Basic Education

KwaZulu-Natal Department of Basic Education
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCES: PHYSICS (P1)

COMMON TEST

JUNE 2016

NATIONAL SENIOR CERTIFICATE

GRADE 12

MARKS: 100

TIME : 2 hours

This question paper consists of 10 pages and a 1 – page data sheet.

INSTRUCTIONS AND INFORMATION TO CANDIDATES

1. Write your name on the **ANSWER BOOK**.
2. This question paper consists of FOUR questions. Answer ALL the questions in the ANSWER BOOK.
3. Start EACH question on a NEW page in the ANSWER BOOK.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave ONE line between two subsections, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable calculator.
7. You may use appropriate mathematical instruments.
8. You are advised to use the attached DATA SHEET.
9. Show ALL formulae and substitutions in ALL calculations.
10. Round off your final numerical answers to a minimum of TWO decimal places.
11. Give brief motivations, discussions, et cetera where required.
12. Write neatly and legibly.

QUESTION 1: MULTIPLE- CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A - D) next to the question number (1.1 – 1.6) in the ANSWER BOOK, for example 1.7 D.

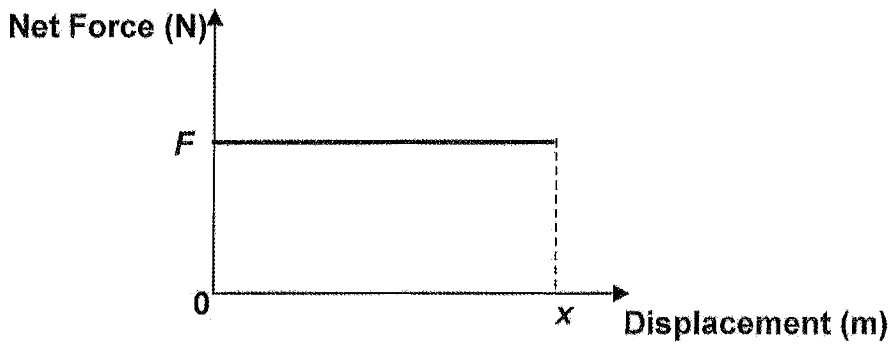
1.1 The net force acting on a body is equal to the . . .

A rate of change of velocity of the body.
B rate of change of momentum of the body.
C rate of change of the kinetic energy of the body.
D product of the mass of the body and the change in the velocity of the body. (2)

1.2 A ball is thrown vertically upwards into the air. Neglecting friction, which ONE of the following physical quantities has a zero value at the instant the ball changes direction?

A The momentum of the ball.
B The acceleration of the ball.
C The net force acting on the ball.
D The gravitational force acting on the ball. (2)

1.3 The graph below represents a constant net force *F* acting on an object over a displacement, *x* metres. The force and displacement are in the same direction.



Which ONE of the following statements can be deduced from the graph?

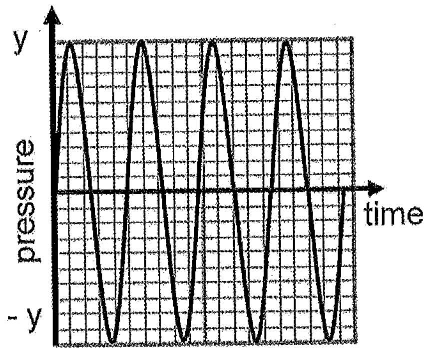
A The gradient of the graph represents the net work done by *F*.
B The area under the graph represents the power dissipated *F*.
C The area under the graph represents the net work done by *F*.
D The gradient of the graph represents the power dissipated by *F*. (2)

1.4 Two trolleys, X and Y, of masses m and 2m, respectively, are moving towards each other at constant speeds on a frictionless horizontal surface. They collide head-on and come to rest immediately after the collision.

Which ONE of the following statements is TRUE?

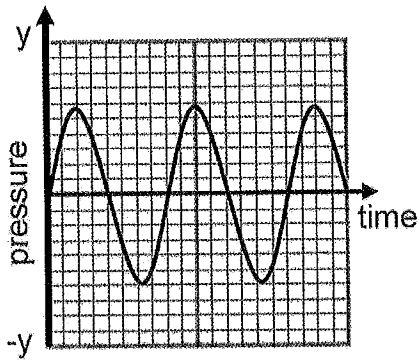
A The collision between trolley X and trolley Y is elastic.
B The sum of the initial momentum of trolley X and trolley Y is zero.
C The sum of the initial kinetic energies of trolley X and trolley Y is zero.
D The magnitude of the change in momentum of trolley Y is greater than that of trolley X. (2)

1.5 The pressure versus time graph below represents a sound wave in air emitted by a stationary source.

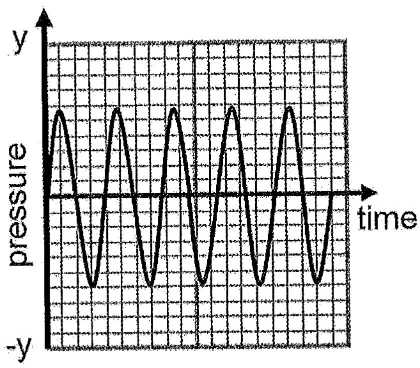


Which ONE of the following graphs best represents the sound wave, as observed by a stationary observer, if the source is moving away from the observer?

