POSSIBLE ANSWERS FOR:

PHYSICAL SCIENCE PAPER 1 SG / NATUUR- en SKEIKUNDE VRAESTEL 1 SG

QUESTION 1 / *VRAAG 1*

1.1 C 1.2 D 1.3 B 1.4 D 1.5 A / B 1.6 A 1.7 B

1.8 D 1.9 C 1.10 D 1.11 A 1.12 B 1.13 C 1.14 A / D

1.15 A

[15 x 3 = 45]

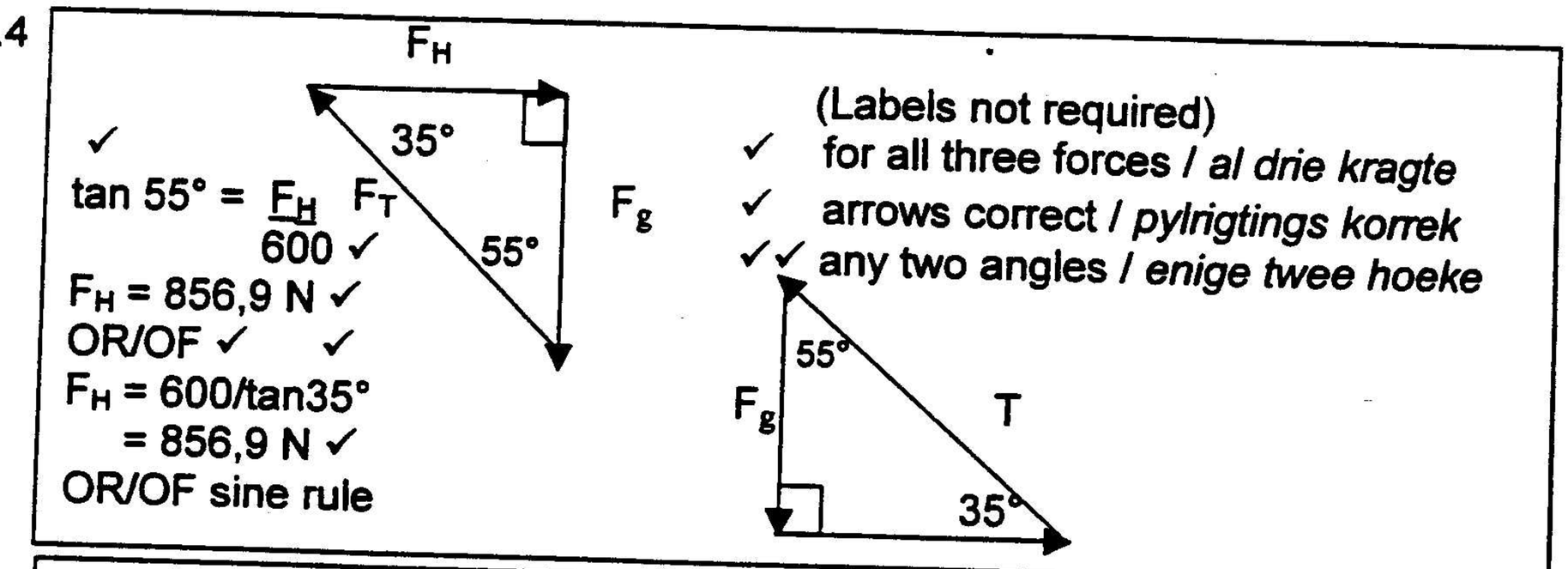
QUESTION 2 / *VRAAG 2*

2.1 3 ✓ / Three ✓✓ ✓ (1)

2.2 0 N / Zero (-1 for no unit) (2)

2.3 $F_g = mg = 60 \times 10 = 600$ N ✓✓ (2)

2.4



✓ $\tan 55° = \frac{F_H}{600}$ ✓

$F_H = 856,9$ N ✓

OR/OF ✓ ✓

$F_H = 600/\tan 35°$

$= 856,9$ N ✓

OR/OF sine rule

(Labels not required)

