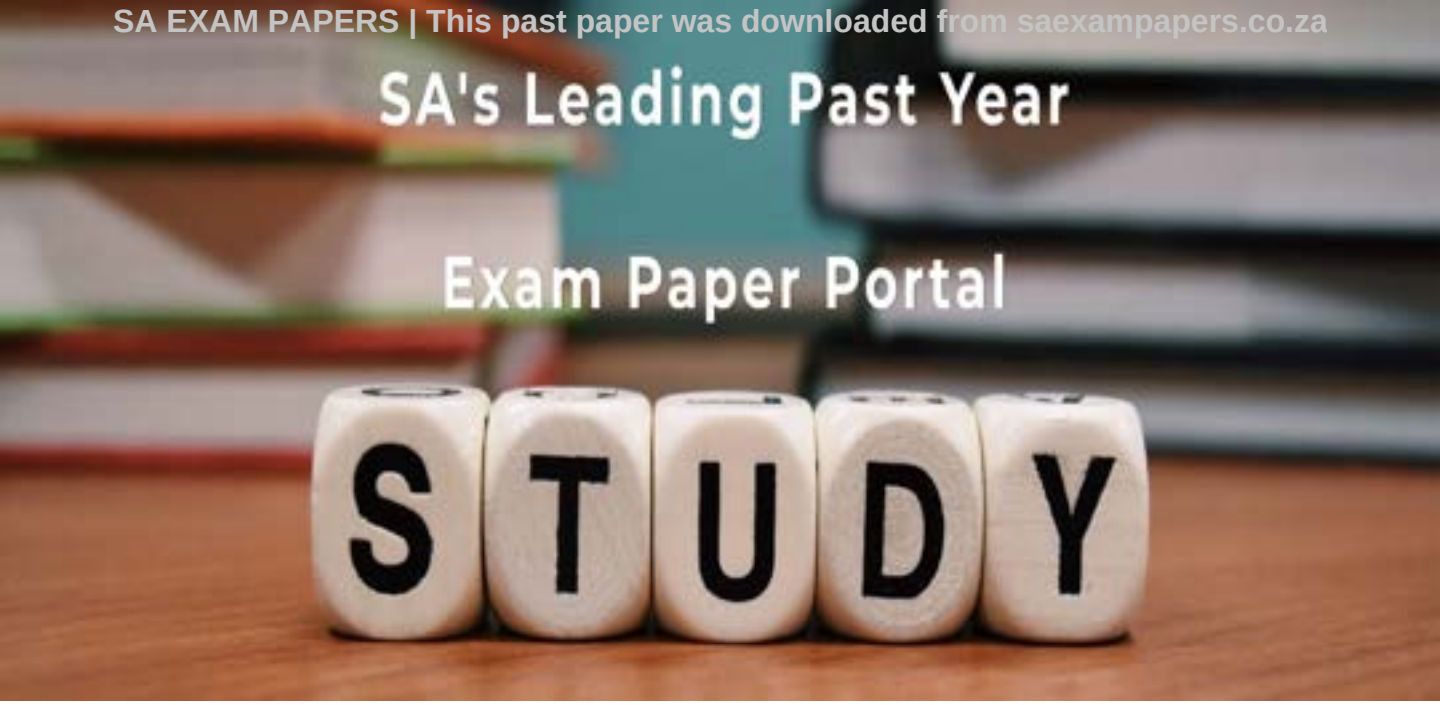

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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

JUNE/*JUNIE* 2025

PHYSICAL SCIENCES P1/ *FISIESE WETENSKAPPE V1* MARKING GUIDELINE/*NASIENRIGLYN*

MARKS/*PUNTE*: **150**

This marking guideline consists of 17 pages./
Hierdie nasienriglyn bestaan uit 17 bladsye.

GENERAL GUIDELINES/*ALGEMENE RIGLYNE*

1. CALCULATIONS/*BEREKENINGE*

1.1 **Marks will be awarded for**: correct formula, correct substitution, correct answer with unit.
Punte sal toegeken word vir: *korrekte formule, korrekte substitusie, korrekte antwoord met eenheid.*

1.2 **No marks** will be awarded if an **incorrect or inappropriate formula is used**, even though there are many relevant symbols and applicable substitutions.
Geen punte *sal toegeken word waar 'n* ***verkeerde of ontoepaslike formule gebruik word nie****, selfs al is daar relevante simbole en relevante substitusies.*

1.3 When an error is made during **substitution into a correct formula**, a mark will be awarded for the correct formula and for the correct substitutions, but **no further marks** will be given.
Wanneer 'n fout gedurende ***substitusie in 'n korrekte formule*** *begaan word, sal 'n punt vir die korrekte formule en vir korrekte substitusies toegeken word, maar* ***geen verdere punte*** *sal toegeken word nie.*

1.4 If **no formula** is given, but **all substitutions are correct**, a candidate will **forfeit one mark.**
Indien ***geen formule*** *gegee is nie, maar* ***al die substitusies is korrek****,* ***verloor*** *die kandidaat* ***een punt****.*

