Province of the
EASTERN CAPE
EDUCATION

iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Departement van Onderwys
Porafensie Ya Kapa Botjhabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE 12

JUNE 2026

PHYSICAL SCIENCES P1

MARKS: 150

TIME: 3 hours

This question paper consists of 15 pages, including 2 data sheets.

INSTRUCTIONS AND INFORMATION

1. Write your full NAME and SURNAME in the appropriate space in the ANSWER BOOK.
2. Answer ALL the questions in the ANSWER BOOK.
3. You may use a non-programmable calculator.
4. You may use appropriate mathematical instruments.
5. Number the answers correctly according to the numbering system used in this question paper.
6. You are advised to use the attached DATA SHEETS.
7. The formulae and substitutions must be shown in ALL calculations.
8. Give brief motivations, discussions, et cetera where required.
9. Round off your final numerical answers to a minimum of TWO decimal places.
10. Start EACH question on a NEW page in the ANSWER BOOK.
11. All diagrams are NOT necessarily drawn according to scale.
12. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various options are provided as answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1 to 1.10) in the ANSWER BOOK, for example 1.11 B.

1.1 Which ONE of the following forces always acts perpendicular to the surface on which a body is placed?

A Applied force

B Frictional force

C Normal force

D Gravitational force (2)

1.2 An astronaut has a weight **W** on Earth. He lands on a planet with mass three times greater than that of the earth and a radius twice that of the earth. What is the weight of the astronaut on this planet? Take the radius of the earth as R.

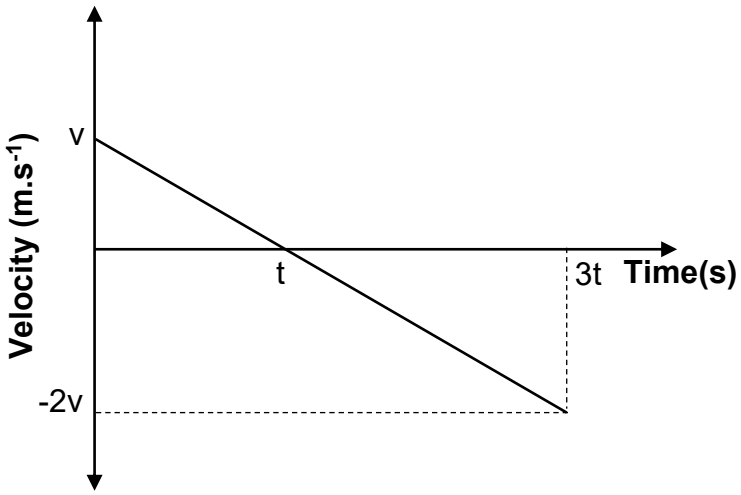
A ¾ W

B ¼ W

C 3W

D ⅔ W (2)

1.3 The velocity-time graph below represents the motion of an object under the influence of gravitational force only.



A learner makes the following statements about the graph:

(i) The object was thrown from a certain height above the ground with velocity, v.

(ii) The object was dropped from a certain height.

(iii) The object reached it maximum height at time, t.

(iv) The acceleration of the object at time t is equal to zero.

(v) The object's velocity is a maximum at time 3t.

Which of the statements on the previous page (page 3) are TRUE about the object's motion?

A (i), (ii) and (iv)

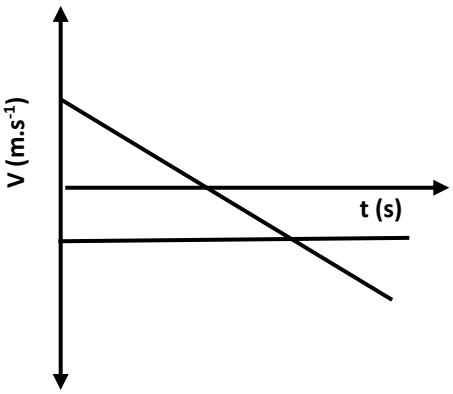
B (i), (iii), (iv) and (v)

C (i), (ii), (iii), (iv) and (v)

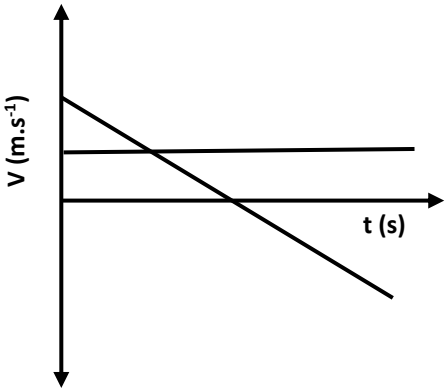
D (i), (iii) and (v) (2)

1.4 A ball is dropped from a hot air balloon that is ascending at a constant velocity. Take UPWARDS as the POSITVE direction. The CORRECT velocity versus time graph for the motion of the ball and the balloon is:

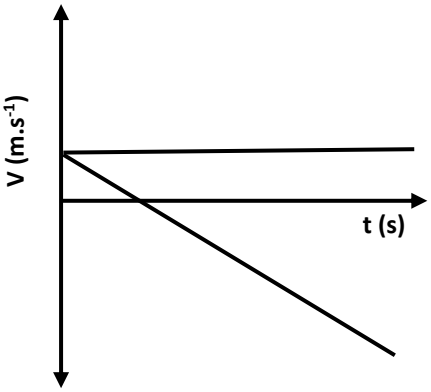
A



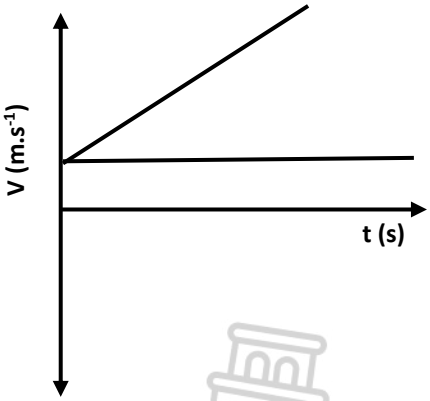
B



C



D



(2)

1.5 Airbags can protect passengers from serious injury during a collision. Which ONE of the following best describes why this is possible?

	CONTACT TIME	NET FORCE
A	Increase	Increase
B	Increase	Decrease
C	Decrease	Increase
D	Decrease	Decrease

(2)

1.6 An object moving with a constant speed **v** has a kinetic energy K. Which ONE of the following will be TRUE for the change in kinetic energy if the object has a constant velocity of **2v**?

A 2K

B 3K

C 4K

D ¼K (2)

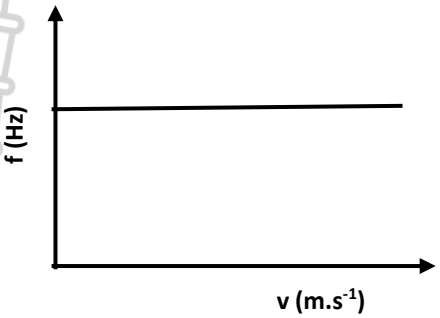
1.7 A bird flies directly away from a stationary birdwatcher at constant velocity. The bird constantly emits sound waves at a certain frequency. Which ONE of the following combinations of properties of the sound heard by the birdwatcher, as the bird flies away is CORRECT?

