vorm volkome herwin as die vervormingskrag verwyder word. (2)
- 7.2 The internal restoring force per unit area is called stress. ✓✓
Die interne herstelkrag per eenheidsoppervlakte van die liggaam word druk genoem. ✓✓ (2)
- 7.3 7.3.1 Stress is directly proportional to strain. ✓✓
Druk is direk eweredig aan rekking. ✓✓ (2)
- 7.3.2 Hooke's law ✓
Hooke se wet ✓ (1)
- 7.3.3 Tungsten ✓
 Graph of tungsten is steeper than steel. ✓
Grafiek van tungsten (wolfram) is steiler as staal. ✓ (2)
- 7.3.4 $m = \frac{5,4 \times 10^9 - 0}{3 \times 10^{-2} - 0}$ ✓ ✓
 $m = 1,8 \times 10^{11}$
 Modulus of elasticity / *Elastisiteitsmodulus* = $1,8 \times 10^{11}$ Pa ✓ (3)
- 7.4 7.4.1 The property of the fluid to oppose relative motion between the two adjacent layers. ✓✓
Die eienskap van 'n vloeistof om die relatiewe beweging tussen twee aangrensende vlakke teen te werk. ✓✓ (2)
- 7.4.2 Water ✓
 The lower the viscosity, the faster the flow. ✓
Hoe laer die viskositeit – hoe vinniger die vloei. (2)
- 7.4.3 As the temperature of the fluid increases, its viscosity decreases. ✓✓
Indien die temperatuur van die vloeistof toeneem, verminder sy viskositeit. ✓✓ (2)
- 7.5 7.5.1 Pascal's law states that in a continuous liquid at equilibrium, the pressure applied at a point is transmitted equally to the other parts of the liquid. ✓✓
Pascal se wet stel dat in 'n kontinue vloeistof in ewewig die druk wat by enige punt toegepas word eweredig na die ander dele van die vloeistof versprei word. ✓✓ (2)
- 7.5.2 $\frac{F_1}{A_1} = \frac{F_2}{A_2}$ ✓
 $\frac{1765}{284 \times 10^{-6}} \checkmark = \frac{F_2}{507 \times 10^{-6}} \checkmark$
 $F_2 = 3\,150,9 \text{ N}$ ✓ (4)

- 7.5.3 Increases / *Neem toe* ✓ (1)
- 7.5.4 Bulldozer's working systems, dentists' chairs, hydraulic lifts used to lift heavy loads, car jacks ✓✓ (ANY TWO)
Stootskrapeer se werkende sisteme, tandarts-stoele, hidrouliese hysers om swaar vragte te lig, motors se domkragte. ✓✓
 (ENIGE TWEE) (2)

[27]

QUESTION/VRAAG 8

- 8.1 8.1.1 The process of adding impurities to intrinsic / inpure semiconductors. ✓✓
Die proses waardeur onsuierhede by intrinsieke / onsuier halfgeleiers gevoeg word. ✓✓ (2)
- 8.1.2 5 ✓ (1)
- 8.1.3 n-type / *n-tipe* ✓✓ (2)
- 8.1.4 In n-type material current is due to electrons whereas in p-type the current is due to holes. ✓✓
In n-tipe materiaal is die stroom as gevolg van elektrone terwyl in p-tipe is die stroom as gevolg van holtes. ✓✓ (2)
- 8.2 8.2.1 $C = \frac{\epsilon_0 A}{d}$ ✓
 $C = \frac{8,85 \times 10^{-12} \times 10 \times 10^{-4}}{1 \times 10^{-2}}$ ✓
 $C = 8,85 \times 10^{-13} \text{ F}$ ✓
 $Q = CV$ ✓
 $Q = (8,85 \times 10^{-13})(12)$ ✓
 $Q = 1,06 \times 10^{-11} \text{ C}$ ✓ (6)
- 8.2.2 Zero / *Nul* ✓ (1)
- 8.2.3 Area of the plate / *Oppervlak van die plate*
 Distance between the plate / *Afstand tussen die plate.* } (Any TWO)
 Dielectric used / *Diëlektrikum gebruik* } (Enige TWEE) (2)
- 8.3 8.3.1 Energy transferred per second. / *Energie oorgedra per sekonde.* ✓✓ (2)
- 8.3.2 $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ ✓ $R_p = \frac{R_1 R_2}{R_1 + R_2}$ ✓
 $\frac{1}{R} = \frac{1}{26} + \frac{1}{52}$ ✓ **OR/OF** $= \frac{26 \times 52}{26 + 52}$ ✓
 $\frac{1}{R} = \frac{3}{52}$ $= 17,33 \Omega$ ✓
 $R = 17,33 \Omega$ ✓ (3)

8.3.3 **OPTION/OPSIE 1**

$$P = \frac{V^2}{R} \checkmark$$

$$P = \frac{(230)^2}{26} \checkmark$$

$$P = 2\,034,62 \text{ W} \checkmark$$

OPTION/OPSIE 2

$$I = \frac{V}{R} = \frac{230}{26} = 8,85 \text{ A} \checkmark$$

$$P = VI$$

$$= (230)(8,85) \checkmark = 2\,034,62 \text{ W} \checkmark \quad (3)$$

8.3.4 **OPTION/OPSIE 1**

$$W = Pt \checkmark$$

$$= (2\,034,62)(2)(60) \checkmark$$

$$= 244\,154,4 \text{ J} \checkmark$$

OPTION/OPSIE 2

$$W = VIt \checkmark$$

$$= (230)(8,85)(120) \checkmark$$

$$= 244\,154,4 \text{ J} \checkmark$$

(3)

[27]**TOTAL/TOTAAL: 150**