

Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

SEPTEMBER 2011

**PHYSICAL SCIENCES P1
NATURWETENSKAPPE V1
MEMORANDUM**

MARKS: 150

PUNTE: 150

This memorandum consists of 11 pages.
Hierdie memorandum bestaan uit 11 bladsye.

2 PHYSICAL SCIENCES P1 MEMORIAL SEPTEMBER 2011

GENERAL GUIDE LINES/ALGEMENE RIGLYNE

1. CALCULATIONS/BEREKENINGE

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

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

1.3 When no formula is given, marks will be forfeited for zero substitution not shown.
Indien geen formule gegee is, sal punte verbeur word as nulwaardes nie getoon.

2. UNITS/EENHEDE

2.1 Units are only required in the final answer to a calculation.
Eenheids word slegs benodig by antwoorde.

SECTION AAFDELING A

QUESTION/VRAAG 1: ONE WORD ITEMS/EENWOORDJEMS

1.1 Projectile/Projekiel ✓	(12.2.1)	(1)
1.2 Electric potential energy/Elektriese potensiale energie ✓	(12.2.1)	(1)
1.3 Wave front/golffront ✓	(12.2.1)	(1)
1.4 Electromagnetic spectrum/elektromagnetiese spektrum ✓	(12.2.1)	(1)
1.5 Threshold frequency/drumpel/frekwensie ✓	(12.2.1)	(1)

QUESTION/VRAAG 2:

**MULTIPLE CHOICE
QUESTIONS/MEERVOUDIGEKEUSE-VRAE**

2.1 B	✓✓	(2)
2.2 C	✓✓	(2)
2.3 C	✓✓	(2)
2.4 B	✓✓	(2)
2.5 A	✓✓	(2)
2.6 D	✓✓	(2)
2.7 C	✓✓	(2)
2.8 A	✓✓	(2)
2.9 C	✓✓	(2)
2.10 D	✓✓	(2)

TOTAL SECTION/TOTAAL AFDDELING A: 25

[20]

SECTION B

QUESTION/VRAAG 3

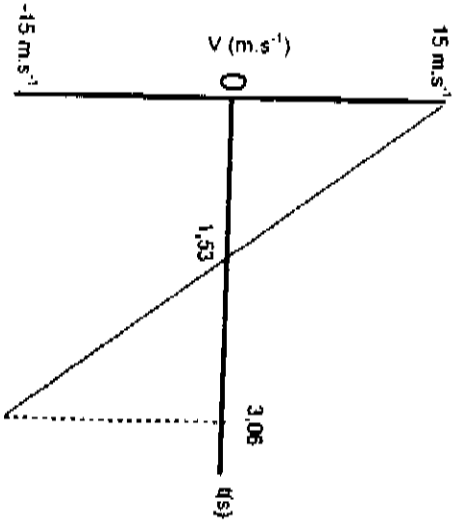
3.1 $w = v_1 + a \Delta t$
 $0 = 15 + (-9,81)t$
 $t = 1,53 \text{ s}$

3.2 $w^2 = v_1^2 + 2a_1 y$ or/of $y = \frac{v_1^2 + 2a_1 \Delta t^2}{2}$ or/of $y = \frac{v_1^2 + 2a_1 \Delta t^2}{2}$
 $(0)^2 = (15)^2 + 2(-9,81)y$ or/of $y = \frac{(15)^2}{2 \times 19,62}$ or/of $y = \frac{(0)^2 + 2(-9,81)(1,53)^2}{2}$
 $y = 11,48 \text{ m}$ or/of $y = 11,47 \text{ m}$

3.3 Time taken to rise is equal to time taken to fall.
 Tyd boortoe is gelyk aan tyd ondertoe.
 $t_{\text{downward}} = 2 \times 1,53 \text{ s}$
 $= 3,06 \text{ s}$

3.4 The graph of velocity vs time/Die grafiek v_r sneeheid vs. tyd

X-axis (labelled) with values as indicated in the graph) /
 X-as (byskryfde met waardes soos aangedui in grafiek) /
 Y-axis (labelled) with values as indicated in the graph) /
 Y-as (byskryfde met waardes soos aangedui in grafiek) /
 shape/curm



(3)
 [11]

4

QUESTION/VRAAG 4

4.1 Hypothesis: as the distance from the target increases, the impact speed of the target decreases. v
 Hipoteses: as die afstand vanaf die teiken vergroot, sal die impakspoed van die teiken vermeerder. v