	VELOCITY	FREQUENCY
A	Remain the same	Decrease
B	Increase	Decrease
C	Decrease	Increase
D	Remains the same	Remains the same

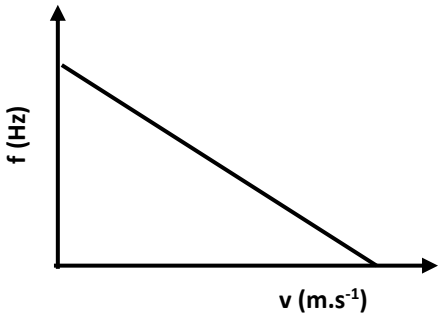
(2)

1.8 A star moving away from the earth produces a spectrum that is red-shifted. Which ONE of the following graphs represents the red-shift?

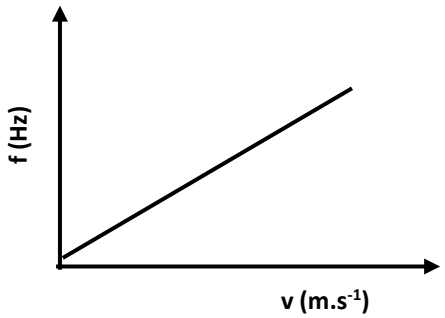
A



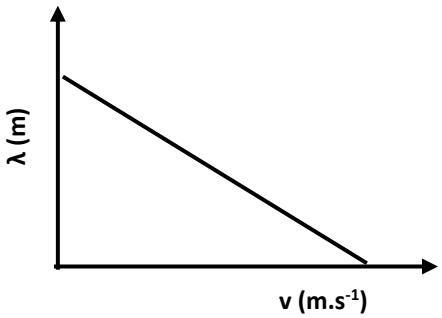
B



C



D



(2)

1.9 Two charges, **X** and **Y**, on insulting stands exerts a force **F** on each other when placed **r** m apart. When the charges are moved to new positions the force they exert on each other changes to **16F**. What is the new distance between the charges?

A 2r

B ½r

C 4r

D ¼r (2)

1.10 Two identical positively charged spheres, which are free to move, are placed near each other on a frictionless surface. Which ONE of the following CORRECTLY describes the motion of the two spheres?

A They move away from each other with increasing acceleration.

B They move away from each other with decreasing acceleration.

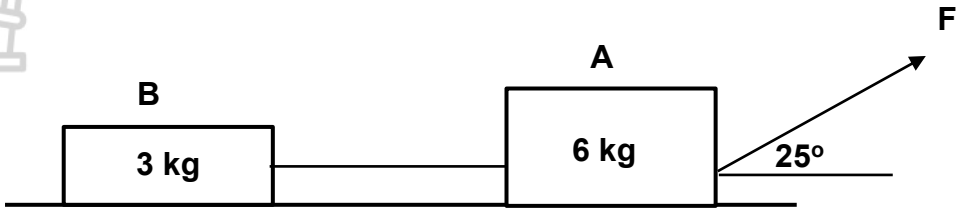
C They move away from each other with constant acceleration.

D They move away from each other with zero acceleration. (2)

[20]

QUESTION 2 (Start on a new page.)

Two IDENTICAL boxes with different masses **A** and **B**, resting on a rough horizontal surface, are connected by a light inextensible string. The boxes have masses 6 kg and 3 kg respectively. A constant force F, acting at an angle of 25° to the horizontal, is applied to the 6 kg box and the boxes accelerate to the right, as shown below.



The surface exerts a perpendicular force with a magnitude of 33,43 N on the 6 kg box.

2.1 Draw a labelled free-body diagram of all forces acting on the 6 kg box. (5)

2.2 Calculate the applied force **F**. (4)

The coefficient of kinetic friction between the surface and the 6 kg block is 0,15.

2.3 Give a reason why the coefficient of kinetic friction has no unit. (1)

2.4 State Newton's Second Law of Motion in words. (2)

2.5 Calculate the:

2.5.1 Frictional force exerted on the 3 kg box (3)

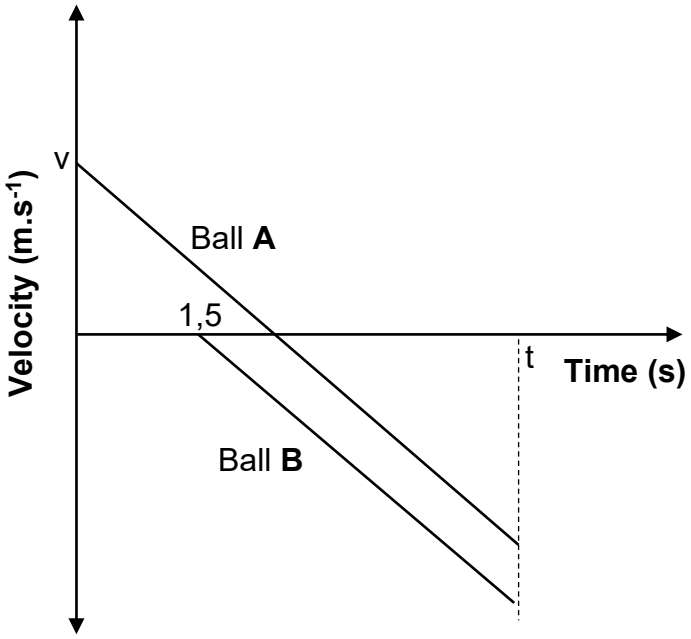
2.5.2 Acceleration of the boxes (5)

2.6 Suddenly the string between the two boxes breaks. In which direction will the 3 kg box move at the instant the string breaks? Write down, TO THE LEFT or TO THE RIGHT. Explain your answer using a relevant LAW OF PHYSICS. (3)

[23]

QUESTION 3 (Start on a new page.)

The velocity-time graph below represents the motion of two balls projected from a height of 50 m above the ground.



Use the information on the graph to answer the following questions.

