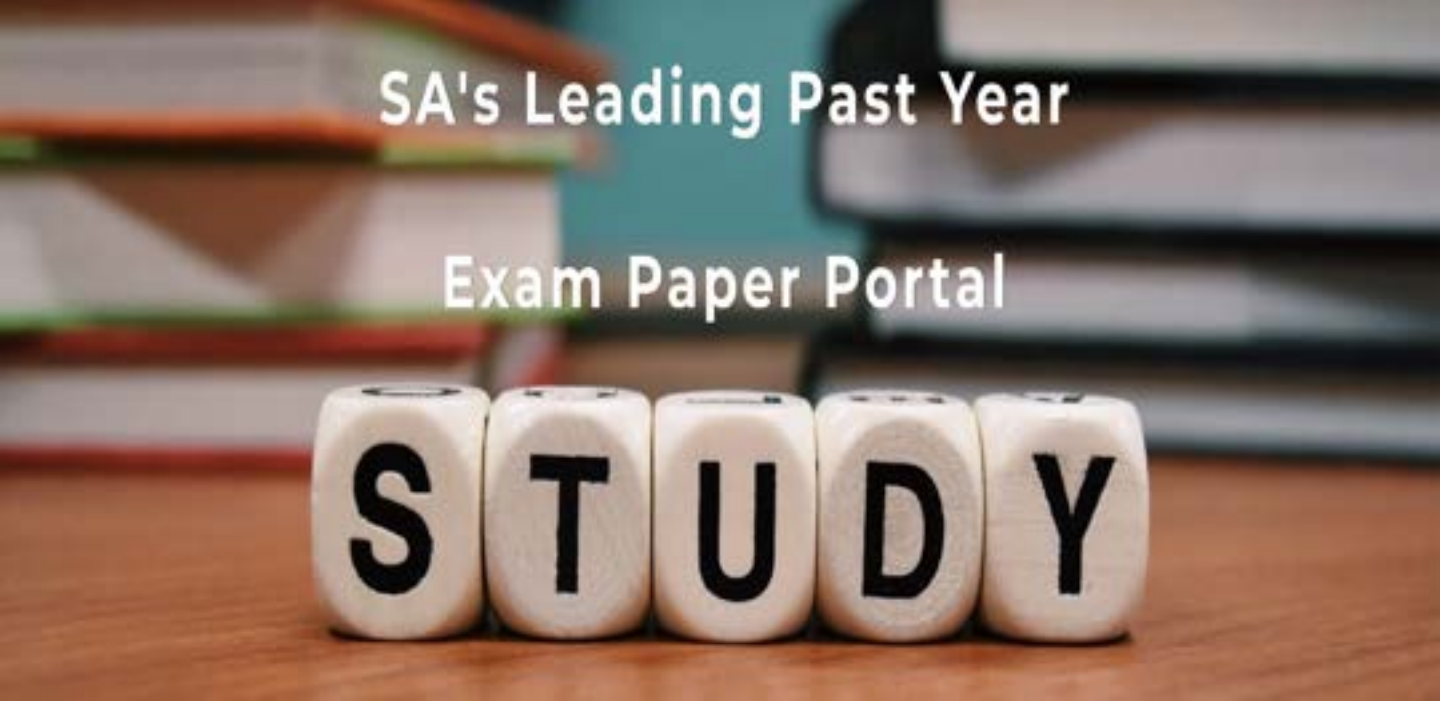

education

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NORTH WEST PROVINCE

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

PHYSICAL SCIENCES: PHYSICS (P1)/ *FISIESE WETENSKAPPE: FISIKA (V1)*

SEPTEMBER 2020

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 7 pages and a cognitive grid of 2 pages/ *Hierdie nasienriglyne bestaan uit 7 bladsye en 'n kognitiewe tabel van 2 bladsye*

Please turn over/*Blaai om asseblief*

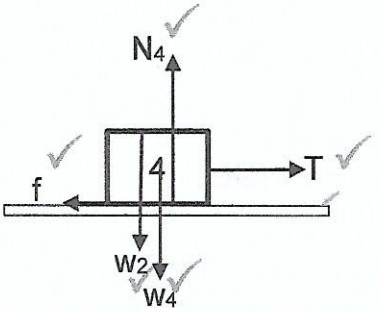
QUESTION 1/*VRAAG 1*

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

QUESTION 2/ *VRAAG 2* netto krag is gelyk aan tempo van verandering in momentum.