1.5 **No penalisation** if **zero substitutions are omitted** in calculations where **correct formula**/**principle** is correctly given.
Geen penalisering *indien* ***nulwaardes nie getoon*** *word nie in berekeninge waar die* ***formule/beginsel korrek gegee is nie****.*

1.6 Mathematical manipulations and change of subject of appropriate formulae carry no marks, but if a candidate starts off with the correct formula and then changes the subject of the formula incorrectly, marks will be awarded for the formula and correct substitutions. The mark for the incorrect numerical answer is forfeited.
Wiskundige manipulasies en verandering van die onderwerp van toepaslike formules tel geen punte nie, maar indien 'n kandidaat met die korrekte formule begin en dan die onderwerp van die formule verkeerd verander, sal die punte vir die formule en korrekte substitusies toegeken word. Die punt vir die verkeerde numeriese antwoord word verbeur.

1.7 Marks are only awarded for a formula if a **calculation has been attempted**, i.e. substitutions have been made or a numerical answer given.
Punte word slegs vir 'n formule toegeken indien ***'n poging tot berekening aangewend*** *is, d.w.s. substitusies is gedoen of 'n numeriese antwoord is gegee.*

1.8 Marks can only be allocated for substitutions when values are substituted into formulae and not when listed before a calculation starts.
Punte kan slegs toegeken word vir substitusies wanneer waardes in formules ingestel word en nie vir waardes wat voor 'n berekening gelys is nie.

1.9 All calculations, when not specified in the question, must be done to a minimum of two decimal places.
Alle berekeninge, wanneer nie in die vraag gespesifiseer word nie, moet tot 'n minimum van twee desimale plekke gedoen word.

1.10 If a final answer to a calculation is correct, full marks will not automatically be awarded. Markers will always ensure that the correct/appropriate formula is used and that workings, including substitutions, are correct.
Indien 'n finale antwoord van 'n berekening korrek is, sal volpunte nie outomaties toegeken word nie. Nasieners sal altyd verseker dat die korrekte/toepaslike formule gebruik word en dat bewerkings, insluitende substitusies korrek is.

1.11 Questions where a series of calculations have to be made (e.g. a circuit diagram question) do not necessarily always have to follow the same order. FULL MARKS will be awarded provided it is a valid solution to the problem. However, any calculation that will not bring the candidate closer to the answer than the original data, will not count any marks.
Vrae waar 'n reeks berekeninge gedoen moet word (bv. 'n stroombaan-diagramvraag) hoef nie noodwendig dieselfde volgorde te hê nie. VOLPUNTE sal toegeken word op voorwaarde dat dit 'n geldige oplossing vir die probleem is. Enige berekening wat egter nie die kandidaat nader aan die antwoord as die oorspronklike data bring nie, sal geen punte tel nie.

2. UNITS/*EENHEDE*

2.1 Candidates will only be penalised once for the repeated use of an incorrect unit **within a question**.
*Kandidate sal slegs een keer gepenaliseer word vir die herhaaldelike gebruik van 'n verkeerde eenheid **in 'n vraag**.*

2.2 Units are only required in the final answer to a calculation.
Eenhede word slegs in die finale antwoord op 'n vraag verlang.

2.3 Marks are only awarded for an answer, and not for a unit *per se*. Candidates will therefore forfeit the mark allocated for the answer in each of the following situations:

- Correct answer + wrong unit
- Wrong answer + correct unit
- Correct answer + no unit

Punte sal slegs vir 'n antwoord en nie vir 'n eenheid per se toegeken word nie. Kandidate sal die punt vir die antwoord in die volgende gevalle verbeur:

- *Korrekte antwoord + verkeerde eenheid*
- *Verkeerde antwoord + korrekte eenheid*
- *Korrekte antwoord + geen eenheid*

2.4 SI units must be used except in certain cases, e.g. $V \cdot m^{-1}$ instead of $N \cdot C^{-1}$, and $cm \cdot s^{-1}$ or $km \cdot h^{-1}$ instead of $m \cdot s^{-1}$ where the question warrants this.
SI-eenhede moet gebruik word, behalwe in sekere gevalle, bv. $V \cdot m^{-1}$ in plaas van $N \cdot C^{-1}$, en $cm \cdot s^{-1}$ of $km \cdot h^{-1}$ in plaas van $m \cdot s^{-1}$ waar die vraag dit regverdig.

3. GENERAL/*ALGEMEEN*

3.1 If one answer or calculation is required, but two are given by the candidate, only the first one will be marked, irrespective of which one is correct. If two answers are required, only the first two will be marked, etc.
Indien een antwoord of berekening verlang word, maar twee word deur die kandidaat gegee, sal slegs die eerste een nagesien word, ongeag watter een korrek is. Indien twee antwoorde verlang word, sal slegs die eerste twee nagesien word, ens.

3.2 For marking purposes, alternative symbols (s, u, t, etc.) will also be accepted.
Vir nasiendoeleindes sal alternatiewe simbole (s, u, t, ens.) ook aanvaar word.