3.1 Define the term *projectile*. (2)

3.2 Write down the rate of change of velocity of the balls. (2)

3.3 Calculate the:

3.3.1 Time, t, indicated on the graph (5)

3.3.2 Velocity with which ball **B** hits the ground (3)

3.3.3 Velocity, v, indicated on the graph (4)

3.3.4 Maximum height reached by ball **A** above the ground (4)

3.4 Sketch a position versus time graph for the full duration of the motion of the two balls.

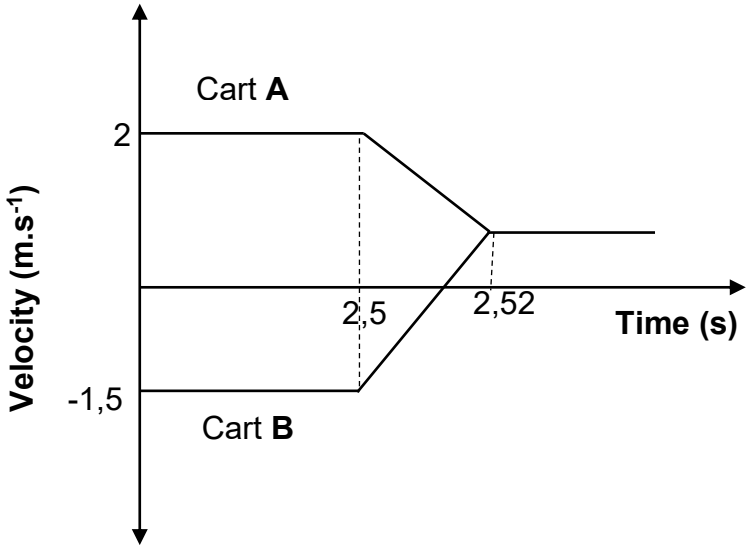
Indicate the following on your graph:

- The position of the balls from which it was projected
- The maximum height reached by ball **A** above the ground
- The time when the balls hit the ground (4)

[24]

QUESTION 4 (Start on a new page.)

The graph below represents the motion of two toy carts, **A** and **B**, of mass 1 kg and 2 kg respectively. Cart **A** is traveling eastwards.



4.1 Define the term *linear momentum* in words. (2)

4.2 Write down the initial speed of each cart. (2)

4.3 Calculate the:

4.3.1 Velocity of the carts after the collision (4)

4.3.2 Net force that the carts **A** exert on cart **B** (4)

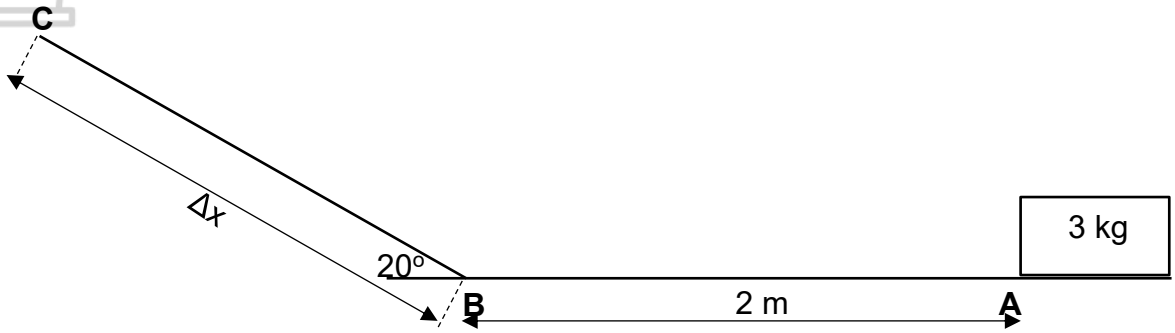
4.4 What is the acceleration of the carts after the collision? (1)

4.5 Use a relevant calculation to determine whether the collision is ELASTIC or INELASTIC. (5)

[18]

QUESTION 5 (Start on a new page.)

A 3 kg block slides at a constant velocity of 7 m·s^{-1} along a horizontal surface. It then strikes a rough surface causing it to experience a constant frictional force of 30 N. The block slides 2 m under the influence of this frictional force before it moves up a frictionless ramp inclined at an angle of 20° to the horizontal, as shown in the diagram below.



The block moves a distance **d** up the ramp, before it comes to rest.

5.1 Define the term *non-conservative force* in words. (2)

5.2 Write down the NAME of a non-conservative force acting on the block, while it slides on the horizontal surface. (1)

5.3 Is mechanical energy conserved between points **A** and **B**? Answer YES or NO and give a reason for your answer. (2)

5.4 Show by means of a calculation that the speed of the block at the bottom of the ramp is 3 m.s^{-1}. (3)

5.5 Draw a free-body diagram to show all the forces acting on the block, whilst the block is sliding up the ramp. (3)

5.6 State the work-energy theorem in words. (2)

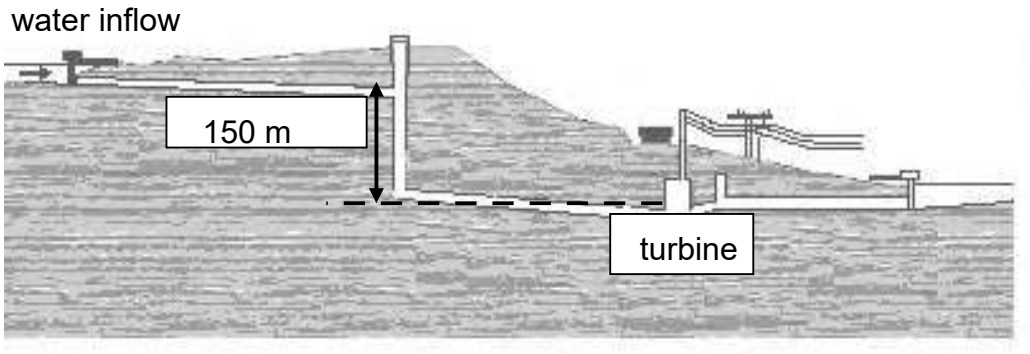
5.7 Use ENERGY PRINCIPLES ONLY, to calculate the distance, **d**, the block slides up the ramp. (5)
[18]

QUESTION 6 (Start on a new page.)

The diagram below represents how water is funnelled into a pipe and directed to a turbine at a hydro-electric power plant. The force of the falling water rotates the turbine.

Each second, 200 m^3 of water is funnelled down a vertical shaft to the turbine below. The vertical height through which the water falls upon reaching the turbine is 150 m. Ignore the effects of friction.

NOTE: 1 m^3 of water has a mass of 1 000 kg.



6.1 Calculate the mass of water that enters the turbine each second. (1)

6.2 Use energy principles to calculate the kinetic energy of this mass of water when entering the turbine. (4)

6.3 Calculate the maximum speed at which this mass of water enters the turbine. (3)
[8]

QUESTION 7 (Start on a new page.)

A siren of a stationary police van emits sound waves at a certain frequency. A learner is moving while measuring the detected frequency and recorded the results as shown in a table below.