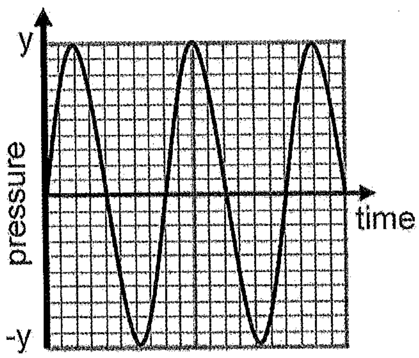
A



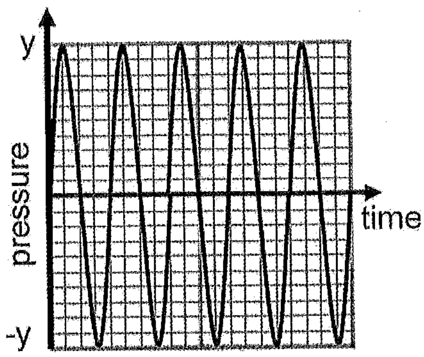
B



C



D



(2)

1.6 A body of mass, m, falls freely from rest from a height, h metres, above the ground. It reaches a velocity v after falling a distance of x metres. If air resistance is negligible, the total mechanical energy of the body after falling x metres is:

A mgh

B $\frac{1}{2}mv^2$

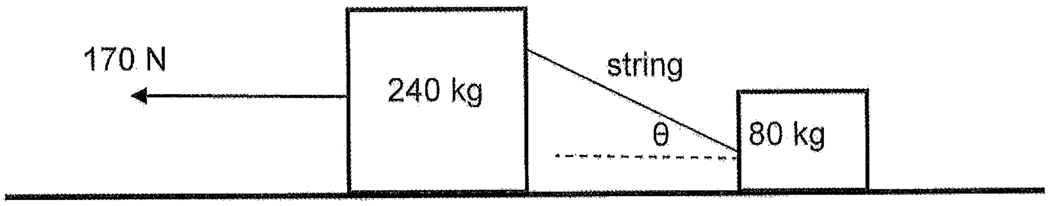
C mgh – mgx

D mgh + $\frac{1}{2}mv^2$ (2)

[12]

QUESTION 2

2.1 Two blocks of masses 240 kg and 80 kg, lie stationary on a rough horizontal surface. They are connected by a light, inextensible string. The string makes an angle of θ with the horizontal, as shown in the diagram below:



When a horizontal force of magnitude 170 N is applied to the 240 kg block, both blocks accelerate to the left at 0,30 $m.s^{-2}$. The 240 kg block experiences a constant frictional force of 40 N whilst moving.

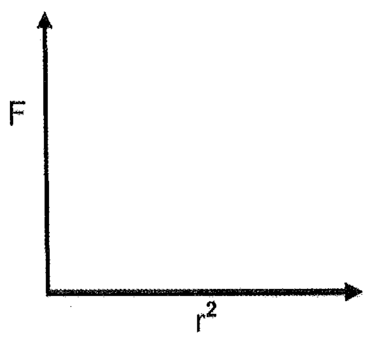
2.1.1 Draw a labelled free body diagram indicating ALL the forces acting on the 240 kg block while it is accelerating. (5)

2.1.2 Calculate the magnitude of the frictional force acting on the 80 kg block. (7)

2.1.3 How will the frictional force obtained in question 2.1.2 above be affected if the string that joined the blocks was horizontal?
(Write down INCREASES, DECREASES OR REMAINS THE SAME) (1)

2.1.4 The co-efficient of kinetic friction (μ_k), between the 80 kg block and the surface is 0,125. Calculate the magnitude of the angle (θ), shown in the diagram above. (7)

2.2 A spaceship is moving towards the Earth. Copy the following axes in your answer book and on it sketch a graph to show the relationship between the force that the Earth exerts on the spaceship and the distance between the spaceship and the centre of the Earth.