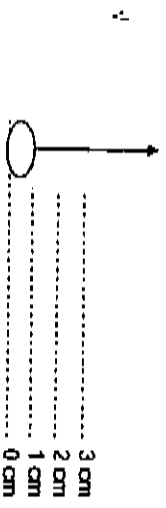
4.2.1 Independent variable: distance from the target v
 Onafhanklike veranderlike: afstand vanaf die teiken v

4.2.2 Dependent variable: the impact speed of the pellet v
 Afhanklike veranderlike: die impakspoed van die koeël v

4.3 measure the angle with a protractor v
 Meet die hoek met 'n gradeboog v

measure the length of string v
 use cosine of an angle to find the adjacent side and
 $h = \text{length} \times \text{adjacent side}$ v
 Meet die lengte van die tou v
 Gebruik kosinus van die hoek om die aangrensende sy te vind en
 $h = \text{lengte} \times \text{aangrensende sy}$ v

put ruler behind an apple, v
 zero at resting position v
 OR/OF
 plaas kritiaal agter appel v
 nulwaarde by ruspunt v



4.4 Principle of conservation of mechanical energy states that total mechanical energy remains constant. (In an isolated system) provided that the net work done by non conservative forces is zero. v
 Wel van behoud van meganiese energie tur dat die totale meganiese energie konstant bly in 'n geïsoleerde sisteem/nlits die netto arbeid vering deur nie-konservatiewe kragte nul is. v

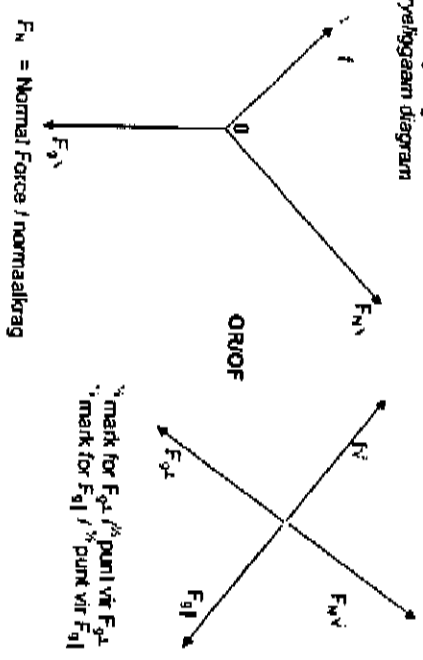
4.5 $(E_k + E_p)_{\text{begin}} = (E_k + E_p)_{\text{end}}$ v
 $0 + m(0,101)^2 = (0,101)(9,8)(0,15) + 0$ v
 $v = 1,71 \text{ m.s}^{-1}$ v

4.6 total momentum before collision = total momentum after collision v
 Totale momentum voor botsing = totale momentum na botsing v
 $m_1 v_1 + m_2 v_2 = (m + m) v$
 $(0,001 \times v_1) + 0 = (0,001 + 0,1) 1,71$ v
 $v_1 = \frac{0,171}{0,001}$
 $= 172,71$ or/of $1,72 \times 10^2 \text{ m.s}^{-1}$ v

(3)
 [15]

QUESTION/VRAAG 5

5.1 free body diagram
vryliggaam diagram



F_N = Normal Force / normaal krag (3)

- f = Frictional Force / wrywryngkrag
- F_g = Gravitational Force / gravitasiekrag
- $F_{g\perp}$ = Component of gravitational force perpendicular to the slope
Komponent van gravitasiekrag loodreg op die skuinsvlak
- $F_{g\parallel}$ = Component of Gravitational Force parallel to the slope
Komponent van gravitasiekrag parallel aan die skuinsvlak

5.2.1 $F_{\text{net}} = F_{g\parallel} + f$
 $= mg \sin \alpha + f$
 $= (58 \text{ kg} \cdot 9,8) (\sin 25^\circ) + 70 \text{ N}$
 $= 170,22 \text{ N downhill/aftwaarts}$ (3)

5.2.2 $W_{\text{net}} = F_{\text{net}} \cos \theta \cdot \Delta x$
 $= (170,22 \cos 0^\circ) \times 57 \text{ m}$
 $= 9,69 \times 10^3 \text{ J}$ (3)