Velocity of learner ($m.s^{-1}$)	0	5	10	15	20	25
Frequency (Hz)	780	791,47	802,94	814,41	825,88	837,35

7.1 State Doppler effect in words. (2)

7.2 Is the learner moving TOWARDS or AWAY from the police van? Give a reason for your answer. (2)

7.3 Write down the frequency of sound emitted by the siren of the police van. (2)

7.4 Using the recorded data in the table. Calculate the:

7.4.1 Speed of sound in the air (5)

7.4.2 Wavelength of the sound waves emitted by the siren of the police van (3)

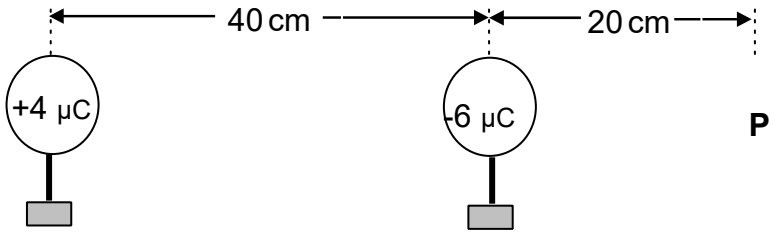
7.5 Give TWO applications of the Doppler effect in medicine. (2)

7.6 Spectral lines of a certain gas observed from a distant star appear to be experiencing red shift. Explain this observation by referring to MOTION OF THE STAR and FREQUENCY of the spectral line. (2)

[18]

QUESTION 8 (Start on a new page.)

Two metal spheres on insulated stands carry charges of +4 µC and -6 µC respectively. The spheres are arranged with their centres 40 cm apart, as shown below.



8.1 State Coulomb's law in words. (2)

8.2 Calculate the:

8.3.1 Number of electrons that the -6 µC charge gained (3)

8.2.2 Magnitude of the force exerted by each sphere on the other (4)

8.2.3 Net electric field at point **P** as shown in the diagram above (5)

8.3 The spheres are now brought into contact with each other and then returned to their original positions.

8.3.1 Define *electric field* around a charged object. (2)

8.3.2 Draw the electric field pattern between the two charges. (3)
[19]

TOTAL: 150

DATA FOR PHYSICAL SCIENCES GRADE 12
PAPER 1 (PHYSICS)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 12
VRAESTEL 1 (FISIKA)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME/*NAAM*	SYMBOL/ *SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity/ *Swaartekragversnelling*	g	9,8 m•s^{-2}
Universal gravitational constant/ *Universelegravitasiekonstant*	G	6,67 × 10^{-11} N•m^2•kg^{-2}
Speed of light in a vacuum/*Spoed van lig in 'n vakuum*	c	3,0 × 10^8 m•s^{-1}
Planck's constant/*Planck se konstante*	h	6,63 × 10^{-34} J•s
Coulomb's constant/*Coulomb se konstante*	k	9,0 × 10^9 N•m^2•C^{-2}
Charge on electron/*Lading op elektron*	e	-1,6 × 10^{-19} C
Electron mass/*Elektronmassa*	m_e	9,11 × 10^{-31} kg
Mass of earth/*Massa op aarde*	M	5,98 × 10^{24} kg
Radius of earth/*Radius van aarde*	R_E	6,38 × 10^6 m

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

MOTION/*BEWEGING*

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ or/*of* $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^2 = v_i^2 + 2a\Delta x$ or/*of* $v_f^2 = v_i^2 + 2a\Delta y$	$\Delta x = \left(\frac{v_i + v_f}{2}\right)\Delta t$ or/*of* $\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$

FORCE/*KRAG*

$F_{net} = ma$	$p = mv$
$f_s^{max} = \mu_s N$	$f_k = \mu_k N$
$F_{net}\Delta t = \Delta p$ $\Delta p = mv_f - mv_i$	$w = mg$
$F = \frac{Gm_1m_2}{d^2}$	$g = G\frac{M}{d^2}$

WORK, ENERGY AND POWER/*ARBEID, ENERGIE EN DRYWING*

$W = F\Delta x\cos\theta$	$U = mgh$ or/*of* $E_P = mgh$
$K = \frac{1}{2}mv^2$ or/*of* $E_k = \frac{1}{2}mv^2$	$W_{net} = \Delta K$ or/*of* $W_{net} = \Delta E_k$ $\Delta K = K_f - K_i$ or/*of* $\Delta E_k = E_{kf} - E_{ki}$
$W_{nc} = \Delta K + \Delta U$ or/*of* $W_{nc} = \Delta E_k + \Delta E_p$	$P = \frac{W}{\Delta t}$
$P_{av} = Fv$	

WAVES, SOUND AND LIGHT/*GOLWE, KLANK EN LIG*

$v = f\lambda$	$T = \frac{1}{f}$
$f_L = \frac{v \pm v_L}{v \pm v_s} f_s \quad f_L = \frac{v \pm v_L}{v \pm v_b} f_b$	$E = hf$ or/*of* $E = h\frac{c}{\lambda}$
$E = W_o + E_k$ where/*waar* $E = hf$ and/*en* $W_0 = hf_0$ and/*en* $E_k = \frac{1}{2}mv^2$ or/*of* $K_{max} = \frac{1}{2}mv_{max}^2$	

ELECTROSTATICS/*ELEKTROSTATIKA*

$F = \frac{kQ_1Q_2}{r^2}$	$E = \frac{kQ}{r^2}$
$E = \frac{V}{d}$	$E = \frac{F}{q}$
$V = \frac{W}{q}$	$n = \frac{Q}{q_e}$

ELECTRIC CIRCUITS/*ELEKTRIESE STROOMBANE*

$R = \frac{V}{I}$	emf (ε) = I(R + r) emk (ε) = I(R + r)
$R_s = R_1 + R_2 + \ldots$ $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$	$q = I\Delta t$
W = Vq W = VIΔt W= $I^2R\Delta t$ W= $\frac{V^2\Delta t}{R}$	$P = \frac{W}{\Delta t}$ P = VI P = I^2R P = $\frac{V^2}{R}$

ALTERNATING CURRENT/*WISSELSTROOM*

$I_{rms} = \frac{I_{max}}{\sqrt{2}}$	/	$I_{wgk} = \frac{I_{maks}}{\sqrt{2}}$	$P_{average} = V_{rms}I_{rms}$ / $P_{gemiddeld} = V_{wgk}I_{wgk}$ $P_{average} = I_{rms}^2R$ / $P_{gemiddeld} = I_{wgk}^2R$
$V_{rms} = \frac{V_{max}}{\sqrt{2}}$	/	$V_{wgk} = \frac{V_{maks}}{\sqrt{2}}$	$P_{average} = \frac{V_{rms}^2}{R}$ / $P_{gemiddeld} = \frac{V_{wgk}^2}{R}$

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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD 12*

JUNE/*JUNIE* 2026

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

MARKS/*PUNTE*: **150**

This marking guideline consists of 12 pages./
Hierdie nasienriglyn bestaan uit 12 bladsye.