3.3 Separate compound units with a multiplication dot, not a full stop, for example, $m•s^{-1}$.
For marking purposes, $m•s^{-1}$ and m/s will also be accepted.
Skei saamgestelde eenhede met 'n vermenigvuldigingspunt en nie met 'n punt nie, byvoorbeeld $m•s^{-1}$.
Vir nasiendoeleindes sal $m•s^{-1}$ en m/s ook aanvaar word.

4. POSITIVE MARKING/*POSITIEWE NASIEN*

Positive marking regarding calculations will be followed in the following cases:
Positiewe nasien met betrekking tot berekeninge sal in die volgende gevalle geld:

4.1 **Subquestion to subquestion:** When a certain variable is calculated in one subquestion (e.g. 3.1) and needs to be substituted in another (3.2 of 3.3), e.g. if the answer for 3.1 is incorrect and is substituted correctly in 3.2 or 3.3, **full marks** are to be awarded for the subsequent subquestions.
***Subvraag na subvraag**: Wanneer 'n sekere veranderlike in een subvraag (bv. 3.1) bereken word en dan in 'n ander vervang moet word (3.2 of 3.3), bv. indien die antwoord vir 3.1 verkeerd is en word korrek in 3.2 of 3.3 vervang, word **volpunte** vir die daaropvolgende subvraag toegeken.*

4.2 **A multistep question in a subquestion**: If the candidate has to calculate, for example, current in die first step and gets it wrong due to a substitution error, the mark for the substitution and the final answer will be forfeited.
*'n **Vraag met veelvuldige stappe in 'n subvraag**: Indien 'n kandidaat bv. die stroom verkeerd bereken in 'n eerste stap as gevolg van 'n substitusiefout, verloor die kandidaat die punt vir die substitusie sowel as die finale antwoord.*

5. NEGATIVE MARKING/*NEGATIEWE NASIEN*

Normally an incorrect answer cannot be correctly motivated if based on a conceptual mistake. If the candidate is therefore required to motivate in QUESTION 3.2 the answer given in QUESTION 3.1, and QUESTION 3.1 is incorrect, no marks can be awarded for QUESTION 3.2. However, if the answer for e.g. QUESTION 3.1 is based on a calculation, the motivation for the incorrect answer could be considered.
'n Verkeerde antwoord, indien dit op 'n konsepsuele fout gebaseer is, kan normaalweg nie korrek gemotiveer word nie. Indien 'n kandidaat gevra word om in VRAAG 3.2 die antwoord op VRAAG 3.1 te motiveer en VRAAG 3.1 is verkeerd, kan geen punte vir VRAAG 3.2 toegeken word nie. Indien die antwoord op bv. VRAAG 3.1 egter op 'n berekening gebaseer is, kan die motivering vir die verkeerde antwoord in VRAAG 3.2 oorweeg word.

QUESTION/*VRAAG* 1: MULTIPLE-CHOICE QUESTIONS
MEERVOUDIGEKEUSE-VRAE

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

[20]

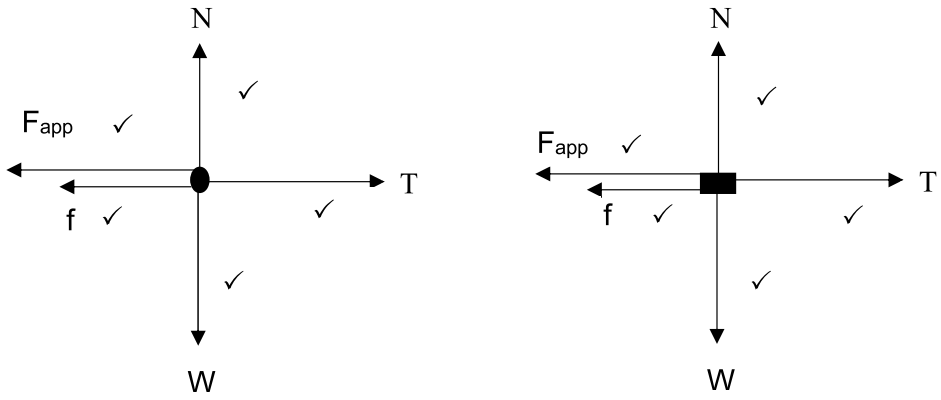
QUESTION/*VRAAG* 2

2.1 When a resultant/net force acts on an object, the object will accelerate in the direction of the resultant/net force with an acceleration that is directly proportional to the resultant/net force ✓ and inversely proportional to the mass ✓of the object.
Wanneer 'n resultante/netto krag op 'n voorwerp inwerk, sal die voorwerp in die rigting van die resulterende/netto krag versnel met 'n versnelling wat direk eweredig is aan die resultante/netto krag en omgekeerd eweredig aan die massa van die voorwerp.

Acceleration is directly proportional to the resultant/net force ✓and inversely proportional to the mass of the object. ✓
Versnelling wat direk eweredig is aan die resultante/netto krag en omgekeerd eweredig aan die massa van die voorwerp is.