5.2.3 $W_{\text{net}} = \Delta E_k$
 $= E_{k1} - E_{k2}$
 $9,690 = E_{k1} - (1/2 \cdot 58 (3,6^2)) \text{ J}$
 $E_{k1} = 10,065,84 \text{ J}$ (3)

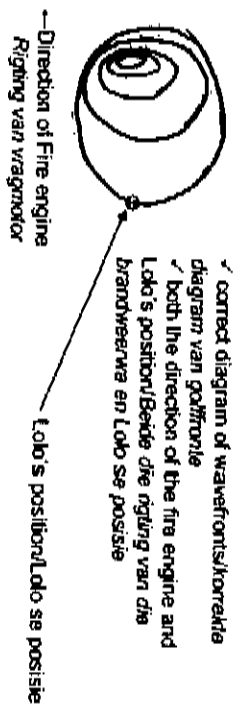
5.2.4 $E_{k1} = 1/2 m v^2$
 $10,065,84 = 1/2 \cdot 58 v^2$
 $v = 18,63 \text{ m} \cdot \text{s}^{-1}$ (3)

QUESTION/VRAAG 6

6.1 Doppler effect/Doppler-efek ✓ (1)

6.2 $f_L = (v \pm v_o / v \pm v_s) f_s$
 $= (340 / (340 + 20)) \cdot 18 \times 10^3$
 $= 17 \times 10^3 \text{ Hz}$ (4)

6.3 The diagram to represent wavefronts/Die diagram stel die golf fronte voor



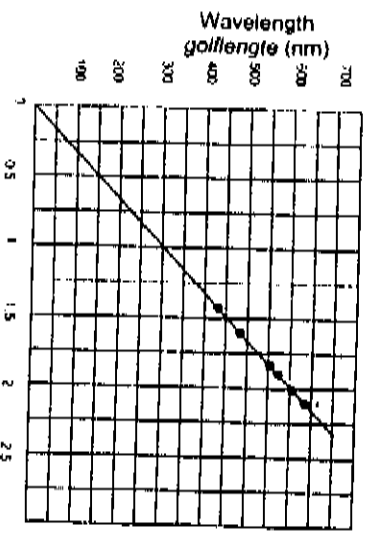
Direction of Fire engine
Rigting van vragmotor (2)

✓ correct diagram of wavefronts/korrekte diagram van golffronte
 ✓ both the direction of the fire engine and Lolo's position/Bede die rigting van die brandweerwa en Lolo se posisie

6.4 Speed of sound in air is much less than speed of light. Therefore the velocity of the fire engine produces a noticeable Doppler shift in the frequency of siren but of no consequences when compared to speed of light. ✓
 Die spoed van klank in lug is baie minder as die spoed van lig, daarom het die spoed van die brandweerwa 'n beduidende Doppler skuif in die frekwensie van die sirene, maar geen effek wanneer vergelyk word met die spoed van lig nie. (3)

(3) [10]

- 7.1 Bending of a wave around an obstacle/in an opening/apertuur/leemmer. ✓
Buiging van golwe om 'n verspreiingsdeur 'n oopning/hoek. (1)
- 7.2 Constructive Interference/konstruktiewe interferensie ✓ (1)
- 7.3 The graph of wavelength against $\frac{1}{f}$
Grafiek van golflengte teenoor $\frac{1}{f}$



calculating values of $\frac{1}{f}$ ✓
 berekening van $\frac{1}{f}$ waardes
 both axes/steibei asse ✓
 shape/vorm ✓
 heading/opskrif ✓

wavelength (nm)	$\frac{1}{f}$ (s)
660	$2,22 \times 10^{-15}$
610	$2,03 \times 10^{-15}$
580	$1,93 \times 10^{-15}$
540	$1,80 \times 10^{-15}$
470	$1,57 \times 10^{-15}$
440	$1,47 \times 10^{-15}$
410	$1,37 \times 10^{-15}$

- 7.4 Speed of light in a vacuum/spoed van lig in 'n vakuum ✓ (1)
- 7.5 $10 \frac{1}{f}$ (1)

QUESTION 8

- 8.1 8.1.1 Radio waves/radiogolwe ✓ (1)
- 8.1.2 Gamma rays/gammastrale ✓ (1)
- 8.1.3 Infrared/infraroo ✓ (1)