QUESTION/*VRAAG* 1

1.1 C ✓✓ (2)

1.2 A ✓✓ (2)

1.3 D ✓✓ (2)

1.4 C✓✓ (2)

1.5 B ✓✓ (2)

1.6 B✓✓ (2)

1.7 A ✓✓ (2)

1.8 B ✓✓ (2)

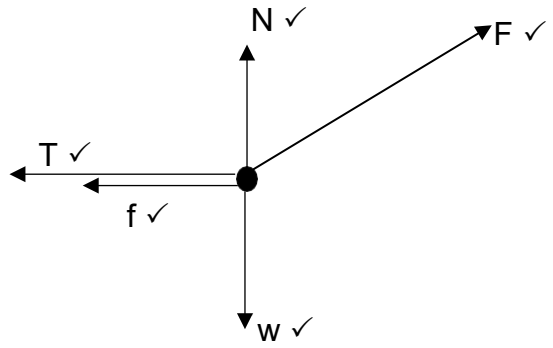
1.9 D ✓✓ (2)

1.10 B ✓✓ (2)

[20]

QUESTION/*VRAAG 2*

2.1



N	F_N, Normal force/ *Normaalkrag*
F	F_{app} ,F_A, $F_{applied}$, Applied force / $F_{toegepas}$/ *Toegepastekrag*
T	F_T, Tension/ *Spanning*
f	f_k, F_f, Frictional force/ *Wrywingskrag*
w	F_g, weight, gravitational force/ *gewig/ gravitasiekrag*

Mark awarded for arrow and label/ / *Punt toegeken vir pyltjie en benoeming*
Do not penalise for length of arrows since drawing is not drawn to scale, *Moenie penaliseer vir die lengte van die pyltjies nie aangesien teken nie volgens skaal geteken is nie.*

Any other additional force(s)/ *Enige addisionele kragte* ⅘
If force(s) do not make contact with body/ *As kragte nie kontak maak met liggaam* Max/*Maks* ⅘ (5)

2.2 $N = mg - F\sin\theta$ ✓
$33,43$ ✓$= \underline{6 \times 9,8 - F\sin 25^\circ}$ ✓
$F = 60,03$ N ✓ (4)

2.3 It is a ratio of two forces / *Dit is 'n verwantskap tussen twee kragte*. ✓ (1)

2.4 When a <u>resultant/net force</u> acts on an object, the object accelerates in the direction of the force with an <u>acceleration directly proportional to the force</u> ✓ and <u>inversely proportional to the mass</u> of the object. ✓
Wanneer 'n <u>resulterende/netto krag</u> op 'n voorwerp inwerk, versnel die voorwerp in die rigting van die krag met 'n <u>versnelling direk eweredig aan die krag</u> en <u>omgekeerd ewerewig aan die massa</u> van die voorwerp. (2)

OR

The net (resultant) force acting on an object is equal to the rate of change of momentum ***(2 or 0)***
Die netto (resulterende) kragt wat op 'n voorwerp in werk is gelyk aan die verandering in momentum ***(2 or 0)***

2.5 2.5.1 $f_k = \mu_k N$ ✓
$f_k = 0,15 \times 3 \times 9,8$ ✓
$f_k = 4,41$ N left ✓ (3)

POSITIVE MARKING FROM QUESTION 2.2 and 2.5.1/*POSITIEWE NASIEN VANAF VRAAG 2.5.1*

2.5.2 $F_{net} = ma$
$F\cos\theta - f - T = ma$ - Any one/ *Enige een* ✓
$T - f = ma$
$\underline{60,03\cos 25^\circ}$ - $\underline{(0,15 \times 33,43)}$ ✓ - T = 6a ✓

Substituting/ *Vervanging* 6a or/*of* 3a

$\underline{T - 4,41}$ ✓= 3a

$F_{net} = T - f_k$

$T - 4,41 = 3a$

$a = 5,00$ m.s^{-2} ✓ (5)

2.6 To the right. ✓ According to Newton's first law, an object will continue in its state of rest or motion at constant velocity unless a non-zero net force acts on it. ✓✓

According to Newton's 1st law the object will maintain its original inertia.

Independent marking (3)

Na regs. Volgens Newton se eerste wet sal 'n voorwerp in sy toestand van rus of beweging teen konstante snelheid voortgaan, tensy 'n netto krag wat nie nul is nie, daarop inwerk.

[23]

QUESTION/*VRAAG* 3

3.1 An object (which has been given an initial velocity) and then it moves under the influence of the gravitational force only. **(0 or 2)** ✓✓
Dit is 'n voorwerp waaraan 'n beginsnelheid gegee is en wat dan slegs onder die invloed van die gravitasiekrag beweeg. (2)

3.2 $9,8\ m.s^{-2}$ ✓ downwards/ *afwaarts* ✓ (2)

3.3.1

UPWARD POSITIVE/*POSITIEF OPWAARTS*	**UPWARD NEGATIVE/*NEGATIEF OPWAARTS***
$\Delta y = v_i\Delta t + \frac{1}{2} a\Delta t^2$	$\Delta y = v_i\Delta t + \frac{1}{2} a\Delta t^2$ ✓
-50 ✓ $= 0 \times \Delta t + \frac{1}{2} \times (-9,8)\Delta t^2$ ✓	50 ✓ $= 0 \times \Delta t + \frac{1}{2} \times (9,8)\Delta t^2$ ✓
$\Delta t = 3,19$ s	$\Delta t = 3,19$ s
$t = 1,5 + 3,19$ ✓	$t = 1,5 + 3,19$ ✓
$t = 4,69$ s	$t = 4,69$ s ✓ (5)
add 2nd option v_f 1st of ball b	
$v_f = v_i + a\Delta t$	$v_f = v_i + a\Delta t$
$v_f = 0 + (-9,8) \times 3,19$ ✓	$v_f = 0 + (9,8) \times 3,19$ ✓
$v_f = -31,26$	$v_f = 31,26$
$v_f = 31,26\ m.s^{-1}$	$v_f = 31,26\ m.s^{-1}$
$-31,26$✓ $= 0 + (-9,8) \times \Delta t$ ✓	$31,26$✓ $= 0 + (9,8) \times \Delta t$ ✓
$\Delta t = 3,19$ s	$\Delta t = 3,19$ s
$t = 1,5 + 3,19$ ✓	
$t = 4,69$ s✓	$t = 1,5 + 3,19$ ✓
	$t = 4,69$ s✓

OPTION 1 / *OPSIE 1*

3.3.2 **POSITIVE MARKING FROM/*POSITIEWE NASIE VANAF* 3.3.1**

UPWARD POSITIVE/*POSITIEF OPWAARTS*	**UPWARD NEGATIVE/*NEGATIEF OPWAARTS***
$v_f = v_i + a\Delta t$ ✓	$v_f = v_i + a\Delta t$ ✓
$v_f = 0 + (-9,8) \times 3,19$ ✓	$v_f = 0 + (9,8) \times 3,19$ ✓
$v_f = -31,26$	$v_f = 31,26\ m.s^{-1}$ downwards/*afwaarts* ✓
$v_f = 31,26\ m.s^{-1}$ downwards/*afwaarts* ✓	