✓ for all three forces / *al drie kragte*

✓ arrows correct / *pylrigtings korrek*

✓✓ any two angles / *enige twee hoeke*

Construction / *Konstruksie*

(Different scale – max : $\frac{5}{7}$)

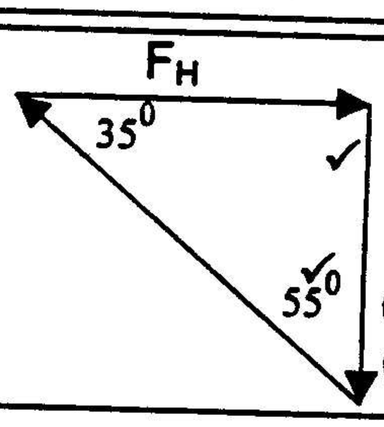
Directions /*Rigtings* ✓

(± 5 mm)

$F_H = 17,1 \times 50$

$= 857$ N (± 25 N) ✓✓

(832 N – 882 N)



If magnitude outside range, check length of F_H – if correct length allocate 1 mark for answer

NO MARKS FOR ROUGH DIAGRAM if done construction !

(7)

[12]

QUESTION 3 / *VRAAG 3*

3.1.1 $s = ut + \frac{1}{2}at^2$ ✓✓
$= 0 + \frac{1}{2}.10.4^2$
$= 80\ m$ ✓

OR/OF

$v = u + at$
$= 0 + 10.4$
$= 40\ m.s^{-1}$

$v^2 = u^2 + 2as$ ✓
$(40)^2 = 0 + 2.10.s$
$s = 80\ m$ ✓

$s = \left(\frac{u+v}{2}\right)t$ ✓
$= \left(\frac{0+40}{2}\right)4$ ✓
$= 80\ m$ ✓

(5)

If $g = -10\ m.s^{-2}$ substituted, $s = -80\ m$
If then give $s = 80\ m$, lose 1 mark.

$s = \frac{1}{2}gt^2$ ✓✓
$= \frac{1}{2}(10)(4)^2$ ✓ ✓
$= 80\ m$ ✓

3.1.2 $v = u + at$ ✓
✓ ✓
$= 0 + 10.4$
$= 40\ m.s^{-1}$ ✓

$v^2 = u^2 + 2as$ ✓
✓ ✓
$= 0 + 2.10.80$
$v = \sqrt{1\,600}$ ✓
$v = 40\ m.s^{-1}$

Also allow, as for SG only downward motion from rest:
$v = gt$ ✓✓
✓
$= (10)(4)$
$= 40\ m.s^{-1}$ ✓
or/of
$v^2 = 2gs$

From Energy ppl.

$v = \sqrt{2gh}$ ✓✓
$= \sqrt{2.10.80}$ ✓
✓
$= 40\ m.s^{-1}$

$s = \left(\frac{u+v}{2}\right)t$ ✓
✓ ✓
$80 = \left(\frac{0+v}{2}\right).4$
$v = 40 m.s^{-1}$ ✓

If calc $v = 40\ m.s^{-1}$ in 3.1.1 – full marks in 3.1.2 if only write answer

(4)

3.2 $s = vt$
$t = \frac{s}{v}$ ✓
$= \frac{80}{330}$ ✓
$= 0{,}24\ s$ ✓

$s = \left(\frac{u+v}{2}\right)t$
✓ ✓ ✓
$80 = \left(\frac{330+330}{2}\right)t$
$t = 0{,}24\ s$ ✓

Accept: ✓
$t = \frac{80}{330} = 0{,}24\ s$ ✓
✓✓
(has used proportionality)

(4)
[13]