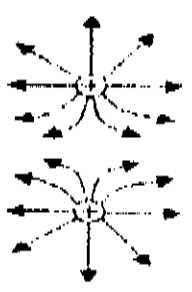
8.2 Photons of UV light are absorbed by the fluorescent ink. ✓. Energy is radiated by ink in the visible region of light ✓
Fotonie van die UV-lyg word geabsorbeer deur die fluoreserende ink. Energie wat uitgestraal word deur ink, is in die sigbare spektrum van lig (2)

8.3 Sunburn ✓ and skin cancer ✓
Sonbrand en velkanker (2)

8.4 Flesh, bones and metal ✓ (in this order only)
Vlees, been en metaal (in hierdie volgorde) (1)

QUESTION 9

9.1 electric field pattern/elektrieseveldpatroon (1)



direction of field lines ✓
rigting van veldlyne
 correct pattern ✓
korrekte vorm

9.2 Electric field is a region in which a charge will experience a force. ✓
Elektrieseveld is die gebied waar 'n lading 'n krag sal ondervind. (2)

9.3 Given that $Gegoes E_1 + E_2 = 0$ ✓
 Directions are opposite which implies that $E_1 = E_2$ ✓
Rigting is teenoorgesteld wat impliseer dat $E_1 = E_2$
 Then/Dan $k(16 \times 10^{-9})/(3-d)^2 = k(4 \times 10^{-9})/d^2$
 $(3-d)^2(4 \times 10^9) = 16 \times 10^9 d^2$
 $3-8d+d^2 = 4d^2 = 0$
 $(3+d)(1-d) = 0$
 $d = 1 \text{ m}$ ✓ (5)

9.4 Q on each sphere = $(q_1 + q_2)/2$
 $= (16 \times 10^{-9} + 4 \times 10^{-9})/2$
 $= 10 \times 10^{-9} \text{ C}$ ✓
 Number of electrons = charge transferred/charge of electron ✓
Aantal elektrone = lading oorgedra/leed van elektron
 $= \frac{10 \times 10^{-9}}{-1,6 \times 10^{-19}}$ OR/OR $\frac{(10 \times 10^{-9}) - (4 \times 10^{-9})}{-1,6 \times 10^{-19}}$
 $= 3,75 \times 10^{13} \text{ e}^-$ ✓ (3)

QUESTION 10

10.1 $C = \epsilon_0 A/d$
 $= 8,85 \times 10^{-12} \times 4/4 \times 10^{-3}$
 $= 8,85 \times 10^{-3} F$
 $= 8,85 nF$ (3)

10.2 $Q = CV$
 $= 8,85 \times 10^{-3} \times 20\,000$
 $= 1,77 \times 10^{-4} C$ (3)

10.3 $E = V/d$
 $= 2000V/4 \times 10^{-3}$
 $= 5 \times 10^5 V \cdot m^{-1}$ (3)

QUESTION 11

11.1 emf is the maximum amount of energy per unit charge which the cell can produce.
 emf is die maksimum hoeveelheid energie per eenheidslading wat die sel kan produseer. (2)

11.2 $V_{int} = I \times r$
 $(30 - 28,5) V = 3 \times r$
 $r = 0,5 \Omega$ (4)

11.3 0 V (1)

11.4 remains constantly dissipated (1)

11.5 $1/R = 1/R_1 + 1/R_2$
 $= 1/7 + 1/3$
 $R = 2,1 \Omega$
 $V = IR$
 $= 3 \times 2,1$
 $= 6,3 V$ (4)

11.6 $W = I^2 R t$
 $= 3^2 \times 0,5 \times 60$
 $= 270 J$ (3)

$W = V I t$
 $= 1,5 \times 3 \times 60$
 $= 270 J$ (3)

$W = V^2 t/R$
 $= (1,5)^2 \times 60/0,5$
 $= 270 J$ (3)

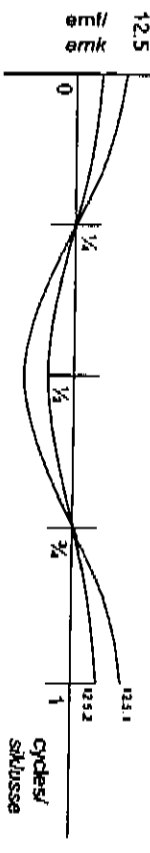
QUESTION 12

12.1 electromagnetic induction/elektromagnetiese induksie (1)

12.2 mechanical energy is converted to electrical energy /
 meganiese energie is omgeskakel na elektriese energie (1)

12.3 carries current to external circuit /
 dra stroom oor aan eksterne stroombaan (1)