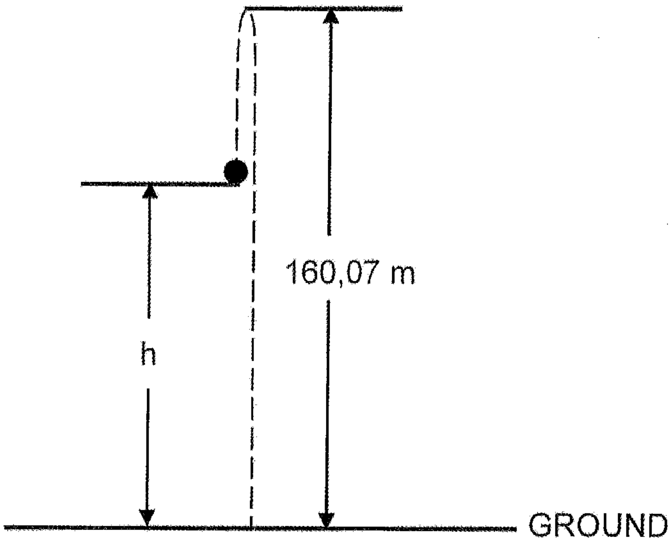


(2)
[22]

QUESTION 3

A helicopter is ascending vertically at a constant speed of 8 $m.s^{-1}$. A parcel is dropped from the helicopter, at the instant the helicopter reaches a height of h metres above the ground. The helicopter continues to ascend vertically at the same constant speed of 8 $m.s^{-1}$.

The parcel reaches a maximum height of 160,07 m above the ground.



The diagram above represents the motion of the parcel from the instant it was dropped from the helicopter. Ignore the effects of air friction.

3.1 Give a reason why the parcel is in *free fall* after it is dropped from the helicopter. (2)

3.2 Calculate the height,h, of the helicopter above the ground at the instant the parcel was dropped. (5)

3.3 Calculate the height of the parcel above the ground when the distance between the parcel and the helicopter is 78,40 m. (8)

3.4 Sketch a velocity-time graph for both the parcel and the helicopter from the instant the parcel is dropped from the helicopter to the instant the distance between the helicopter and the parcel is 78,40 m.

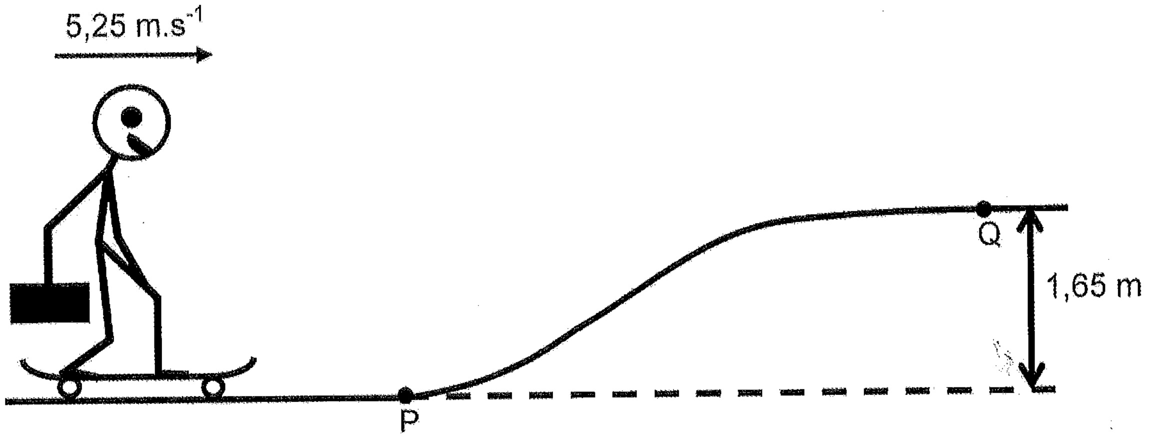
Show the following on the graph:

(a) Initial velocity for both the parcel and the helicopter.
(b) The time when the distance between the parcel and the helicopter is 78,40 m. (5)

[20]

QUESTION 4

A boy on a skateboard moves at a constant speed of 5,25 m.s^{-1} to the right towards point P, the bottom of a slope. He is carrying a bag of mass 6 kg. The total mass of the boy, his skateboard and the bag is 90 kg.
He needs to increase his speed, in order to reach point Q, the top of the slope with a speed of 0,75 m.s^{-1}. The vertical height of Q above the ground level is 1,65 m.
The boy throws his bag horizontally before he reaches point P in order to increase his forward velocity.



Ignore the effects of friction.