QUESTION 4 / *VRAAG 4*

4.1

$v^2 = u^2 + 2as$ ✓

✓ ✓ ✓

$16,6^2 = 25^2 + 2.a.100$

$a = -1,75\ m.s^{-2}$ ✓

Negative sign not necessary for a

$v^2 = u^2 + 2as$ ✓

✓ ✓ ✓

$16,6 = 25 + 2.a.100$

$a = -0,04\ m.s^{-2}$ X $(^4/_5)$

Check for correct substitution of u and v

(5)

4.2

$v = u + at$ ✓

✓ ✓ ✓

$16,6 = 25 + (-1,75).t$

$t = 4,8\ s$ ✓

$s = ut + ½at^2$ ✓

✓ ✓ ✓

$100 = 25t + ½.(-1,75).t^2$

$t = 4,8\ s$ ✓

Negative sign for a necessary !!

$s = \left(\frac{u+v}{2}\right)t$ ✓

✓ ✓ ✓

$100 = \left(\frac{25+16,6}{2}\right)t$

$t = 4,8\ s$

(5)

[10]

QUESTION 5 / *VRAAG 5*

5.1 The **resultant force** acting on a body produces an acceleration ✓ in its direction. The magnitude of the acceleration ✓ is directly proportional to the **resultant force** and inversely proportional to its mass. ✓ (**not acceptable** : unbalanced force, indirectly proportional)

*Die **resulterende krag** wat op 'n liggaam inwerk, gee aan dit 'n versnelling ✓ in die rigting van die krag.*
*Die grootte van die versnelling is direk eweredig aan die grootte van die **resulterende krag** en omgekeerd eweredig aan sy massa.* ✓
*(**nie aanvaarbaar nie**: ongebalanseerde krag, indirek eweredig)*
OR/OF
The resultant ✓ force acting on a body is equal to the rate of change of momentum ✓ in the direction of the resultant force. ✓

Die *resultante krag wat op 'n liggaam inwerk is gelyk aan die tempo van verandering ✓ in momentum in die rigting van die resultante krag.* ✓

(3)

5.2 0 N ✓ (unit not reqd) (1)

5.3

$T_2\ (= F_g) = 6\ N$ ✓

$T_1 = F_g + T_2$ ✓

✓

$= 2 + 6$

$= 8\ N$ ✓

If only:
$T = 2 + 6$
$= 8\ N$ $(^2/_4)$

$F_{up} = F_g$ ✓
$= mg$
✓ ✓ ✓
$= (0,2 + 0,6).10 = 8\ N$

(4)

5.4.1 Increases /*Neem toe* ✓✓

5.4.2 Increases / *Neem toe* ✓✓

5.4.3 Remains constant / *Bly konstant* ✓✓

(3x2 = 6)

[14]

QUESTION 6 /*VRAAG 6*

6.1 Rate of change of velocity / *tempo van verandering van snelheid* ✓✓
Change in velocity divided by time / *verandering in snelheid gedeel deur tyd* ✓✓
OR

$a = \frac{\Delta v}{\Delta t}$ ✓✓

$a = \frac{v}{t}$ X

2 or 0 marks

(2)

6.2

F = ma ✓
= 5,3 ✓
= 15 N ✓

when loaded:/ *wanneer gelaai:* m = 5 + 1 = 6 kg

F = ma ✓✓
15 = 6.a
a = 2,5 m.s^{-2} ✓

$m_1a_1 = m_2a_2$ ✓
✓✓ ✓✓
5.3 = 6.a
✓
a = 2,5 m.s^{-2}

a = $\frac{5}{6}$ x 3 ✓ ✓✓
✓✓
= 2,5 m.s^{-2} ✓

(6)
[8]

QUESTION 7 / *VRAAG 7*

7.1

E_p = mgh ✓
✓ ✓
= 2.10.9,5
= 190 J ✓

W = F. s ✓
✓ ✓
= (2 x 10) x 9,5
= 190 J ✓

(4)