2.1 If a net (resultant) force acts on an object, the object will accelerate in the direction of the net force. The acceleration is directly proportional to the net force and inversely proportional to the mass of the object/*Wanneer 'n netto (resulterende) krag op 'n voorwerp inwerk sal die vorrwerp versnel in die rigting van die krag. Die versnelling is direk eweredig aan die krag en omgekeerd eweredig aan die massa.* ✓✓ (2)

2.2



(5)

2.3 $F_N = mg$ ✓ $= (4 + 2)\cdot 9{,}8$ ✓ $= 58{,}8$ N ✓ (3)

2.4 $f_k = \mu\cdot N$ ✓ $= 0{,}3\cdot 58{,}8$ ✓ $= 17{,}64$ N ✓ (3)

2.5

3 kg	6 kg
$F_{net} = ma$ ✓	$F_{net} = ma$
$W - T = m\cdot a$	$T - f = m\cdot a$
$\underline{29{,}4 - T}$ ✓ $= 3\cdot a$ ✓ 1	$T - 17{,}64 = 6\cdot a$ ✓ 2

1 + 2

$29{,}4 - 17{,}64 = 9\cdot a$ ✓

$a = \underline{1{,}31}\ \underline{m\cdot s^{-1}}$ ✓ (6)

[19]

QUESTION 3/*VRAAG 3*

3.1 No/*Nee.*✓

Constant velocity/*Konstante snelheid*:

A $F_A = w$ **B** $F_A = w \cdot \sin\Theta$ ✓✓ (3)

3.2.1 $W = F_{g//} \cdot \Delta X \cdot \cos\Theta = m \cdot g \cdot \sin\Theta \cdot \Delta X \cdot \cos 0°$ ✓

$= \underline{1250 \cdot (9{,}8)}$ ✓ $\cdot \underline{(\frac{9}{18}) \cdot 18 \cdot 1}$ ✓

$= 110250$ J✓ (4)

3.2.2 $P = \frac{W}{\Delta t}$✓ $= \frac{110250}{36}$ ✓ $= 3062{,}5$ W ✓ (3)

3.3 The total mechanical energy (sum of gravitational potential energy and kinetic energy) in an isolated system remains constant/*Die totale meganiese energie (som van die gravitasie potensiele energie en kinetiese energie) in 'n geslote sisteem bly konstant.* ✓✓ (2)

3.4 $E_{m\ top} = E_{m\ bottom}$. ✓

$mgh + ½ mv^2 = mgh + ½ mv^2$

$1250(9{,}8)(9) + 0 = 0 + ½ (1250) v^2$✓

$v^2 = 176{,}4$

$v = 13{,}28\ m \cdot s^{-1}$✓ (3)

[15]

QUESTION 4/*VRAAG 4*

4.1. An object moving under the force of gravity only/*'n Voorwerp wat slegs onder die invloed van gravitasiekrag beweeg.*✓ ✓ (2)

4.2. $v = \frac{\Delta x}{\Delta t} \Rightarrow 4{,}8 = \frac{20}{\Delta t}$ ✓ $\Delta t = 4{,}17$ s

$\Delta y = v_i \cdot \Delta t + \frac{1}{2} \cdot a \cdot t^2$ ✓ $= 0 + 0{,}5 \cdot 9{,}8 \cdot 4{,}17^2$ ✓ $= 85{,}07 - 85{,}21$ m✓

(Range: 85,07 - 85,21) (4)

4.3. The product of the resultant/net force acting on an object and the time the resultant/net force acts on the object. ✓✓ /*Die produk van die netto krag en die tyd wat die krag op die voorwerp inwerk.* ✓✓ (2)

4.4. $v_f = v_i + a \cdot \Delta t$ ✓ $= 0 + 9{,}8 \cdot 4{,}17$ ✓ $= 40{,}87\ m \cdot s^{-1}$

$F_{net}\Delta t = m\Delta v = m(v_f - v_i)$ ✓

$F_{net} \cdot 1{,}2$ ✓ $= 90(0 - 40{,}87)$ ✓

$F_{net} = -3065{,}25$ N

$F_{net} = 3065{,}25$ N ✓ (Range: 3065,25 – 3065,95) (6)

