

# PROVINCIAL MID YEAR EXAMINATIONS

# MID YEAR EXAM

# GRADE 12

# PHYSICAL SCIENCE / FISIESE WETENSKAP (P1/V1)

**MAY/JUNE 2017**

**MEMORANDUM**

**MARKS: 150**

**TIME: 3 hours**

**QUESTION** 1/VRAAG 1

1.1 B √√ (2)

1.2 C √√ (2)

1.3 B √√ (2)

1.4 B √√ (2)

1.5 D √√ (2)

1.6 C √√ (2)

1.7 C √√ (2)

1.8 C √√ (2)

1.9 C√√ (2)

1.10 A √√ (2)

 [20]

QUESTION/ VRAAG 2

2.1 An object will remain in a state of rest or move at a constant velocity, unless an external net (resultant) force works in on it.√√ (2)

 *‘n Voorwerp sal in rus verkeer of teen ‘n konstante snelheid bly voorbeweeg,*

 *tensy ‘n ongebalanseerde/netto/resulterende krag daarop inwerk.*

2.2

applied force/F/Fpacker√ *toepaste krag/F/Fpakker*

gravitationalforce/Fg/w/weight √ *gravitasiekrag/Fg/w/gewig* (2)

2.3 **Choose upwards as positive.**

Fnet = ma √

 Fpacker - w = ma

 Fpacker - 

 Fpacker  N *opwaarts*

 The bag will not tear √ since the force exerted by the packer is smaller than the force that the bag can withstand. / N (5)

 *Die sak sal nie skeur nie omdat die krag wat deur die pakker toegepas word kleiner is as wat die sak kan weerstaan. /*

F

packer

F

packer

10

°

10

°

 w = (10,5)(9,8)

 = 102,9 N

√

√

√

2.4

sin 10⁰√ = sin 160⁰√

 Fpacker w

 Fpacker = sin 10⁰ ∙ 102,9 √

sin 160⁰

 = 52,24N√

 **OR**

Scale 10 mm/1cm : 10 N.✓ Skaal: 10mm:10N

 10⁰ Fpacker = 5,2 cm = 52 mm✓

✓

✓Fpacker = 52 N

w = 10,29cm✓ ✓

w = 102,9 N Fpacker = 5,2 cm = 52 mm✓

 10⁰ Fpacker = 52N (7) **[16]**

**QUESTION / VRAAG 3**

3.1 The object had an upward velocity when it was released.  (1)

*Die voorwerp het ’n opwaartse snelheid toe dit losgelaat is.*

**OR/ *OF***

The object continues with its state of motion in a straight line.

*Die voorwerp beweeg voort in dieselfde rigting van beweging in ’n reguit lyn.*

**OR/ *OF***

The object has inertia.

D*ie voorwerp het traagheid.*

3.2.1 Upwards  (1)

*Opwaarts*

3.2.2 Downwards  (1)

 *Afwaarts*

3.3.1

|  |  |
| --- | --- |
| **Upward positive / opwaarts positief** vf = vi + a∆ t 0 = 110 - 9,8Δt∆ t = 11,22 s  | **Downward positive/ *afwaarts positief*** vf = vi + a∆ t 0 = - 110 + 9,8Δt∆ t = 11,22 s  |

(3)

3.3.2 **OPTION 1**

|  |  |
| --- | --- |
| **Upward positive / *opwaarts positief***Δy = viΔt +a∆t 22 -550  = 110Δt + ½(-9 ,8)Δt4,9Δt2 -110 Δt – 550 = 0 ∆t =−(−110)± (−110)2 − 4(4,9)(−550)2(4,9)Δt = 26,66 s or – 4,21 s Δt = 26,66 s  | **Upward negative / *opwaarts negatief*** Δy = viΔt +a∆t 22 550  = -110Δt + ½(9,8)Δt 4,9Δt2 -110 Δt – 550 = 0 Δt = 26,66 s or – 4,21 s Δt = 26,66 s  |

(4)