7.2

$v^2 = u^2 + 2as$ ✓
✓ ✓
= 0 + 2.10.1,5
v = $\sqrt{30}$ m.s^{-1} } ✓
= 5,48 m.s

from grd to P

Using Q as ref.
$(E_k)_Q = (E_P)_P$ } ✓
$\frac{1}{2}mv^2 = mgh$

$v = \sqrt{2gh}$ ✓ ✓
$= \sqrt{2.10.1,5}$
$v = \sqrt{30}\ m.s^{-1}$ } ✓
$= 5,48\ m.s^{-1}$

Using ground as ref.
$\Delta E_K = (E_P)_P - (E_P)_Q$ } ✓
$\frac{1}{2}mv^2 = mg\Delta h$

$v^2 = 2g\Delta h$ ✓ ✓
$= 2.10.(9,5-8)$
$= 2.10.1,5$
$v = \sqrt{30}\ m.s^{-1}$ } ✓
$= 5,48\ m.s^{-1}$

(4)

from grd to P

$v^2 = u^2 + 2gs$

$0^2 = u^2 + 2(-10).9{,}5$

$u^2 = 190$

from grd to Q

$v^2 = u^2 + 2as$

$0^2 = u^2 + 2(-10).8$

$u^2 = 160$

velocity at Q

$v^2 = 30$

$v = \sqrt{30}$

$= 5{,}48\ m.s^{-1}$

7.3

$E_k = \frac{1}{2}mv^2$ ✓

✓ ✓

$= \frac{1}{2}.2.(5{,}48)^2$

$= 30$ J ✓

or / *of* $E_k = \Delta E_p$

✓

$= mg(h_2 - h_1)$

✓ ✓

$= 2.10.(9{,}5 - 8)$

$= 30$ J ✓

If working done in 7.2 and answer re-written, award FULL MARKS.

(4)
[12]

QUESTION 8 / *VRAAG 8*

8.1

$p = mv$ ✓

✓

$= 2.5$ ✓

$= 10\ kg.m.s^{-1}$

(3)

8.2

$p_{before} = p_{after}$ } ✓

$(m_1 + m_2)u = m_1v_1 + m_2v_2$ }

✓ ✓ ✓

$0 = 50.v + 10$

$v = -^{10}/_{50}$

$v = -0{,}2\ m.s^{-1}$

✓ ✓

$= 0{,}2\ m.s^{-1}$ away from jetty

right

weg van kaai ;