4.1 State Newton's Third Law of Motion in words. (2)

4.2 In which direction must the boy throw the bag in order to increase his forward velocity. (ONLY write down TO THE LEFT OR TO THE RIGHT) (1)

4.3 State the *Principle Of Conservation Of Mechanical Energy.* (2)

4.4 What must the velocity of the boy be, immediately after the bag leaves his hand, in order for him to reach point Q, with a speed of 0,75 m.s^{-1}? Clearly show how you arrived at your answer. (5)

4.5 How will the answer you obtained in 4.4 above be affected if

4.5.1 the boy had a greater mass? (1)

4.5.2 the effects of friction are not ignored? (1)
(Write down GREATER THAN, LESS THAN or REMAINS THE SAME)

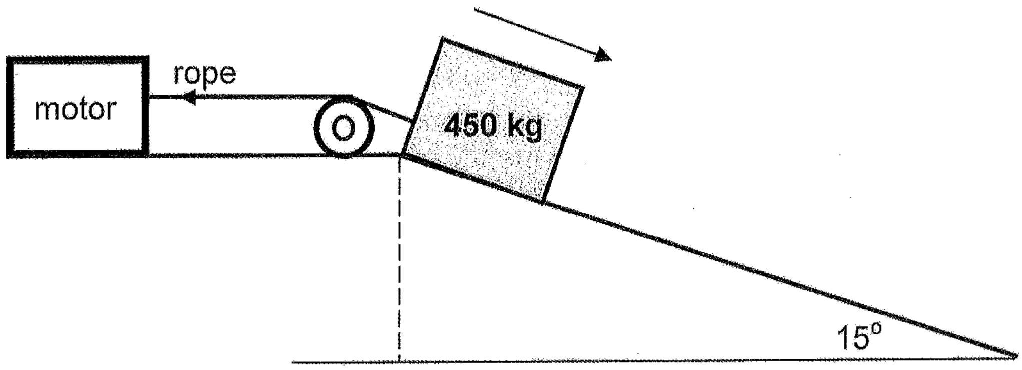
4.6 Calculate the magnitude of the velocity with which the boy must throw the bag in order for him to reach point Q with a speed of 0,75 m.s^{-1}. (5)

4.7 Name the principle that you used to calculate the answer to question 4.6. (1)

[18]

QUESTION 5

The diagram below represents the system used at a construction site to slide a crate filled with bags of cement down a 25 m ramp that makes an angle of 15° with the horizontal, as indicated.



The motor exerts a constant force by means of a light inextensible rope running over a frictionless pulley.
The crate together with the bags of cement has a total mass of 450 kg and slides from rest from the top of the ramp and reaches the bottom of the ramp with a velocity of 1,39 m.s^{-1}.
The loaded crate experiences a constant frictional force of 275 N as it slides down the ramp.

5.1 Draw a labelled force diagram indicating ALL the forces acting on the crate as it slides down the ramp. (4)

5.2 Define a non-conservative force. (2)

5.3 Calculate the work done by the motor to lower the crate to the bottom of the ramp. (5)

5.4 What is the average power delivered by the motor if it takes 5 minutes to lower the crate to the bottom of the ramp. (3)
[14]

QUESTION 6

Sanam is sitting at the side of a road with a detector that can measure several frequencies of sound waves.
A fire engine and an ambulance travel at constant velocity in the same direction and on the same road where Sanam is sitting.

The siren of the ambulance emits sound waves with a constant frequency of 920,00 Hz, while the siren of the fire engine emits sound waves with a constant frequency of 900,00 Hz.

The detector that Sanam has measures the frequency of the sound waves emitted from the ambulance as 1030,00 Hz, and that of the fire engine as 850,00 Hz.

6.1 State the *Doppler* effect in words. (2)

6.2 Which vehicle (the ambulance or the fire engine) is travelling . . .

6.2.1 towards Sanam. (1)

6.2.2 away from Sanam. (1)

6.3 The fire engine is travelling at a constant speed of 20 $m.s^{-1}$.
Calculate the speed with which the ambulance is travelling. (6)

6.4 Most scientists subscribe to the theory that the universe is expanding. Briefly explain how the Doppler effect is used to support this theory. (4)
[14]

GRAND TOTAL: [100]

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	$9{,}8\ m\cdot s^{-2}$
Speed of light in a vacuum *Spoed van lig in 'n vacuum*	c	$3{,}0 \times 10^{8}\ m\cdot s^{-1}$
Planck's constant *Planck se konstante*	h	$6{,}63 \times 10^{-34}\ J\cdot s$
Electron mass *Elektronmassa*	m_e	$9{,}11 \times 10^{-31}\ kg$

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

FORCE/*KRAG*

$F_{net} = ma$	$p = mv$
$F\Delta t = \Delta p = mv_f - mv_i$	$F_g = mg$
$f_s^{max} = \mu_s N$	$f_k = \mu_k N$