The resultant/net force acting on an object is directly proportional the rate of change in momentum. ✓✓ (2 or 0)
Die resulterende/netto krag wat op 'n voorwerp inwerk is direk eweredig aan die tempo van verandering in momentum. (2 of 0) (2)

2.2



Mark awarded for arrow and label / *Punt toegeken vir benoeming en pyltjie*
Do not penalise for length of arrows since drawing is not drawn to scale/ *Moenie vir die lengte van die pyltjies penaliseer nie, die tekening is nie volgens skaal geteken nie*
Any other additional force(s)/ *Enige ander addisionele krag(te)* $^{4}/_{5}$
If force(s) do not make contact with body / *Indien krag(te) nie met die voorwerp kontak maak nie:* Max./ *Maks.* $^{4}/_{5}$ (5)

2.3 2.3.1 $f_k = \mu_k N$ / $f_k = \mu_k mg$ } Any one / *Enige een* ✓
$f_k = 0,2 \times 8 \times 0,8$ ✓
$f_k = 15,68$ N ✓ (3)

Positive marking from QUESTION 2.3.1 / Positiewe nasien vanaf VRAAG 2.3.1

DOWNWARDS POSITIVE / *AFWAARTS AS POSITIEF*	**UPWARDS POSITIVE/ *OPWAARTS AS POSITIEF***
2.3.2 $F_{net} = ma$ / $F_g - T = ma$ / $T - F - f = ma$ } Any one / *Enige een* ✓	$F_{net} = ma$ / $T - F_g = ma$ / $F + f - T = ma$ } Any one / *Enige een* ✓
$T - 76 - 15,68 = 0$ ✓	$76 + 15,68 - T = 0$ ✓
$T = 91,68$ N	$T = 91,68$ N
$m \times 9,8 - 91,68 = 0$ ✓	$91,68 - (m \times 9,8) = 0$ ✓
$m = 9,36$ kg ✓ (4)	$m = 9,36$ kg ✓ (4)

2.4 2.4.1 Remains the same / *Bly dieselfde* ✓ (1)

2.4.2 Decrease / *Afneem*.✓ Normal force decreases / *Normaal krag neem af*. ✓
$N = F_g - F\sin\theta$ $f_k \alpha N$ / $f_k = \mu_k N$ ✓ (3)
[18]

QUESTION/*VRAAG* 3

3.1 Each body in the universe attracts every other body with a force that is directly proportional to the product of their masses ✓and inversely proportional to the square of the distance between their centres. ✓
Elke liggaam in die heelal trek elke ander liggaam aan met 'n krag wat direk eweredig is aan die produk van hul massas en omgekeerd eweredig aan die kwadraat van die afstand tussen hul middelpunte. (2)

3.2 $F = \frac{Gm_1m_2}{d^2}$ ✓

$F = \frac{6,67 \times 10^{-11} 6,42 \times 10^{23} \times 5,98 \times 10^{24}}{(3,93 \times 10^{6} + 1,5 \times 10^{6} + 6,38 \times 10^{6})^2}$ ✓ ✓

$F = 1,84 \times 10^{24}$ N ✓ (4)

3.3 **Positive marking from QUESTION 3.2 / *Positiewe nasien vanaf VRAAG 3.2***

$F_2 = \frac{Gm_1m_2}{d^2}$ ✓

$F_2 = \frac{6,67 \times 10^{-11} \times 1,92 \times 10^{25} \times 5,98 \times 10^{24}}{d^2}$ ✓

$F_2 = 7,658 \times 10^{39}/d^2$

$F_{net} = F_{CB} - F_{AB}$

$0 = 7,658 \times 10^{39}/d^2 - 1,84 \times 10^{24}$ ✓

$d = 6,45 \times 10^{7}$ m ✓

$X = 6,45 \times 10^{7} - 6,38 \times 10^{6} - 7,20 \times 10^{6}$ ✓

$X\ 5,09 \times 10^{7}$ m ✓ (6)

[12]

QUESTION/*VRAAG* 4

4.1 The gradient represents the acceleration due to gravity (g*)* which is constant for free fall. ✓
Die gradiënt verteenwoordig die versnelling as gevolg van gravitasie (g) wat konstant is vir vrye val. (1)

4.2 DOWNWARDS IS POSITIVE/ *AFWAARTS IS POSITIEF* ✓ (1)

4.3 Twice / *twee keer* ✓ (1)

4.4 4.4.1

DOWNWARDS IS POSITIVE ***AFWAARTS IS POSITIEF***	**DOWNWARDS IS NEGATIVE** ***AFWAARTS IS NEGATIEF***
$v_f = v_i + a\Delta t$ ✓	$v_f = v_i + a\Delta t$ ✓
$v_f = 0 + (9,8)\ (2)$ ✓	$v_f = 0 + (-9,8)\ (2)$ ✓
$v_f = 19,6$ m.s^{-1} downwards/ *afwaarts* ✓	$v_f = -19,6$ $V_I = 19,6$ m.s^{-1} downwards/*afwaarts* ✓

(3)