**OPTION 2**

**POSITIVE MARKING FROM QUESTION 3.3.1 / POSITIEWE NASIEN VAN VRAAG 3.3.1.**

|  |  |
| --- | --- |
| Time(point **Q** to **R)**: 11,22 s Time(point **R** to **Q)**: 11,22 s Time(point Q to ground): **Upward positive / *opwaarts positief***  Δy = viΔt +a∆t 2 -550 = (-110)Δt + ½(-9,8)Δt 4,9 Δt2 + 110 Δt – 550 = 0 -110 ± (110)2 − 4(4,9)(−550)∆t = 2(4,9)Δt = 4,21 s Total time = 11,22 + 11,22 + 4,21  = 26,65 s  | Time(point **Q** to **R)**: 11,22 s Time(point **R** to **Q)**: 11,22 s Time(point Q to ground): **Upward negative / *opwaarts negatief***Δy = viΔt +a∆t 2 2 550  = (110)Δt + ½(9,8)Δt 4,9 Δt2 +110 Δt – 550 = 0 -110 ± (110)2 − 4(4,9)(−550)∆t = 2(4,9)Δt = 4,21 s Total time = 11,22 + 11,22 + 4,21 = 26,65 s  |

**OPTION 3**

**POSITIVE MAKING FROM *QUESTION 3.3.1 / POSITIEWE NASIEN VAN VRAAG***

|  |  |
| --- | --- |
| **Upward positive / *opwaarts positief*** Height reached above point Q: vf2 = vi2+ 2a∆y2(0)2 = (110)2 + 2(-9,8)∆y2∴∆y= 617,35 m Displacement from point **R** to ground: ∆y= 550 + 617,35 = 1 167,35 m Δy = viΔt +a∆t 2 -1 167,35  = (0)Δt + ½(-9 ,8)Δt2Δt = 15,435 s Total time = 11,22 + 15,435  = 26,66 s  | **Upward negative / Opwaarts negatief** Height reached above point Q: vf2 = vi2+ 2a∆y2(0)2 = (-110)2 + 2(9,8)∆y2∴∆y= 617,35 m Displacement from point **R** to ground: ∆y= 550 + 617,35 = 1 167,35 m Δy = viΔt +a∆t 2 1 167,35 = (0)Δt + ½(9,8)Δt2Δt = 15,435 s Total time = 11,22 + 15,435  = 26,66 s  |

3.4 **POSITIVE MARKING FROM *QUESTION 3.3 / POSITIEWE NASIEN VAN***

***VRAAG* 3.3.**

**Downward as positive / *afwaarts as positief*:**

**Upward as positive**

**/**

***opwaarts as positief***

**:**

0

11

,

22

,66

26



t(s)

*v (*

m·s

-

1

)

-

110

|  |  |
| --- | --- |
| **Marking criteria/*nasienriglyne*** |  |
| Positive slope */ positiewe helling*  |  |
| Graph starts at v = -110 m·s -1 *Grafiek begin by v = -110* m·s-1 |  |
| Graph intercepts x axis at 11,22 s *Grafiek sny x axis by 11,22 s*  |  |
| Graph ends at 26,66 s *Grafiek eindig by 26,66 s*  |  |







|  |  |
| --- | --- |
| **Marking criteria**  |  |
| Negative slope / *negatiewe helling*  |  |
| Graph starts at v = 110 m·s -1 *Grafiek begin by v = 110* m·s-1 |  |
| Graph intercepts x axis at 11,22 s *Grafiek sny x axis by 11,22 s* |  |
| Graph ends at 26,66 s *Grafiek eindig by 26,66 s* |  |



(

4

)

**[1**

**4**

**]**

110

*v (*

m

·

s

-

1

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0

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11

22

,66

26



t(s)





**QUESTION 4**

4.1 The total linear momentum √of an isolated (closed) system remains constant √ (is conserved). **OR**

In an isolated systemthe total linear momentum before collision equals the total linear moment after collision. (2)

*Die totale liniêre momentum in ‘n geslote sisteem bly konstant.****OF***

*In ‘n geslote sisteem is die totale liniêre momentum voor die botsing gelyk aan die totale liniêre momentum na die botsing.*