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

$W = F\Delta x \cos\theta$	$U = E_P = mgh$
$K = E_k = \frac{1}{2}mv^2$	$W = \Delta K = \Delta E_k = E_{kf} - E_{ki}$
$P = \frac{W}{\Delta t}$	$P = Fv$

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

$v = f\lambda$ or/*of* $v = \nu\lambda$	$T = \frac{1}{f}$ or/*of* $T = \frac{1}{\nu}$
$f_L = \frac{v \pm v_L}{v \pm v_s} f_s$	

Basic Education

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PHYSICAL SCIENCES P1

MEMORANDUM

COMMON TEST

JUNE 2016

NATIONAL
SENIOR CERTIFICATE

GRADE 12

N.B. This memorandum consists of 9 pages including this page.

SECTION A

PART I: PHYSICS

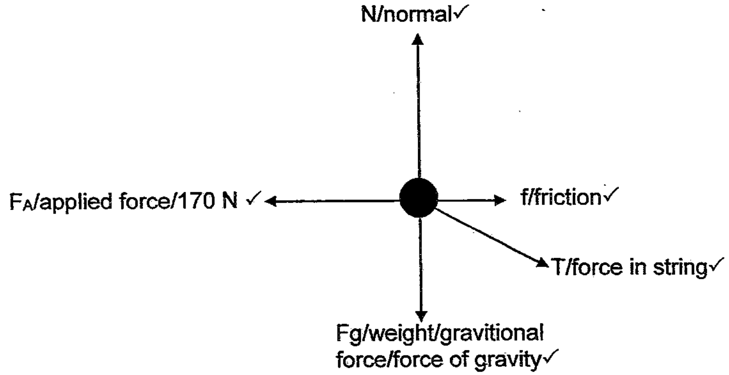
QUESTION 1

1.1 B✓✓
1.2 A✓✓
1.3 C✓✓
1.4 B✓✓
1.5 C✓✓
1.6 A✓✓

6x 2 = **[12]**

QUESTION 2

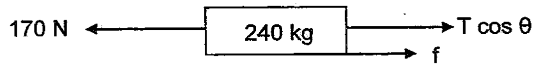
2.1.1



(5)

2.1.2

OPTION 1 (taking left as positive)

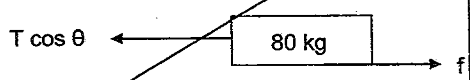


Fnet = ma✓

170 + (-T cos θ) + (-f) ✓ = (240)(0,3) ✓

170 + (-T cos θ) + (-40) ✓ = (240)(0,3)

T cos θ = 58 N



T cos θ + (-f) = ma

58 + (-f) ✓ = (80)(0,3) ✓

f = 34 N✓

OPTION 2 (right as positive)

Fnet = ma✓

-170 + (T cos θ) + (f) ✓ = (240)(-0,3)✓

-170 + (T cos θ) + (40) ✓ = (240)(-0,3)

T cos θ = 58 N

T cos θ + (-f) = ma

-58 + (+f) ✓ = (80)(-0,3) ✓

f = 34 N✓

(7)

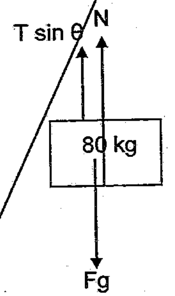
OPTION 3

$$F_{net} = ma ✓$$
$$170 + (-f)\ ✓ = (240 + 80)(0,3)\ ✓$$
$$f = 74\ N$$
$$f = f_{240\ kg} + f_{80\ kg}\ ✓$$
$$74 = 40 + f_{80\ kg} ✓$$
$$f_{80\ kg} = 34\ N$$

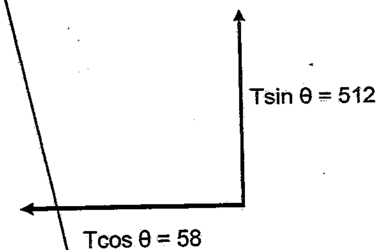
max 5/7

2.1.3 increases✓ (1)

2.1.4



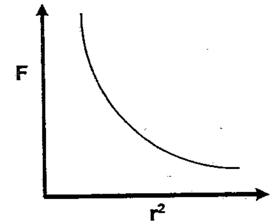
$$f_k = \mu_k N ✓$$
$$34\ ✓ = (0,125)(F_g - T\sin\theta)\ ✓$$
$$34 = (0,125)\{(80)(9,8)\ ✓ - T\sin\theta\}$$
$$T\sin\theta = 512\ N$$



$$\tan\theta = 512✓/58✓$$
$$\theta = 83{,}54°✓$$

(7)

2.2



✓✓ (2)