na regs

If: $p_b = p_a$ } ✓

$m_1.u_1 = m_2.u_2$ }

$10 = 50v$

✓ ✓

$v = 0{,}2\ m.s^{-1}$, right max $^3/_6$

If: $p_b = p_a$ } ✓

$m_1.u_1 = m_2.u_2$ }

✓ ✓

$-10 = 50\ v$

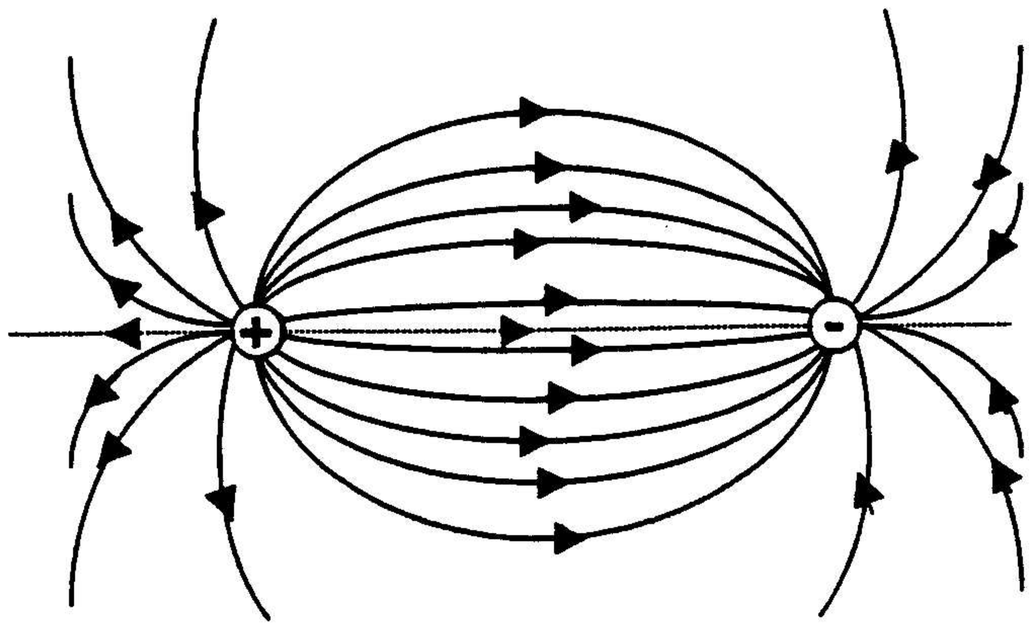
✓ ✓

$v = -0{,}2\ m.s^{-1}$, right max $^5/_6$

(6)
[9]

QUESTION 9 / *VRAAG 9*

9.1



Note – the charge density is slightly higher at the negative charge which will result in a greater field density at B.
NOT necessary to indicate !!!

- ✓ shape between / *tussen*
- ✓ shape outside / *buitekant*
- ✓ direction / *rigtings*

(3)

9.2 Electrostatic force between any two point charges is directly proportional to the product of their charges and inversely proportional to the square of the distance between them.
Die elektrostatiese krag tussen enige twee puntladings is direk eweredig aan die produk van hul ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle.

(4)

9.3

$$F = \frac{kq_1q_2}{r^2} \quad (\text{or/of } = \frac{kQ_1Q_2}{r^2})$$

$$= \frac{(9\times10^{9}.6\times10^{-9}.7\times10^{-9})}{(15\times10^{-2})^2}$$

$$= 1{,}68 \times 10^{-5}\ \text{N}$$

Note: if formula wrong/ *indien formule verkeerd*
NO MARKS / GEEN PUNTE

(5)

9.4 attractive / *aantrekkend*

(1)
[13]

QUESTION 10 / *VRAAG 10*

10.1 $\frac{1}{R} = \frac{1}{6} + \frac{1}{2} = \frac{2}{3}$ ✓ ✓

R = 1,5 Ω ✓

$R_p = \frac{product}{sum}$

$= \frac{6 \times 2}{6+2}$ ✓✓

= 1,5Ω ✓

(+ 4,5 Ω)

If: $R = \frac{1}{6} + \frac{1}{2}$

Zero

(3)

10.2 $I = \frac{V}{R} = \frac{12}{6} = 2\,A$ ✓ ✓ ✓

(3)

10.3 $I_{2\,\Omega} = \frac{3}{4} \times 2 = 1,5\,A$ ✓ ✓ ✓

$V_{//} = 1,5 \times 2 = 3\,V$ ✓ ✓

$I_{2\Omega} = \frac{V}{R} = \frac{3}{2} = 1,5\,A$ ✓ ✓

$I_{2\Omega} = \frac{R_p}{R_{branch}} \times I_{tot}$

$= \frac{1,5}{2} \times 2$ ✓ ✓

$= 1,5\,A$ ✓

(4)

10.4 $I_{6\Omega} = 0,5\,A$

$P = I^2 R = (0,5)^2 (6)$ ✓ ✓ ✓

$= 1,5\,W$ ✓

$P = V.I$ ✓ $= 3 \times 0,5$ ✓ ✓

$= 1,5\,W$ ✓

$P = \frac{V^2}{R} = \frac{3^2}{6}$ ✓ ✓ ✓

$= 1,5\,W$ ✓

(4)

[14]

TOTAL : 150