4.4.2

DOWNWARDS IS POSITIVE ***AFWAARTS IS POSITIEF***	**DOWNWARDS IS NEGATIVE** ***AFWAARTS IS NEGATIEF***
$v_f = v_i + a\Delta t$ ✓	$v_f = v_i + a\Delta t$ ✓
$15 = 0 + 9,8\ \Delta t$ ✓	$-15 = 0 + (-9,8)\ \Delta t$ ✓
$\Delta t = 1,53$ s	$\Delta t = 1,53$ s
$T = 4 + 1,53$ ✓	$T = 4 + 1,53$ ✓
$T = 5,53$ s ✓	$T = 5,53$ s ✓

(4)

4.4.3

OPTION 1 / *OPSIE 1*

DOWNWARDS IS POSITIVE ***AFWAARTS IS POSITIEF***	**DOWNWARDS IS NEGATIVE** ***AFWAARTS IS NEGATIEF***
$\Delta x = v_i\ \Delta t + \frac{1}{2}\ a\ \Delta t^2$ ✓	$x = v_i\ \Delta t + \frac{1}{2}\ a\ \Delta t^2$ ✓
$\Delta x = 0\ \underline{x\ 2} + \frac{1}{2}\ (9,8) \times 2^2$ ✓	$\Delta x = 0\ \underline{x\ 2} + \frac{1}{2}\ (-9,8) \times 2^2$ ✓
$\Delta x = 19,6$ m ✓	$\Delta x = -19,6$ $\Delta x = 19,6$ m ✓

OPTION 2 / *OPSIE 2*

DOWNWARDS IS POSITIVE ***AFWAARTS IS POSITIEF***	**DOWNWARDS IS NEGATIVE** ***AFWAARTS IS NEGATIEF***
$\Delta x = \frac{V_f + V_i}{2}\ \Delta t$ ✓	$x = \frac{V_f + V_i}{2}\ \Delta t$ ✓
$\Delta x = \frac{0+19,6}{2} \times 2$ ✓	$\Delta x = \frac{0+(-19,6)}{2} \times 2$ ✓
$\Delta x = 19,6$ m ✓	$\Delta x = -19,6$ m $\Delta x = 19,6$ m ✓

OPTION 3 / *OPSIE 3*

DOWNWARDS IS POSITIVE *AFWAARTS IS POSITIEF*	**DOWNWARDS IS NEGATIVE** *AFWAARTS IS NEGATIEF*
$v_f^2 = v_i^2 + 2\Delta x$ ✓	$v_f^2 = v_i^2 + 2\Delta x$ ✓
$19,6^2 = 0 + 2 \times 9,8\ \Delta x$ ✓	$-19,6^2 = 0 + 2 \times (-9,8)\ \Delta x$ ✓
$\Delta x = 19,6$ m ✓	$\Delta x = -19,6$
	$\Delta x = 19,6$ m ✓ (3)

4.4.4 **OPTION 1 / *OPSIE 1***

DOWNWARDS IS POSITIVE *AFWAARTS IS POSITIEF*	**DOWNWARDS IS NEGATIVE** *AFWAARTS IS NEGATIEF*
$\Delta x = v_i\ \Delta t + ½\ a\ \Delta t^2$ ✓	$\Delta x = v_i\ \Delta t + ½\ a\ \Delta t^2$ ✓
$\Delta x = -11,24 \times 1,2 + ½\ (9,8) \times 1,2^2$ ✓	$\Delta x = 11,24 \times 1,2 + ½\ (-9,8) \times 1,2^2$ ✓
$\Delta x = -6,43$	$\Delta x = 6,43$ m ✓
$\Delta x = 6,43$ m ✓	