[22]

QUESTION 3

3.1 Force of gravity is the only force that acts on the parcel. ✓✓ (2)

3.2

OPTION 1

$$v_f^2 = v_i^2 + 2a\Delta y ✓$$
$$0^2 = 8^2\ ✓ + (2)(-9,8)((\Delta y)\ ✓$$
$$\Delta y = 3{,}27\ m$$
Height of the helicopter = 160,07 - ✓ 3,27 = 156,80 m✓

(5)

OPTION 2

$$v_f^2 = v_i^2 + 2a\Delta y ✓$$
$$0^2 = -8^2\ ✓ + (2)(9,8)((\Delta y)\ ✓$$
$$\Delta y = 3{,}27\ m$$
Height of the helicopter = 160,07 - ✓ 3,27 = 156,80 m✓

(5)

3.3 Consider the displacement of the helicopter to be y
Then the displacement of the parcel is –(78,4 -y)

OPTION 1 (upward is positive)

<u>Helicopter</u> $\Delta y = v_i\Delta t + ½a\Delta t^2 ✓$ or $\Delta y = v_i\Delta t$

$$\Delta y = (8)\Delta t ✓$$

<u>Parcel</u> $\Delta y = v_i\Delta t + ½a\Delta t^2$

$$-(78{,}40 - y)\ ✓ = (8)(\Delta t) + ½(-9{,}8)\Delta t^2 ✓$$
$$y - 78{,}40 = (8\Delta t) - 4{,}9\Delta t^2$$
$$(8)\Delta t - 78{,}40 = (8\Delta t) - 4{,}9\Delta t^2$$
$$\Delta t = 4\ s✓$$

OPTION 1 CONTINUED

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

$= (8)(4) + \frac{1}{2}(-9,8)(4)^2$✓ (4s from above)

$= -46,40$ m

Height of parcel $= 156,8 -$✓ $46,40$ (156,80 from 2.2)

$= 110,40$ m✓

OPTION 2

<u>Helicopter</u> $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$✓ or $\Delta y = v_i\Delta t$

$\Delta y = (-8)\Delta t$✓

<u>Parcel</u> $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$

$(78,40 - y)$ ✓ $= (8)(\Delta t) + \frac{1}{2}(9,8)\Delta t^2$✓

$78,40 - y = (8\Delta t) + 4,9\Delta t^2$

$78,40 - (-8)\Delta t = (8\Delta t) + 4,9\Delta t^2$

$\Delta t = 4$ s✓

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

$= (-8)(4) + \frac{1}{2}(+9,8)(4)^2$✓ (4s from above)

$= +46,40$ m

Height of parcel $= 156,8 -$✓ $46,40$ (156,80 from 2.2)

$= 110,40$ m✓

(8)

OPTION 3

When the helicopter is 78,40 m above the parcel : $y_{helicopter} = y_{parcel} + 78,40 - 156,80$

$\Delta y_{helicopter} = y_f - y_i = y_{parcel} - 78,40$

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

$= 8\Delta t$✓

$= y_{parcel} - 78,40$

$y_{parcel} = 8\Delta t + 78,40$✓ ....(1)

$\Delta y_{parcel} = y_f - y_i = y_{parcel} - 156,80$

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

$= (8)\Delta t + \frac{1}{2}(-9,8)\Delta t^2$✓

$= y_{parcel} - 156,80$

$y_{parcel} = (8)\Delta t + \frac{1}{2}(-9,8)\Delta t^2 + 156,80$ ....(2)

equating (1) and (2)

$8\Delta t + 78,40 = (8)\Delta t + \frac{1}{2}(-9,8)\Delta t^2 + 156,80$

$\Delta t = 4$ s✓

$y_{parcel} = 8\Delta t + 78,40$✓ OR $y_{parcel} = (8)\Delta t + \frac{1}{2}(-9,8)\Delta t^2 + 156,80$

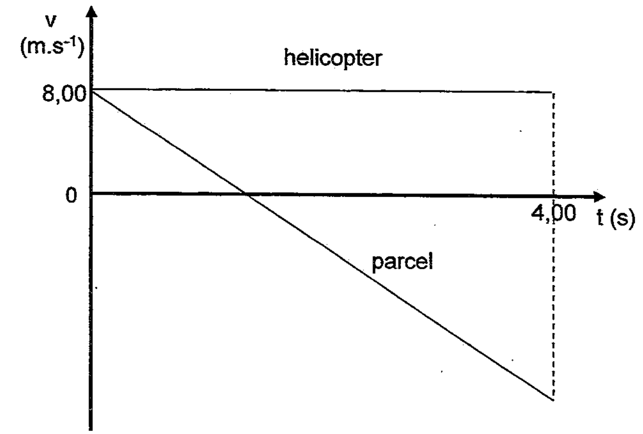
$= 8(4) + 78,40$ OR $y_{parcel} = (8)(4) - (4,9)(4)^2 + 156,80$