4.5. $F_{net} = \frac{\Delta p}{\Delta t}$ ✓

Δp remains constant/*bly konstant* ✓

Δt increase hence the force decreases or Force is indirectly proportional to time. ✓ /*Δt verleng, dus sal die krag verminder of die krag is omgerkeerd eweredig aan die tyd.* (3)

[17]

QUESTION 5/*VRAAG 5*

5.1. Observed change in frequency when the observer and source move relative to each other/ *waarneembare verandering in frekwensie wanneer waarnemer en bron relatief tot mekaar beweeg.* ✓ ✓ (2)

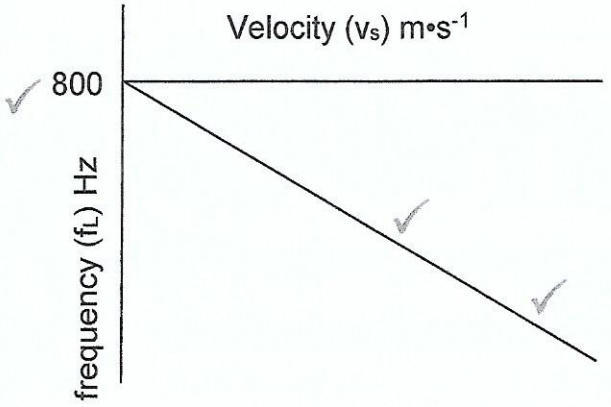
5.2 800 Hz ✓ (1)

5.3 $f_l = \frac{v \mp v_l}{v \mp v_s} f_s$ ✓

950 ✓ $= \left(\frac{340}{340 - v_s}\right)$ ✓ 800 ✓

<u>$V = 53{,}68\ m \cdot s^{-1}$ ✓</u> (5)

5.4



(3)

[11]

QUESTION 6/*VRAAG 6*

6.1 Force between two point charges are directly proportional to the product of the charges and inversely proportional to the square distance between them/*Die krag tussen twee puntladings is direk eweredig aan die produk van die ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle.* ✓✓ (2)

6.2 $F_x = \frac{k\,Q^2}{r^2}$ ✓

$F_y = \frac{k\,Q^2}{(2r)^2}$ ✓ $= \frac{1}{4}\left(\frac{k\,Q^2}{r^2}\right)$

$F_y = \frac{1}{4}F$ ✓ To the right ✓ (4)

Note: Mark direction independently./*merk rigting onafhanklik.*
Answer only/*slegs antwoord* 1/4

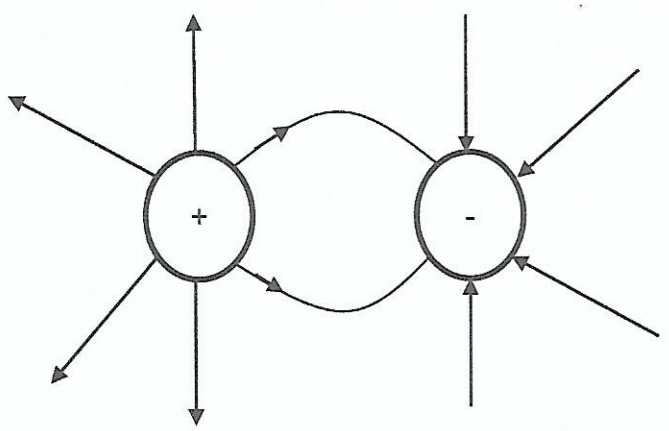
6.3 $F_{net} = F_x + F_y = F - \frac{1}{4}F$ ✓ $= \frac{3}{4}F$ ✓ To the right ✓ (3)

[9]

QUESTION 7/*VRAAG 7*

7.1 The direction of the electric field at a point is the direction that a positive test charge would move if placed at that point. ✓✓ (2)

7.2



✓✓✓ (3)

7.3 $E = \frac{k\,Q_1}{r^2} = \frac{9x10^9\,(3\,x\,10^{-6})}{(0{,}03)^2} = \underline{3 \times 10^7\ C}$ ✓

✓ $E = \frac{k\,Q_2}{r^2} = \frac{9x10^9\,(1\,x\,10^{-6})}{(0{,}03)^2} = \underline{1 \times 10^7\ C}$ ✓

$E_{net} = Q_1 + Q_2$

$= 3 \times 10^7 + 1 \times 10^7$ ✓ $= \underline{4 \times 10^7\ N{\bullet}C^{-1}}$ ✓ to the right ✓ (6)