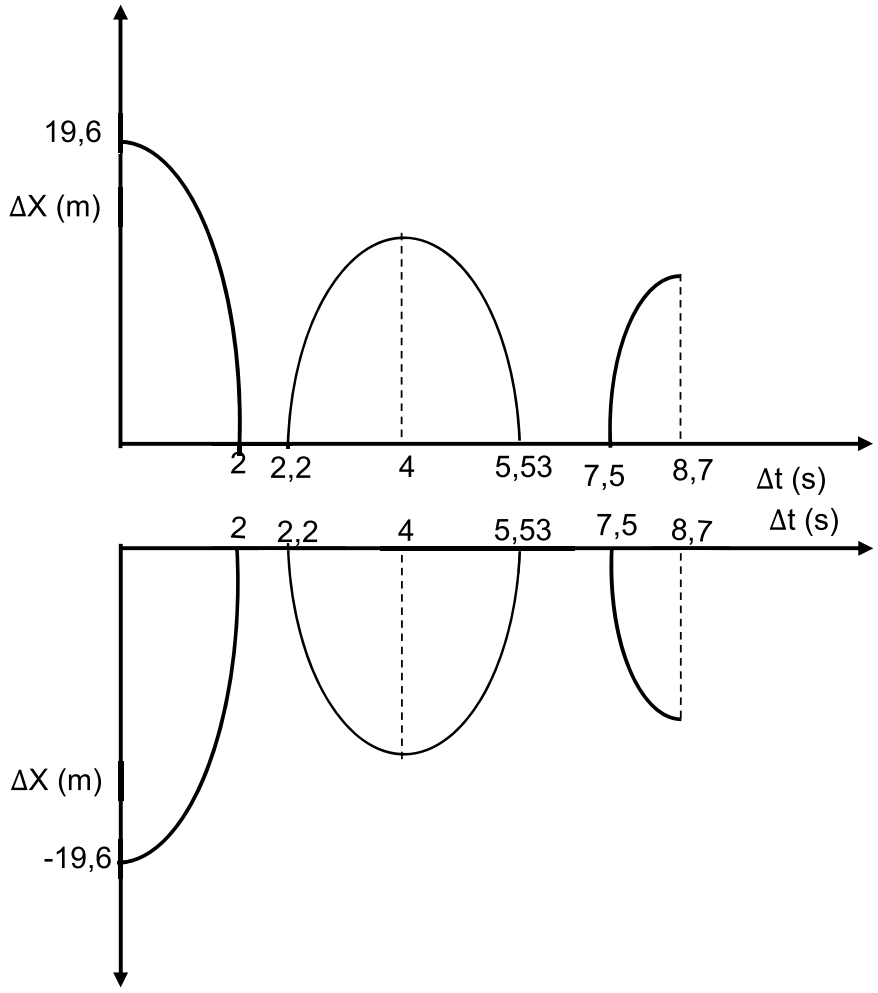
OPTION 2 / *OPSIE 2*

DOWNWARDS IS POSITIVE *AFWAARTS IS POSITIEF*	**DOWNWARDS IS NEGATIVE** *AFWAARTS IS NEGATIEF*
$\Delta x = \frac{V_f + V_i}{2}\ \Delta t$ ✓	$x = \frac{V_f + V_i}{2}\ \Delta t$ ✓
$\Delta x = \frac{0+11,24}{2} \times 1,2$ ✓	$\Delta x = \frac{0+(-19,6)}{2} \times 1,2$ ✓
$\Delta x = 6,74$ m ✓	$\Delta x = -6,74$ m
	$\Delta x = 6,74$ m ✓

OPTION 3 / *OPSIE 3*

DOWNWARDS IS POSITIVE *AFWAARTS IS POSITIEF*	**DOWNWARDS IS NEGATIVE** *AFWAARTS IS NEGATIEF*
$v_f^2 = v_i^2 + 2\Delta x$ ✓	$v_f^2 = v_i^2 + 2\Delta x$ ✓
$0^2 = -11,24^2 + 2 \times 9,8\ \Delta x$ ✓	$0^2 = 11,24^2 + 2 \times (-9,8)\ \Delta x$ ✓
$\Delta x = 6,45$ m ✓	$\Delta x = -6,45$
	$\Delta x = 6,45$ m ✓ (3)

4.5 **Positive marking from QUESTION 4.4.2 / *Positiewe nasien vanaf VRAAG 4.4.2***



CRITERIA FOR MARKING / *NASIENKRITERIA*	
Correct shape/ *Korrekte vorm*	✓
Point of projection indicated / *Projeksiepunt aangedui*	✓
Maximum height indicated/ *Maksimum hoogte aangedui*	✓
All relevant times indicated/ *Alle relevante tye aangedui*	✓

(4)
[20]

QUESTION/*VRAAG* 5

5.1 In an isolated system total linear momentum is conserved. ✓✓
In 'n geïsoleerde sisteem is die totale lineêre momentum behoue. (2)

5.2 $p = mv$ ✓
$p = (1\ 200 + 500) \times 12$ ✓
$p = 20\ 400\ kg.m.s^{-1}$ Right/ *Regs.* ✓ (3)

5.3 Right. Newton's first law of motion. A body will remain at rest or motion at constant velocity unless a non-zero resultant/net force acts on it
Regs. Newton se eerste bewegingswet. 'n Liggaam sal in rus bly of teen konstante snelheid beweeg, tensy 'n nie-nul-resulterende/netto krag daarop inwerk (3)

5.4 $\sum p_i = \sum p_f$
$(m_A + m_B)\ v_i = m_A v_{fA} + m_B v_{fB}$] Any one / *Enige een* ✓
$20\ 400$ ✓ $= 1\ 200 \times 15 + 500 v_{fB}$ ✓
$v_{IB} = 4{,}8\ m.s^{-1}$ right ✓ (4)

5.5 $E_k = \frac{1}{2}mv^2$ ✓
$E_{ki} = \frac{1}{2} \times (1\ 200 + 500) \times 12^2$ ✓
$E_{ki} = 122400\ J$
$E_{kf} = \frac{1}{2} \times 1\ 200 \times 15^2 + \frac{1}{2} \times 500 \times 4{,}8^2$ ✓
$E_{kf} = 140\ 760\ J$
$E_{ki} \neq E_{kf}$ ✓
Collision is inelastic/ *Botsing is onelasties.* ✓ (5)
[17]

QUESTION/*VRAAG* 6

6.1 In an isolated system the total mechanical energy is conserved. ✓✓
In 'n geïsoleerde sisteem, is die totale meganiese energie behoue. (2)