$y_{parcel} = 110,4$ m✓

(8)

Please Turn Over

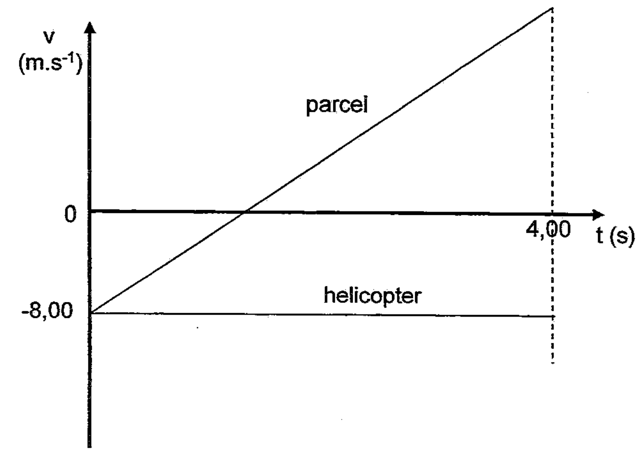
3.4 DOWNWARDS NEGATIVE (Positive marking from 3.3 for the time of 4 s)



Initial velocity for both 8 m.s^{-1}	✓
Both graphs stop at 4 s	✓
For helicopter: straight line parallel to the X-axis	✓
For parcel: straight line above and below the X-axis with a gradient	✓
Above X-axis shorter than below	✓

(5)

DOWNWARDS POSITIVE



Initial velocity for both 8 m.s^{-1}	✓
Both graphs stop at 4 s	✓
For helicopter: straight line parallel to the X-axis	✓
For parcel: straight line above and below the X-axis with a gradient	✓
Below X-axis shorter than above	✓

(5)
[20]

Please Turn Over

QUESTION 4

4.1 When one body exerts a force on a second body, the second body exerts a force of equal magnitude in the opposite direction on the first body. ✓✓/ Whenever body A exerts a force on body B, body B will exert an equal force on body A, but in the opposite direction. ✓✓ (2)

4.2 to the left✓ (1)

4.3 The total mechanical energy (sum of gravitational potential energy and kinetic energy) in an isolated system remains constant. ✓✓/ in the absence of any non-conservative forces the sum of the gravitational potential energy and kinetic energy remains constant / for every action there is equal but opposite reaction✓✓ (2)

4.4

$$(E_k + E_p)_P = (E_k + E_p)_Q ✓$$
$$½mv^2 + 0 = ½mv^2 + mgh$$
$$½(84)v^2 ✓ + 0 = ½(84)(0,75)^2 ✓ + (84)(9,8)(1,65) ✓$$
$$v = 5.736\ m.s^{-1} ✓$$
(5)

NOTE: m can be used for mass, instead of 84 kg.
However if 90 kg used for mass maximum 4/5

4.5.1 remains the same✓ (1)
4.5.2 greater than✓ (1)

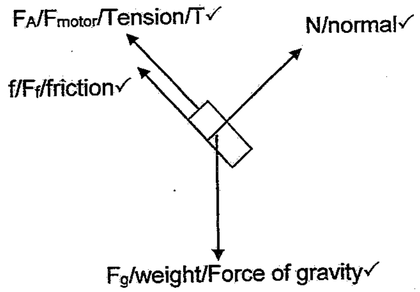
4.6 Positive marking from question 4.4 (velocity of boy)

Total momentum before = Total momentum after } any one✓
p(bag + boy) = p(bag) + p(boy)
$(m_1 + m_2)v_i = m_1v_{f1} + m_2v_{f2}$
(90)(5,25) ✓ = (6) v_f✓ + (84)(5,736) ✓
v_f(bag) = -1,554 $m.s^{-1}$
Therefore speed = 1,554 $m.s^{-1}$✓ (accept: range 1,47 – 1,61) (5)

4.7 The principle of conservation of linear momentum. ✓ (1)
[18]

QUESTION 5

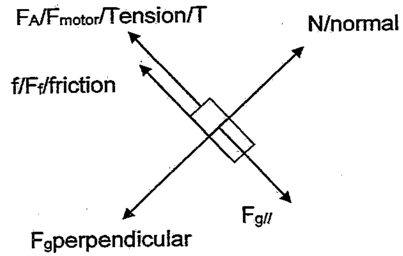
5.1



(4)

5.2 is a force for which the work done in moving an object between two points depends on the path taken. ✓✓ (2)