**

√

QUESTION / VRAAG 5

5.1 N/FN/normal force √

F/Fapplied/applied force√/(components)

 f/friction√

 w/Fg/gravitational force√

 = relative size of arrows correct. (5)

* 1. Friction  (1)

*Wrywing*

* 1. The net/total work done on an object√is equal to the change in the object's

kinetic energy√**OR**

the work done on an object by a resultant/net force is equal to the change in the object's kinetic energy. (2)

 *Die netto/totale arbeid wat op ‘n voorwerp verrig word is gelyk aan die verandering*

 *in die voorwerp se kinetiese energie.*

 *Die arbeid wat op ‘n voorwerp verrig word deur die netto/resulterende krag is*

 *gelyk aan die verandering in die voorwerp se kinetiese energie.*

5.4

|  |
| --- |
| **OPTION 1/*OPSIE 1***Wnet = ΔEkFapp||Δxcosθ + fΔxcosθ = ½ m(vf2 – vi2) (45) cos300(3,5)cos00+ f(3,5)cos1800= ½ (25)(10,82 – 122)f = 136,69 N  |
| **OPTION 2/*OPSIE 2***Wnet = ΔEkFappliedΔxcosθ + fΔxcosθ = ½ m(vf2 – vi2) (45)(3,5)cos300+ f(3,5)cos1800= ½ (25)(10,82 – 122) f = 136,69 N  |
| **OPTION 3/*OPSIE 3***Wnc = ΔEk + ΔEpfΔxcosθ + Fapp||Δxcosθ = ½ m(vf2 – vi2) + mg(hf – hi) f(3,5)cos1800+ (45)cos300(3,5)cos00= ½ (25)(10,82 – 122) + 0f = 136,69 N  |

 (6)

 **[12]**

## **QUESTION 6 / VRAAG 6**

6.1 The air molecules form compressions and rarefactions that vibrate backwards and forwards(move closer and further apart). √ √ (2)

 *Die lugmolekules vorm verdigtings en verdunnings wat heen en weer vibreer.*

6.2.1 Remains the same. √ (1)

 Bly dieselfde

6.2.2 Increases. √ (1)

 Toeneem

 6.2.3 Decreases. √ (1)

 Afneem

6.3 2m √√ (2)

v

√

335

√

f

=

λ

=

2

=

167,50 Hz

6.4

√ (3)

* 1. The Doppler Effect is the change in the observed 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. √√ (2)

*Die Doppler effek is die verandering in die waargenome frekwensie/ toonhoogte/ klank waargeneem deur die luisteraar omdat die klankbron en die luisteraar verskillende snelhede het relatief tot die medium van klank voortplanting*

**OR/ OF**

The change in the (observed) frequency when there is relative motion between the source and the observer.

*Die verandering in die waargenome frekwensie wanneer daar relatiewe beweging is tussen die bron en die waarnemer*

6.6 v = d =12 = 3m∙s-1 √

 ∆t 4

v ± vL

 fL  = v ± vS ∙ fs √

 = (335 + 3) √

 335√ ∙ 167,50 √

 = 169Hz√ (6)

 **[18]**

QUESTION / VRAAG 7

7.1 The force of attraction or repulsion between two charges is directly proportional

to the product oftheir charges√ and inversely proportional to the square of the

distance between them/ their centres√ (2)

*Die elektrostaties aantrekkingskrag tussen twee ladings is direk eweredig aan*

*die produk van die ladings en omgekeerde eweredig aan die kwadraat van die*

*afstand tussen hul middelpunte.*

7.2 FJ ON K = k QJ QK √

 r2

 = (9 x 109)(4 x 10-6)(2 x 10-6) √

 (0,05)2 √

 = 28,80N attraction√ (4)

7.3 FL ON K

α

 FNET FJ ON K

7.4 **MAGNITUDE**: FR2 = FJ ON K 2 + FL ON K 2 √

*GROOTTE:* FR = √ 28,82  + (½ x 28,8)2 √

 = 32,12 N √

 **DIRECTION:** tan α = 28,8 √

 *RIGTING* 14,4

 α = 63,43⁰ √ (OR Any other method) Bearing= 206,57⁰ (5)