6.2 $W_{Fg} = - \Delta E_p$
$W_{Fg} = - mg (h_2 - h_1)$ } Any one / *Enige een* ✓
$W_{Fg} = - 0,5 \times 9,8 (0 - 2)$ ✓
$W_{Fg} = 9,8$ J ✓ (3)

6.3 **Positive marking from QUESTION 6.2 / *Positiewe nasien vanaf VRAAG 6.2***

OPTION 1/ *OPSIE 1*

$ME_{total} = \Delta E_{k(crate)} + \Delta E_{p(ball)} + W_f$
$ME_{total} = ½mv_f^2 - ½mv_i^2 + mgh_2 - mgh_1$ } Any one / *Enige een* ✓
$9,8 = ½ \times 1,5v^2 - 0$ ✓ $+ 0,5 \times 9,8 \times 0,6 - 0$ ✓ $+ 5 \times 5\cos 180^o$ ✓
$v_f = 6,52$ m.s^{-1} ✓

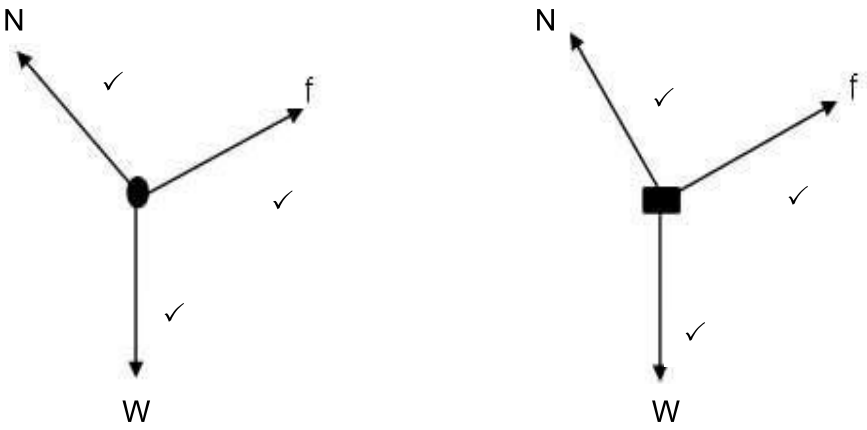
OPTION 2 / *OPSIE 2*

$ME_{lost} = \Delta E_{k(crate)} + W_f$ ✓
$ME_{lost} = ½mv_f^2 - ½mv_i^2 + W_f$ } Any one / *Enige een* ✓
$9,8 - (0,5 \times 9,8 \times 0,6)$ ✓ $= ½ \times 1,5v^2 - 0$ ✓ $+ 5 \times 5\cos 180^o$ ✓
$v_f = 6,52$ m.s^{-1} ✓ (5)
[10]

QUESTION/*VRAAG 7*

7.1 A force for which the work done in moving an object between two points depends on the path taken. ✓✓
'n Krag waarvoor die arbeid verrig om 'n voorwerp tussen twee punte te beweeg, afhanklik is van die roete wat gevolg word. (2)

7.2



Mark awarded for arrow and label / *Punt toegeken vir benoeming en pyltjie*
Do not penalise for length of arrows since drawing is not drawn to scale/ *Moenie vir die lengte van die pyltjies penaliseer nie, aangesien die tekening nie volgens skaal geteken is nie*
Any other additional force(s) / *Enige addisionele krag(te)* $^{2}/_{3}$
If force(s) do not make contact with body. / *Indien krag(te) nie met die voorwerp kontak maak nie:* Max/ *Maks* $^{2}/_{3}$ (3)

7.3 The net work done on an object is equal to the object's change in kinetic energy. ✓✓
Die netto krag wat op 'n voorwerp verrig is, gelyk aan die voorwerp se verandering in kinetiese energie. (2)

7.4 7.4.1 **OPTION 1 / *OPSIE 1***

$W_{nc} = \Delta E_k + \Delta E_p$
$W_f = \Delta E_k + \Delta E_p$
$W_f = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 + mgh_2 - mgh_1$] Any one / *Enige een* ✓

$2{,}5 \times \frac{5}{\sin 10^o} \cos 180^o$ ✓ = $\frac{1}{2} \times 2 \times v_f^2 - 1{,}5^2$ ✓ + $2 \times 9{,}8 \times 0 - 2 \times 9{,}8 \times 5$ ✓

$v_f = 5{,}32\ m.s^{-1}$ ✓

OPTION 2 / *OPSIE 2*

$W_{net} = \Delta E_k$
$W_{Fg} + W_f = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$] Any one / *Enige een* ✓

$2 \times 9{,}8 \times 5\cos 0^o$ ✓ + $2{,}5 \times \frac{5}{\sin 10^o} \cos 180^o$ ✓ = $\frac{1}{2} \times 2 \times v_f^2 - 1{,}5^2$ ✓

$v_f = 5{,}32\ m.s^{-1}$ ✓ (5)

7.4.2 **Positive marking from QUESTION 7.4.1 / Positiewe nasien vanaf VRAAG 7.4.1**