5.3 **OPTION 1**



$F_{g//} = F_g\sin\theta$
$= mg\sin\theta$
$= (450)(9,8)\sin15°$
$= 1141,39\ N$

$W_{net} = \Delta K$ ✓
$W_{Fmotor} + W_{Fg//} + W_f + W_{Fgperpendicular} + W_N = ½mv_f^2 - ½mv_i^2$
$W_{Fmotor} + F_{g//}\Delta x\cos\theta + f\Delta x\cos\theta + 0 + 0 = ½(450)(1,39)^2$✓ $- 0$
$W_{Fmotor} + (1141,39)(25)\cos0°$✓ $+ (275)(25)\cos180°$ ✓ $= 434,72$
$W_{Fmotor} = -21225,03\ J$✓ (5)

OPTION 2

$W_{nc} = \Delta E_p + \Delta E_k$✓
$W_{motor} + W_f = mg\Delta h + ½mv_f^2 - ½mv_i^2$
$W_{motor} + f\Delta x\cos\theta = mg(-25\sin15°) + ½mv_f^2 - 0$
$W_{motor} + (275)(25)\cos180°$✓ $= (450)(9,8)(-25\sin15°)$ ✓ $+ ½(450)(1,39)^2$✓
$W_{motor} = -21\ 225,08\ J$✓ (5)

5.4.

OPTION 1

$P = \frac{W}{\Delta t}$✓

$P = \frac{21225,03}{300}$✓

$= 70,75\ W$✓

OR

OPTION 2

$P = \frac{W}{\Delta t}$✓

$P = \frac{21225,08}{300}$✓

$= 70,75\ W$✓

(3)
[14]

QUESTION 6

6.1 is the change in frequency (or pitch) of the sound detected by a listener because the sound source and the listener have different velocities relative to the medium of sound propagation. ✓✓ or
the change in the observed frequency of a sound wave when the source of the sound is moving relative to the listener.✓✓ (2)

6.2 6.2.1 ambulance✓ (1)

6.2.2 fire engine✓ (1)

6.3 $f_L = \frac{v \pm v_L}{v \pm v_s} f_s$ ✓

$850✓ = \frac{v}{v+20} 900$ ✓

If calculation for speed of sound in air is not shown: maximum 4/6

$v = 340{,}00\ m.s^{-1}$

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

$1030✓ = \frac{340}{340 - v_s} 920$ ✓

$v_s = 36{,}31\ m.s^{-1}$ ✓ (6)

6.4 When a distant star emits light, its spectrum can be observed on Earth.
The spectral lines for certain elements do not correspond to that of the same elements✓ when the light source is stationary. ✓
The shift in the spectral lines (towards the red) implies that the frequency is observed lower than the actual frequency. ✓
Hence the star is moving away from the Earth. ✓ (4)

OR

Moving stars emit light that show a shift towards red(spectral lines). ✓✓
This implies that the frequency observed is lower than the actual frequency. ✓
Hence the star is moving away from the Earth. ✓ (4)

OR

Compare the spectral lines of an element on earth✓ with the spectral lines of the element on a distant planet. ✓
If the spectral lines are red shifted(move closer to the red end) ✓
The distant planet is moving away from the Earth✓ (4)

[14]

TOTAL: 100

PHYSICAL SCIENCES PAPER 1
GRADE 12
JUNE 2016
ANALYSIS GRID

QUESTION	MARKS	NEWTON	VERTICAL PROJECTILE MOTION	MOMENTUM	WORK ENERGY POWER	DOPPLER EFFECT	A (LEVEL 1)	B (LEVEL 2)	C (LEVEL 3)	D 9LEVEL 4)
1.1	2			2			2			
1.2	2		2					2		
1.3	2				2			2		
1.4	2			2					2	
1.5	2					2		2		
1.6	2				2			2		
2.1.1	5	5						5		
2.1.2	7	7							7	
2.1.3	1	1						1		
2.1.4	7	7							7	
2.2	2	2					2			
3.1	2		2				2			
3.2	5		5					5		
3.3	8		8							8
3.4	5		5						5	
4.1	2	2					2			
4.2	1			1					1	
4.3	2				2		2			
4.4	5				5				5	
4.5.1	1				1			1		
4.5.2	1				1			1		
4.6	5			5				5		
4.7	1			1			1			
5.1	4				4			4		
5.2	2				2		2			
5.3	8				8				4	4
6.1	2					2	2			
6.2.1	1					1		1		
6.2.2	1					1		1		
6.3	6					6			6	
6.4	4					4		4		
TOTAL	***100***	***24***	***22***	***11***	***27***	***16***	***15***	***36***	***37***	***12***