- 12.4 12.4.1 Max/Maks (1)
 12.4.2 ABCD (1)
 12.4.3 Zero/Nil (1)
 12.4.4 Max/Maks (1)
 12.4.5 DCBA (1)
 12.4.6 No current/geen stroom (1)



12.5.1 One mark for each sin curve/Een punt vir elke sinus-kurwe
 One mark for starting at maximum/Een punt vir begin by maksimum (2)

12.5.2 One mark for the second graph/Een punt vir die tweede grafiek (1)

12.6 Any two ways to use electricity efficiently /
 Enge twee maniere om elektrisiteit spaarsaamig te gebruik (2)

[14]

QUESTION 13

13.1 $W_0 = hf_0$
 $= 6,63 \times 10^{-34} \times 5,1 \times 10^{14}$
 $= 3,38 \times 10^{-19} \text{ J}$

13.2 $f(\text{violet}) = c/\lambda$
 $= 3 \times 10^8 / 400 \times 10^{-9} \text{ m}$
 $= 7,5 \times 10^{14} \text{ Hz}$
 $E = hf$
 $= 6,63 \times 10^{-34} \times 7,5 \times 10^{14} \text{ J}$
 $= 4,9725 \times 10^{-19} \text{ J}$

OR/OF $hf = W_0 + E_k$
 $hc/\lambda = W_0 + E_k$
 $\frac{6,63 \times 10^{-34} \times (7,5 \times 10^{14})}{400 \times 10^{-9}} = 3,38 \times 10^{-19} + E_k$
 $E_k = 1,59 \times 10^{-19} \text{ J}$

$E = W_0 + E_k$
 $4,9725 \times 10^{-19} = 3,38 \times 10^{-19} + E_k$
 $E_k = 1,59 \times 10^{-19} \text{ J}$

(4)

13.3 Photons hitting a gallium arsenide plate in night vision devices cause ejection of photoelectrons due to the photoelectric effect; these are then amplified into a cascade of electrons that light up phosphor screen.
 Fotone wat in gallium-arseniedplaat in 'n nagvisie-apparaat tref, veroorsaak die vrystelling van fotoëlektrone a.g.v. die fotoëlektriese effek. Hierdie word dan versterk na in magdomm elektrone wat in fosfor skerm verlig.

OR/OF
 Light from the sun hitting lunar dust causes it to become charged through photoelectric effect, the charged dust then repels itself and lifts off the surface of the moon by electrostatic levitation. This manifests itself like an atmosphere of dust.
 Lig van die son wat die stof op die maan tref en laat deur die fotoëlektriese effek. Die gelaaide stof stoot mekaar af en styg van die maanoppervlak op deur elektrostatisies lewtasie. Dit manifesteer in 'n atmosfeer van stof.

OR/OF
 Photocells in light meter for photographic purposes.
 Fotoselle in ligmeter vir fotografiese doeleindes.

OR/OF
 Used in solar powered calculator
 Gebruik in sonkrag-sakrekenaars

(1)
(7)

TOTAL SECTION/TOTAAL AFDELING B: 125
 GRAND TOTAL/GROOTTOTAAL: 150



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ASSESSMENT & EXAMINATIONS

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MEMORANDUM

**TO: DISTRICT DIRECTOR
CES: CURRICULUM
DCES: EXAMINATIONS
SES: FET
SCHOOL PRINCIPALS OF GRADE 12**

**FROM CES: INSTRUMENT DEVELOPMENT AND MODERATION
MR A NDZAUSE**

DATE: 12 SEPTEMBER 2011

SUBJECT: GRADE 12 TRIAL EXAMINATIONS PHYSICAL SCIENCES P 1-2011

1. Great care was taken to present learners with credible and quality question papers and memoranda for each subject and paper. Unfortunately few errors were occurred on memorandum for Grade 12 Trial Physical Sciences P1.
2. Please correct the Physical Sciences P 1 memo as follows:
 - Question 2.10. B ✓✓
 - Question 5.2.2. 9 702,54 J ✓
 - Question 5.2.3. 10 078,38 J ✓
 - Question 5.2.4. 18,64 m.s⁻¹ ✓
3. Assessment Instrument Development and Moderation Unit apologises for the inconvenience.

Yours in Quality Education

MR A NDZAUSE
THE CES: INSTRUMENT DEVELOPMENT AND MODERATION.