[11]

QUESTION 8/*VRAAG 8*

8.1 A conductor that obeys Ohm's law *or* the resistance of the conductor remains constant./*'n Geleier wat Ohm se wette gehoorsaam of Die weerstand van die geleier bly konstant.* (1)

8.2 $\frac{1}{R} = \frac{1}{r+r} + \frac{1}{r+r}$ ✓ $= \frac{1}{50} + \frac{1}{15}$ ✓ R = 11,54 Ω✓ (3)

8.3 $I = \frac{V}{R}$ ✓ $= \frac{12}{11,54}$ ✓ => 1,04 A✓ (3)

8.4

8.4.1 V_{BF} = 12 V✓ (1)

8.4.2 $I = \frac{V}{R} = \frac{12}{50}$ A✓ $\therefore V_{AC} = IR = \frac{12}{50} \cdot 20$ ✓ $= 4,80\ V$✓

Or/of (Ratios: $\frac{20}{50}$ ✓ x 12✓ = 4,8 V✓) (3)

8.4.3 $V_{BD} = IR = \frac{12}{15} \cdot 10$ ✓ = 8 V

$V_{CD} = V_{BD} - V_{AC}$✓ = 8 – 4,8 ✓ = 3,2 V✓ (4)

8.5 STAY THE SAME✓ . Parallel circuit, the reading across branches are the same, 12 V. ✓ Change in resistance will affect the current or no internal resistance. ✓ /*BLY DIESELFDE. Paralelle stroombaan, die lesing vir alle vertakkings bly 12 V, Verandering in weerstand sal die stroom beinvloed of geen interne weerstand.* (3)

8.6 $\frac{1}{R_p} = \frac{1}{4} + \frac{1}{4}$ $\therefore R_P = 2\ \Omega$ $\therefore R_{ext} = 2 + 6 = 8\ \Omega$

emf/emk = I(R + r) ✓
10 = 1,2✓ (8 + r) ✓

0,4 = 1,2 r

r = 0,33 Ω✓ (4)

[22]

QUESTION 9/*VRAAG 9*

9.1 The maximum potential difference value reached by the alternating current as it fluctuates i.e. the peak of the sine wave representing an AC potential difference. ✓✓ /*Die maksimum potensiaal verskil/ spanning bereik deur die verskille in die stroom as dit verander, bv. die piek van die sinusgolf stel AC potesiaal voor.* (2)

9.2 $V_{rms} = \frac{V_{max}}{\sqrt{2}}$ ✓ $= \frac{311}{\sqrt{2}}$ ✓ = 219,91 V✓ (3)

9.3 $f = \frac{\text{no of waves}}{\Delta t} = \frac{2,5}{0,1}$ ✓ = 25 Hz ✓ (2)

9.4 $P_{av} = \frac{V_{rms}^2}{R}$ ✓ $= \frac{219,91^2}{4}$ ✓ = 12 090,10 W✓ (Range: 12090,10 – 12090,13) (3)

9.5 $P = I^2R$✓

$12090,10 = I^2 8$✓

$I = 38,87$ A✓ (3)

9.6 Increases/*Verhoog*✓

The rate of change in magnetic flux increase✓ , this increase the emf of the generator✓ /*Die tempo van verandering in manetiese flux verhoog, dit verhoog die emf van die generator.* (3)

[16]

QUESTION 10/*VRAAG 10*

10.1 Photo electrons that has particle properties and wave properties✓✓ /Foto-elektrone wat deeltjie eienskappe en golf eienskappe toon. (2)

10.2 $E = h\frac{c}{\lambda}$ ✓ $= 6,63 \times 10^{-34} \cdot \frac{3 \times 10^8}{1 \times 10^{-12}}$ ✓ $= 1,99 \times 10^{13}$ J ✓ (3)

10.3 $E = W_o + E_k$ ✓

$\underline{1,99 \times 10^{-13} = 1,9 \times 10^{-13}}$ ✓ $+ \underline{\frac{1}{2}(9.11 \times 10^{-31})}\, v^2$✓

$V = 2,4 \times 10^8\ m \cdot s^{-1}$

$p = mv = 9.11 \times 10^{-31} \cdot 2,4 \times 10^8$✓ $= \underline{2,19 \times 10^{22}\ kg \cdot m \cdot s^{-1}}$ ✓ (5)

[10]

TOTAL/*TOTAAL:* 150