OPTION 2 / *OPSIE 2*

UPWARD POSITIVE/*POSITIEF OPWAARTS*	**UPWARD NEGATIVE/*NEGATIEF OPWAARTS***
$v_f^2 = v_i^2 + 2a\Delta y$ ✓	$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$v_f^2 = 0^2 + 2(-9,8)(-50)$ ✓	$v_f^2 = 0^2 + 2(9,8)(50)$ ✓
$v_f = 31,30\ m.s^{-1}$ downwards/*afwaarts* ✓	$v_f = 31,30\ m.s^{-1}$ downwards/*afwaarts* ✓

OPTION 3 / *OPSIE 3*

POSITIVE MARKING FROM/*POSITIEWE NASIE VANAF* 3.3.1

UPWARD POSITIVE/*POSITIEF OPWAARTS*

$\Delta y = \frac{v_f \pm v_i}{2} \Delta t$ ✓

$-50 = \frac{v_f + 0}{2} \times 3{,}19$ ✓

$v_f = -31{,}35$

$v_f = 31{,}35$ m.s^{-1} downwards/*afwaarts* ✓

UPWARD NEGATIVE/*NEGATIEF OPWAARTS*

$\Delta y = \frac{v_f \pm v_i}{2} \Delta t$ ✓

$50 = \frac{v_f + 0}{2} \times 3{,}19$ ✓

$v_f = 31{,}35$ m.s^{-1} downwards/*afwaarts* ✓

(3)

3.3.3 **POSITIVE MARKING FROM / *POSITIEWE NASIE VANAF* 3.3.1**

UPWARD POSITIVE / *POSITIEF OPWAARTS*

$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓

-50 ✓ $= \underline{v_i \times 4{,}69 + \frac{1}{2}(-9{,}8)(4{,}69)^2}$ ✓

$v_i = 12{,}32$ m.s^{-1} upwards/ *opwaarts* ✓

UPWARD NEGATIVE/ *NEGATIEF OPWAARTS*

$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓

50✓ $= v_i \times 4{,}69 + \frac{1}{2}(9{,}8)(4{,}69)^2$ ✓

$v_f = -12{,}32$ m.s^{-1}

$v_f = 12{,}32$ m.s^{-1} upwards / *opwaarts* ✓ (4)

3.3.4 **POSITIVE MARKING FROM/*POSITIEWE NASIE VANAF* 3.3.3**

UPWARD POSITIVE/*POSITIEF OPWAARTS*

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$\underline{0^2 = 12{,}32^2 + 2 \times -9{,}8 \times \Delta y}$ ✓

$\Delta y = 7{,}74$ m

Height /*hoogte* = $\underline{50 +}$ 7,74 ✓

Height /*hoogte* = 57,74 m ✓

UPWARD NEGATIVE/*NEGATIEF OPWAARTS*

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

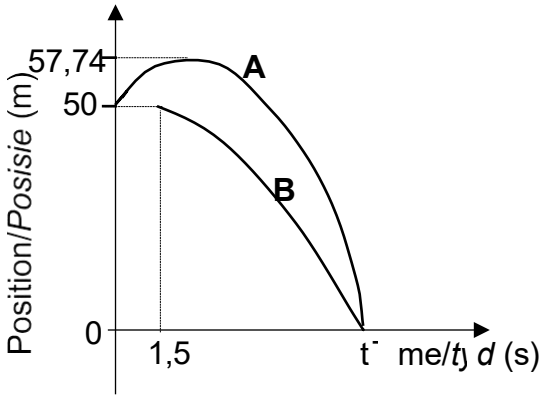
$\underline{0^2 = -12{,}32^2 + 2 \times 9{,}8 \times \Delta y}$ ✓

$\Delta y = 7{,}74$ m

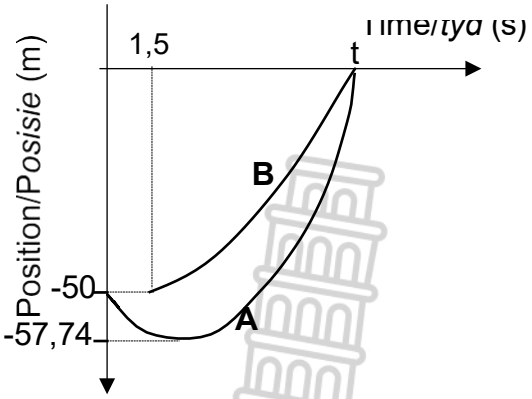
Height/*hoogte* = $\underline{50 +}$ 7,74 ✓

Height/*hoogte* = 57,74 m ✓ (4)

3.4 **UPWARD POSITIVE/*POSITIEF OPWAARTS***



UPWARD NEGATIVE/*NEGATIEF OPWAARTS*



Marking criteria/ *Nasienkriteria*	
Shape / *Vorm*	✓
Time / *tyd*, t / 4,69 s	✓
Position /*Posisie* 50 m and B starting at 1,5 s	✓
Maximum height / *Maksimum hoogte* 57,74 m	✓

Deduct 1 mark if axes are not labelled
Trek 1 punt af indien asse nie benoem is nie

(4)

[24]

QUESTION/*VRAAG 4*

4.1 Product of an object mass and velocity. ✓✓
Die produk van 'n voorwerp se massa en sy snelheid. **(2 OR/*OF* 0)** (2)

4.2 Cart / *Karretjie* A, v = 2 m.s^{-1}. ✓Cart/ *Karretjie* B = 1,5 m.s^{-1} ✓ (2)

4.3 4.3.1

OPTION/*OPSIE* 1

$\sum p_i = \sum p_f$
$m_A v_i + m_B v_i = (m_A + m_B) v_f$ ✓ Any one/ *Enige een*
$\underline{1(2) + 2(-1,5)}$ ✓ $= \underline{(1 + 2)v_f}$ ✓
$v_f = -0,33$ m.s^{-1}
$= \underline{0,33 \text{ m.s}^{-1} \text{ west/wes}}$ ✓

OPTION/*OPSIE* 2

$\sum p_i = \sum p_f$
$m_A v_i + m_B v_i = (m_A + m_B) v_f$ Any one/*Enige een* ✓
$\underline{1(-2) + 2(1,5)}$ ✓ $= \underline{(1 + 2)v_f}$ ✓
$v_f = \underline{0,33 \text{ m.s}^{-1}}$ west/*wes* ✓

$\Delta p_a = -\Delta p_b$ (4)

CONSIDER:
The graph is misleading (some learners are answering EAST), and therefore it will be fair to ignore the direction in the answer for Q 4.3.1

