Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCES P1

MEMORANDUM

COMMON TEST

MARCH 2017

NATIONAL SENIOR CERTIFICATE

GRADE 12

N.B. This memorandum consists of 5 pages including this page.

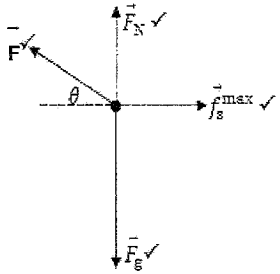
PHYSICS

QUESTION 1

1.1 C✓✓ (2)
1.2 D✓✓ (2)
1.3 A✓✓ (2)
1.4 C/D ✓✓ (2)
[8]

QUESTION 2

2.1



1 mark per arrow and label
subtract 1 mark for each of the following errors:

- F shown with its components (unless components in dashed lines)

- Block representation of the body will be accepted if: All forces are drawn correctly, starting from the surface of the block

(4)

2.2 When a resultant (net) force acts on an object, the object will accelerate in the direction of the force. This acceleration is directly proportional to the force✓ and inversely proportional to the mass of the object. ✓ (Part marks) (2)

OR

The resultant/net force acting on an object is equal to the rate of change of momentum of the object✓✓ in the direction of the resultant/net force. (2 or 0). (2)

2.3

$f_s = \mu_s F_N$ ✓
$120 = (0,34)F_N$✓
$F_N = 352,94$ N

Vertical forces : taking up as positive
$F_{net,y} = 0$
$F_y + F_N + F_g = 0$
$F_y + F_N - mg = 0$
$F_y + 352,94$✓ $- (50)(9,8)$ ✓ $=0$
$F_y = 137,06$ N✓ (5)

2.4.1 DECREASES✓ (1)

2.4.2 $F_N + F_y = F_g$✓, F_y increases✓ and normal force decreases in magnitude (2)

OR

The parcel will not push as hard into the table surface✓✓ so the normal force will decrease in magnitude. (2)

[14]

QUESTION 3

3.1 The motion of an object under the influence of gravity/weight/gravitational force only. (2 or 0). (2)

3.2

Upward positive	Downward positive
$v_f = v_i + a\Delta t$✓ $0 = 20 + (-9,8)\ \Delta t$✓ $\Delta t = 2,04$ s✓	$v_f = v_i + a\Delta t$✓ $0 = -20 + (9,8)\ \Delta t$✓ $\Delta t = 2,04$ s✓

(3)

3.3 **OPTION 1**

Upward positive	Downward positive
$v_f = v_i + a\Delta t$✓ $= 20 + (-9,8)\ (5)$✓ $= 29,00 m.s^{-1}$, downwards✓	$v_f = v_i + a\Delta t$✓ $= -20 + (9,8)\ (5)$✓ $= 29,00 m.s^{-1}$, downwards✓

Note: 1 Mark for both magnitude and direction (3)

OPTION 2

Upward positive	Downward positive
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$✓ $= (20)(5) + \frac{1}{2}(-9,8)(5)^2$ $= -22,50$ m	$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$✓ $= (-20)(5) + \frac{1}{2}(9,8)(5)^2$ $= 22,50$ m
$v_f^2 = v_i^2 + 2a\Delta y$ $= (20)^2 + 2(-9,8)(-22,5)^2$ ✓ $v_f = 29,00 m.s^{-1}$, downwards✓	$v_f^2 = v_i^2 + 2a\Delta y$ $= (-20)^2 + 2(9,8)(22,5)^2$ ✓ $v_f = 29,00 m.s^{-1}$, downwards✓

Note: 1 Mark for both magnitude and direction (4)

3.4 **OPTION 1**

Upward positive	Downward positive
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓ $= (20)(5) + \frac{1}{2}(-9,8)(5)^2$ ✓ $= -22,50$	$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓ $= (-20)(5) + \frac{1}{2}(9,8)(5)^2$ ✓ $= 22,50$
$h = 70 + (-22,50)$ ✓	$h = -(-70 + 22,50)$✓

(4)

OPTION 2

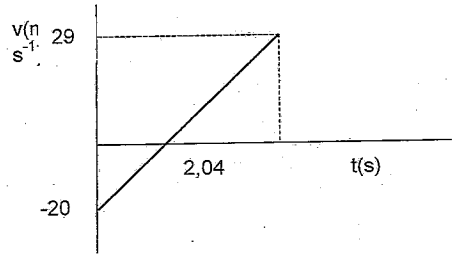
POSITIVE MARKING FROM QUESTION 3.3

Upward positive	Downward positive
$v_f^2 = v_i^2 + 2a\Delta y$✓ $(-29)^2 = (20)^2 + 2(-9,8)\ \Delta y$ ✓ $\Delta y = -22,50$	$v_f^2 = v_i^2 + 2a\Delta y$✓ $(29)^2 = (-20)^2 + 2(9,8)\ \Delta y$ ✓ $\Delta y = 22,50$
$h = 70 + (-22,50)$ ✓ $= 47,50$ m✓	$h = -(-70 + 22,50)$✓ $= 47,50$ m✓

(4)

3.5

Downward is positive

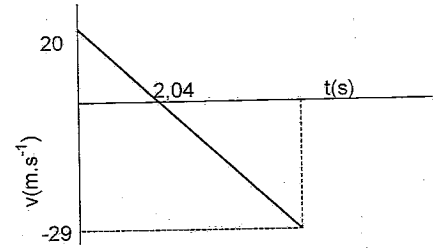


Marking criteria

Shape✓
Graph starts at -20 $m.s^{-1}$✓
Graph intercept at 2,04 s ✓
Graph ends at 29 $m.s^{-1}$✓

(4)

Upward is positive



Marking criteria

Shape✓
Graph starts at 20 $m.s^{-1}$✓
Graph intercept at 2,04 s ✓
Graph ends at -29 $m.s^{-1}$✓

QUESTION 4

4.1 Product of the net force acting on an object and the time the net force acts on the object. ✓✓ (2)

4.2

Take eastwards as positive	Take eastwards as negative
$\Delta p = mv_f - mv_i$✓ = (1100)(0) ✓ – (1100)(4,674) ✓ = -5141,40 = 5141,40 kg.m.s^{-1}, westwards✓	$\Delta p = mv_f - mv_i$✓ = (1100)(0) ✓ – (1100)(-4,674) ✓ = 5141,40 kg.m.s^{-1}, westwards✓

(4)

4.3 **POSITIVE MARKING FROM QUESTION 4.2**

Take eastwards as positive	Take eastwards as negative
$F_{net} = \frac{\Delta p}{\Delta t}$ ✓ $= \frac{-5141,4}{0,2}$ ✓ = -25707,00 = 25 707,00 N (westwards) ✓	$F_{net} = \frac{\Delta p}{\Delta t}$ ✓ $= \frac{5141,4}{0,2}$ ✓ = 25 707,00 N (westwards) ✓

(3)

4.4 $F_{net} = \frac{\Delta p}{\Delta t}$ ✓ OR $F_{net} \alpha \frac{1}{\Delta t}$ ✓

Airbags increase contact time during collision. ✓ This causes the impact force experienced by the driver to be decreased, ✓hence less injuries. (3)

[16]

TOTAL: 50