7.5 E = F√

 Q

 = 32,12 √

 2 x 10-6

 = 1,61 x 107 N∙C-1√ (3)

 **[17]**

**QUESTION / VRAAG 8**

8.1 The resistance of a battery √ that opposes the flow of charge through the battery. √ **OR**

The resistance of a battery that causes a drop in the reading on a voltmeter connected over the battery (p.d) if the switch is closed. (2)

*Die weerstand in ‘n battery wat die vloei van lading teenstaan deur die battery.*

*Die weerstand in ‘n battery wat veroorsaak dat die lesing van die voltmeter afneem wat oor die battery gekoppel is as die skakelaar gesluit is.*

8.2

* Voltmeter in parallel over battery and ammeter in series √

*Voltmeter is parallel oor die battery en die ammeter in serie.*

* Rest of components connected so that circuit will work √ (2)

 *Ander komponente gekoppel sodat stroombaan werk.*

* 1. EMF √ (1)

*EMK*

8.4 If I increases then Vi will increase (Vi = Ir)√ as ε will remain constant√

 therefore Ve will decrease ( ε= Vi + Ve)√ (3)

 *As I toeneem sal Vi toeneem (Vi = Ir) as ε konstant bly*

 *dus sal Ve afneem. ( ε= Vi + Ve)*

* 1. Group 1 √

 The gradient represents the internal resistance and the gradient is steeper. √ (2)

*Groep 1*

*Die gradient stel die interne weerstand voor en die helling is steiler.*

 **[10]**

**QUESTION / VRAAG 9**

* 1. Yes. √ No current in the circuit / no energy usein the circuit / V2 is effectively

 across the battery. (2)

Ja. Daar is geen stroom in die stroombaan/ geen energie verbruik in die stroombaan nie

* 1. .1 Zero or 0 V √ (1)

9.2.2

**OPTION 1**

 V1Ω = ITR √

 = (2,5)(1)

 = 2,5V √

V‖ = 7,5 - 2,5 = 5 V √

V‖  5

R‖ = IT = 2,5 = 2Ω √

*111*

 *Rp = R1 + R2 √*

*111*

 *2 = 6 + R √*

 *R = 3Ω √*

**OPTION 2**

V√ 5

I6Ω = R= 6√ = 0,833 A √

IR = 2,5 - 0.833 √ = 1,667 A √

V 5√

R= I= 1,667 = 2,999 Ω / 3Ω √

 (7)

9.2.3

**OPTION 2**

VT√ 10

RT = IT = 2,5 = 4Ω√

 r = RT - Rext

 = 4 - (1 + 2)

 = 1Ω √

**OPTION 1**

Vlost = Vtot - V1= 10 - 7,5 = 2,5 V √

 Vlost= Ir √

 r = 2,5

2,5

 = 1Ω √

**OPTION 3**

emf = IT (R +r) √

10 = 2,5(3 + r) √

 r = 1 Ω √

 (3)

9.3 Decrease √ (1)

 *Afneem*

 **[14]**

**QUESTION / VRAAG 10**

10.1 DC Generator √

 Mechanical energy converted into electrical energy √ (2)

 *GS Generator*

 *Meganiese energie word omgesit in elektriese energie.*

10.2 To make the direction of the (induced) current to be the same in every half

 cycle/turn. √√ **OR**To keep the (induced) current unidirectional. (2)

 *Om die (geïnduseerde) stroom se rigting dieselfde te hou tydens elke half-*

 *siklus/rotasie.* ***OF****Om die (geïnduseerde) stroom in een rigting te laat vloei.*

10.3 Graph A. √

 DC Generator becomes a AC Generator. √

 Voltage is alternating/changing polarity every half cycle. √ (3)

 *Grafiek A*

 *GS Generator verander na WS Generator*

 *Potensiaalverkil wissel / verander polariteit elke halwe siklus.*

10.4

 GRAND TOTAL/ GROOT TOTAAL: [150]