4.3.2

Positive marking form Q 4.3.1	**OPTION/*OPSIE 2***
OPTION/*OPSIE 1*	**Object B: East as -**
Object B: East as +	
$F_{net}\Delta t = \Delta p$ Any one /*Enige een* ✓ $F_{net}\Delta t = mv_f - mv_i$ $\underline{F_{net}(0,02)}$ ✓ $= \underline{2(-0,33) - 2(-1,5)}$ ✓ $F_{net} = \underline{117 \text{ N}}$ east/*oos* ✓	$F_{net}\Delta t = \Delta p$ ✓ Any one /Enige een $F_{net}\Delta t = mv_f - mv_i$ $\underline{F_{net}(0,02)}$ ✓ $= \underline{2(0,33) - 2(1,5)}$ ✓ $F_{net} = -117$ N $= \underline{117 \text{ N}}$ east/*oos* ✓
OPTION/*OPSIE 3*	**OPTION /*OPSIE 4***
Object A: East as +	**Object A: East as -**
$F_{net}\Delta t = \Delta p$ Any one /*Enige een* ✓ $F_{net}\Delta t = mv_f - mv_i$ $\underline{F_{net}(0,02)}$ ✓ $= \underline{1(-0,33) - 1(2)}$ ✓ $F_{net} = -116,5$ N $= 116,5$ N west/*wes* F_{net}(A on B) = 116,5 N east/*oos*✓	$F_{net}\Delta t = \Delta p$ Any one /*Enige een* ✓ $F_{net}\Delta t = mv_f - mv_i$ $\underline{F_{net}(0,02)}$ ✓ $= \underline{1(0,33) - 1(-2)}$ ✓ $F_{net} = 116,5$ N west/*wes* F_{net} (A on B) = 116,5 N east/*oos* ✓

(4)

CONSIDER: Answer /Antwoord in Q 4.3.1/V 4.3.1 $v_f = \underline{0,33 \text{ m.s}^{-1} \text{ east/oos}}$

Object B: East as +	Object A: East as +
$F_{net}\Delta t = \Delta p$ $F_{net}\Delta t = mv_f - mv_i$ } Any one /*Enige een* ✓ $F_{net}(0,02)$ ✓ = $2(0,33) - 2(-1,5)$ ✓ F_{net} = 183 N east/*oos* ✓	$F_{net}\Delta t = mv_f - mv_i$ $F_{net}(0,02)$ ✓ = $1(0,33) - 1(2)$ ✓ F_{net} = 83,5 N east/*oos* ✓

4.4 Zero/ nul ✓ Add **0** (1)

4.5 Positive marking from Q 4.3.1

$E_k = \frac{1}{2}mv^2$ ✓

$E_{ki} = \frac{1}{2}(1)(2)^2 + \frac{1}{2}(2)(1,5)^2$ ✓ = 4,25 J

$E_{kf} = \frac{1}{2}x(1+2)(0,33)^2$ ✓

E_{kf} = 0,16 J

$E_{ki} \neq E_{kf}$ ✓

Collision is inelastic / *Botsing is onelasties* ✓ (5)

[18]

QUESTION/*VRAAG 5*

5.1 The force for work done in moving an object between two point depends on the path taken. ✓✓ **(0 or 2)**
Die krag waarvoor die arbeid verrig om 'n voorwerp tussen twee punte te beweeg, is afhanklik van die roete wat gevolg word. (2)

5.2 Frictional force / *Wrywingskrag* ✓ (1)

5.3 No/*Nee* ✓
It is not isolated system/ *Die sisteem is nie geïsoleerd nie* ✓
There is frictional force/ *Daar is 'n wrywingkrag*.
There is a non-conservative force/ *Daar is 'n nie-konserwatiewe krag*. (2)

OPTION 1 / *OPSIE 2*

5.4 $W_{net} = \Delta E_k$
$W_f = ½ mv_f^2 - ½ mv_i^2$
$f\Delta x\cos\theta = ½ mv_f^2 - ½ mv_i^2$ Any one/*Enige een* ✓
$\underline{30 \times 2\cos 180^o}$ ✓ = $\underline{½ \times 3\ v_f^2 - ½ \times 3 \times 7^2}$ ✓
$v_f = 3\ m.s^{-1}$

OPTION 2 / *OPSIE 2*
$W_{nc} = \Delta E_p + \Delta E_k$
$W_{nc} = mgh_f - mgh_i + ½ mv_f^2 - ½ mv_i^2$ Any one/ *Enige een* ✓
$W_f = mgh_f - mgh_i + ½ mv_f^2 - ½ mv_i^2$
$\underline{30\Delta x\cos 180^o}$ ✓= 0 + $\underline{½ \times 3\ v_f^2 - ½ \times 3 \times 7^2}$ ✓
$v_f = 3\ m.s^{-1}$ (3)

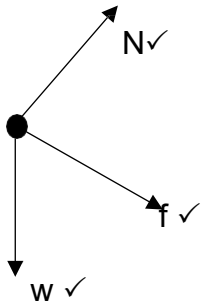
OPTION 3

$F_{net} = ma$

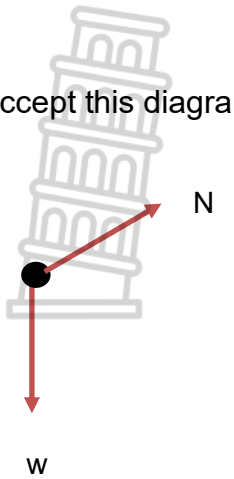
$30 = (3)a$✓

$a = 10\ m.s^{-2}$
$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$v_f^2 = 7^2 + 2(10)(2)$ ✓
$v_f = 3\ m.s^{-1}$

5.5



Accept this diagram



	N	F_N, Normal force / *Normaalkrag*
	f	~~f_k, F_f, Frictional force/ *Wrywingskrag*~~
	W	F_g, weight, gravitational force / *gewig / gravitasiekrag*

Mark awarded for arrow and label/ *Punt toegeken vir pyltjie en benoeming*
Do not penalise for length of arrows since drawing is not drawn to scale,
Moenie penaliseer vir die lengte van die pyltjies nie, die tekening is nie volgens skaal geteken nie.
~~Any other additional force(s)/ *Enige addisionele kragte* ⅔~~
If force(s) do not make contact with body/ *As kragte nie kontak maak met liggaam* Max/*Maks* ⅔ (2)

5.6 The net work done on an object is equal to the change in kinetic energy of the object. ✓✓
Die netto arbeid verrig op 'n voorwerp is gelyk aan die verandering in kinetiese energie van die voorwerp. (2)

5.7 **OPTION 1/ *OPSIE 1***

$W_{net} = \Delta E_k$
$W_f = ½ mv_f^2 - ½ mv_i^2$ } Any one/ *Enige een* ✓
$F_g \Delta x \cos\theta = ½ mv_f^2 - ½ mv_i^2$

$3 \times 9{,}8 \sin 20^\circ$ ✓ $d \cos 180^\circ$ ✓ $= ½ \times 3 \times 0^2 - ½ \times 3 \times 3^2$ ✓
$d = 1{,}34$ m ✓

OPTION 2 / *OPSIE 2*

$W_{nc} = \Delta E_p + \Delta E_k$
$W_{nc} = mgh_f - mgh_i + ½ mv_f^2 - ½ mv_i^2$ } Any one/ *Enige een* ✓