OPTION 1 / *OPSIE 1*

$f_k = \mu_k N$

$2,5 = \mu_k \times 2 \times 9,8\cos 10^o$ ✓

$\mu_k = 0,13$

$W_f = \Delta E_k + \Delta E_p$

$W_f = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 + mgh_2 - mgh_1$ } Any one / *Enige een* ✓

$0,13\ (2 \times 9,8)\ \Delta x \cos 180^o$ ✓ $= \underline{\frac{1}{2} \times 2 \times 0^2 - \frac{1}{2} \times 2 \times 5,32^2}$ ✓ $+ 0$

$\Delta x = 11,11$ m ✓

OPTION 2 / *OPSIE 2*

$f_k = \mu_k N$

$2,5 = \mu_k \times 2 \times 9,8\cos 10^o$ ✓

$\mu_k = 0,13$

$W_{net} = \Delta E_k$

$W_f = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ } Any one / *Enige een* ✓

$\underline{0,13\ (2 \times 9,8)\ \Delta x \cos 180^o}$ ✓ $= \underline{\frac{1}{2} \times 2 \times 0^2 - 5,32^2}$ ✓

$\Delta x = 11,11$ m ✓ (5)

[17]

QUESTION/*VRAAG 8*

8.1 The change in frequency or pitch of sound detected by a listener because the sound source and the listener have different velocities relative to the medium of sound propagation. ✓✓
Die verandering in frekwense of toonhoogte van die klank waargeneem deur 'n luisteraar omdat die klankbron en die luisteraar verskillende snelhede relatief tot die medium waarin die klank voortgeplant word, het. (2)

8.2 AWAY FROM. ✓Detector records lower frequency. ✓
WEG VAN. Die detektor teken laer frekwensie aan. (2)

8.3 As the fire truck moves away from the detector, the wave fronts behind the truck become stretched out. ✓ The detector registers longer wavelength ✓ and lower frequency ✓
Soos die brandweerwa wegbeweeg van die detektor, word die golffronte agter die trok uitgerek. Die detektor registreer langer golflengte en laer frekwensie (3)

8.4 8.4.1 $v = f\lambda$ ✓
$340 = f \times 0{,}34$ ✓
$f = 1000$ Hz ✓ (3)

8.4.2 $f_L = \frac{v \pm v_L}{V \pm V_S} f_s$ ✓
$f_L = \frac{340}{340+20}$ ✓✓x 1000 ✓
$f_L = 944{,}44$ Hz
$v = f\lambda$
$340 = 944{,}44\ \lambda$ ✓
$\lambda = 0{,}36$ m ✓ (6)

8.5 8.5.1 Remains the same / *Bly dieselfde* ✓ (1)

8.5.2 Decreases / *Afneem* ✓ (1)
[18]

QUESTION/*VRAAG 9*

9.1 POSITIVE.✓ It is repelled by charge Q_A. ✓
POSITIEF. Dit word weggestoot deur lading Q_A. (2)

9.2 The magnitude of the electrostatic force exerted by one point charge on another point charge is directly proportional to the product of the magnitude of the charges ✓ and inversely proportional to the square of the distance between them. ✓
Die grootte van die elektrostatiese krag wat deur een puntlading op 'n ander puntlading uitgeoefen word, is direk eweredig aan die produk van die grootte van die ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle. (2)

9.3 9.3.1 $F_g = mg$
$F_g = 6 \times 10^{-5} \times 9,8$ ✓
$F_g = 5,88 \times 10^{-4}$ N
$F_g = T\cos\theta$ ✓
$5,88 \times 10^{-4} = T\cos25^o$ ✓
$T = 6,49 \times 10^{-4}$ N ✓ (4)

9.3.2 $T \sin\theta = F_E$
$6,49 \times 10^{-4} \sin25^o = F_E$ ✓
$F_E = 2,74279 \times 10^{-4}$ N
$F_E = \frac{kQ_1Q_2}{r^2}$ ✓
$2,74279 \times 10^{-4}$ ✓$= \frac{9 \times 10^9 \times 15 \times 10^{-9} Q_B}{0,05^2}$ ✓
$Q = 5,08 \times 10^{-9}$ C ✓ (5)

9.3.3 **Positive marking from QUESTION 9.3.2 / Positiewe nasien vanaf VRAAG 9.3.2**

$E = \frac{kQ}{r^2}$ ✓
$E_B = \frac{9 \times 10^9 \times 5,08 \times 10^{-9}}{0,02^2}$ ✓
$E_B = 114\ 300$ N.C^{-1} left / *links*
$E_A = \frac{9 \times 10^9 \times 15 \times 10^{-9}}{0,03^2}$ ✓
$E_A = 150\ 000$ N.C^{-1} right / *regs*
$E_{net} = E_B - E_A$
$E_{net} = 114\ 300 - 150\ 000$ ✓
$E_{net} = -35\ 700$
$E_{net} = 35\ 700$ N.C^{-1} left / *links* ✓ (5)
[18]

TOTAL/*TOTAAL*: 150