$0 = 3 \times 9{,}8$ ✓ $d \cos 20^\circ - 0$ ✓ $+ 0 + ½ \times 3 \times 0^2 - ½ \times 3 \times 3^2$ ✓
$d = 1{,}34$ m ✓

OPTION 3 /*OPSIE 3*

$(E_p + E_K)_i = (E_p + E_k)_f$
$(mgh + ½mv^2)_i = (mgh + ½mv^2)_f$ } Any one/ *Enige een* ✓

$0 + ½ \times 3 \times 3^2$ ✓ $= [3 \times 9{,}8 \times d \sin 20^\circ$ ✓ $+ 0]$ ✓
$d = 1{,}34$ m ✓

$W_{net} = \Delta E_k$ ✓
$F_g \Delta x \cos\theta = ½ mv_f^2 - ½ mv_i^2$ } Any one/ *Enige een* ✓

$3 \times 9{,}8 \Delta x \cos 110^\circ$ ✓ $= (½ \times 3 \times 0^2) - (½ \times 3 \times 3^2)$ ✓
$\Delta x = 1{,}34$ m ✓

(5)
[17]

QUESTION/*VRAAG 6*

6.1 $m = 200 \times 1000$
$m = 2 \times 10^5$ kg ✓ (1)

6.2 Positive marking from Q 6.1

OPTION 1 / *OPSIE 1*
$(E_p + E_K)_I = (E_p + E_k)_f$
$(mgh + ½mv^2)_I = (E_p + E_k)_f$
Any one/ *Enige een* ✓

$2 \times 10^5 \times 9,8 \times 150 + 0$ ✓ $= 0 + E_{kf}$ ✓
$2,94 \times 10^8$ J ✓

OPTION 2 / *OPSIE 2*
$W_{net} = \Delta E_k$
$F\cos\theta\Delta y = Ekf - Eki$
Any one/ *Enige een* ✓

$(200\ 000)(9,8)(\cos 0^o)(150)$ ✓ $= Ekf - 0$ ✓
$Ekf = 2,94 \times 10^8$ J ✓ (4)

6.3 Positive marking from Q 6.1 and Q 6.2

$E_k = ½mv^2$ ✓
$2,94 \times 10^8 = ½ \times 2 \times 10^5 v^2$ ✓
$v = 54,22$ m.s^{-1} ✓ (3)

$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$v_f^2 = 0^2 + 2(9,8)(150)$ ✓
$v_f = 54,22$ m.s^{-1} ✓

[8]

QUESTION/*VRAAG 7*

7.1 The change in frequency observed by a listener because the listener and source of sound have different velocities relative to the medium of sound propagation. ✓✓
Die verandering in frekwensie (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, het.

The change in frequency observed by a listener due to relative motion between the sound source and the listener. ✓✓
Die verandering in frekwensie wat deur 'n luisteraar waargeneem word as gevolg van relatiewe beweging tussen die klankbron en die luisteraar. (2)

7.2 Towards, ✓ Frequency detected by observer is higher than the source frequency. ✓
Na. Die frekwensie wat deur die luisteraar waargeneem word is hoër as die frekwensie van die bron. (2)

7.3 f_s = 780 Hz ✓✓ (2)

7.4 7.4.1 $f_L = \frac{v \pm v_L}{v \pm v_s} f_s$ ✓

791,47 ✓ = $\frac{v+5}{v}$ ✓ x 780 ✓

v = **340,02** m.s^{-1} ✓ 340,02 m.s^{-1} (5)
Any points can be used

7.4.2 v = fλ ✓
340,02 = 780 x λ ✓
λ = 0,44 m ✓ (3)

7.5 Measure the heart-beat of foetus in the womb./ *Meet die hartklop van die fetus in die baarmoeder* ✓
Measure the rate of blood flow / *Meet die tempo van bloedvloei* ✓ (2)

7.6 The star is moving away, ✓ the spectral lines show a decrease in frequency. ✓
OR the spectral lines show an increase in wavelength.

*Die ster beweeg weg, die spektrallyne toon 'n afname in frekwensie **OF** die spektrallyne toon 'n toename in golflengte.* (2)
[18]

QUESTION/*VRAAG 8*

8.1 The magnitude of the electrostatic force exerted by one point charge (Q1) on another point charge (Q2) is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance (r) between them. ✓✓
Die grootte van die elektrostatiese krag wat een puntlading (Q_1) op 'n ander puntlading (Q_2) uitoefen. Is direk eweredig aan die produk van die groottes van die ladings en omgekeerd eweredig aan die kwadraat van die afstand (r) tussen hulle. (2)
NOTE: if masses then 0/2

8.2 8.2.1 $n = \frac{Q}{q_e}$ ✓

$n = \frac{-6 \times 10^{-6}}{-1,6 \times 10^{-19}}$ ✓

$n = 3,75 \times 10^{13}$ ✓electrons/*elektrone* (3)

8.2.2 $F = \frac{kQ_1Q_2}{r^2}$ ✓

$F = \frac{9 \times 10^{9} \times 4 \times 10^{-6} \times 6 \times 10^{-6}}{0,4^2}$ ✓✓

F = 1,35 N ✓ (4)

8.2.3 $E = \frac{kQ}{r^2}$ ✓

$E_1 = \frac{9 \times 10^{9} \times 4 \times 10^{-6}}{0,6^2}$ ✓= 1 x 10^5 N.C^{-1} right / *regs*

$E_2 = \frac{9 \times 10^{9} \times 6 \times 10^{-6}}{0,2^2}$ ✓= 1,35 x 10^6 N.C^{-1} left / *links*

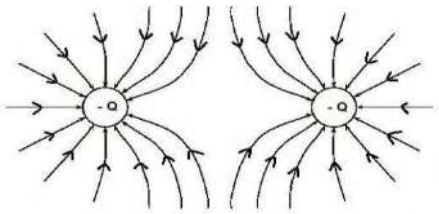
E_{net} = 1 x 10^5 - 1,35 x 10^6 ✓

E_{net} = -1,25 x 10^6

E_{net} = 1,25 x 10^6 N.C^{-1} left/ *links* ✓ (6)

8.3 8.3.1 A region of space in which an electric charge experiences a force. ✓✓
Dit is 'n gebied in die ruimte waarin 'n elektriese lading 'n krag ondervind. (2)

8.3.2



Criteria for marking/*Nasienkriteria*	
Correct shape / *Korrekte vorm*	✓
Direction of field lines/ *Rigting van veldlyne*	✓
Field lines not starting from the same point and do not enter the sphere *Veldlyne begin nie by dieselfde punte nie.*	✓

(3)

[20]

TOTAL/*TOTAAL :* 147

CONVERSION Table See next page

Physical Sciences P1 Conversion Table June 2026

Conversion Table: 147Marks → 150 Marks

The formula used is:
Converted Marks = (Original Marks ÷ 147) × 150

Mark Obtained (out of 147)	Mark to be added to convert to out of 150
0-10	0
11-58	1
59 -106	2
107-147	3