Education

KwaZulu-Natal Department of Education

REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCES P1 (PHYSICS)

SEPTEMBER 2016

COMMON TEST

NATIONAL SENIOR CERTIFICATE

GRADE 10

MARKS: 50

TIME: 1 hour

This question paper consists of 7 pages including a data sheet.

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Non-programmable calculators may be used.
3. Appropriate mathematical instruments may be used.
4. Number the answers correctly according to the numbering system used in this question paper
5. You are advised to use the attached data sheets.
6. Give brief motivations, discussions, etc where required.
7. Round off your final numerical answer to a minimum of TWO DECIMALS.

QUESTION 1: MULTIPLE- CHOICE QUESTIONS

Four possible options are provided as answers to the following questions. Each question has only ONE correct answer. Write ONLY letters (A – D) next to the question number (1.1 – 1.3) in the ANSWER BOOK, for example 1.5 E.

1.1 Which of the following combinations is correct?

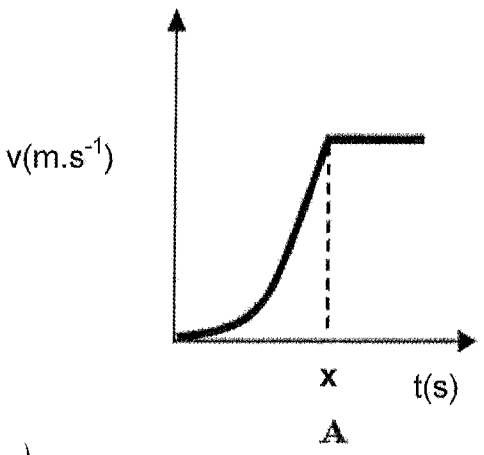
	VECTOR	SCALAR
A	Force	distance
B	Force	velocity
C	distance	Speed
D	distance	acceleration

(2)

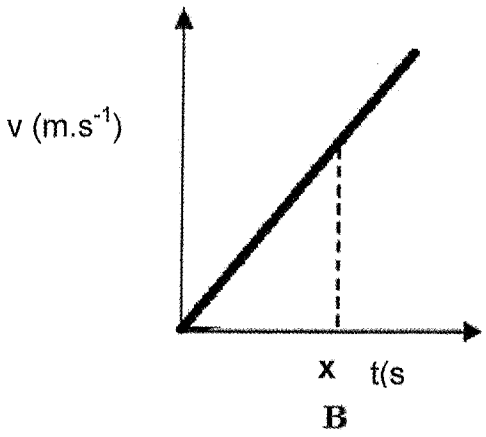
1.2 A body accelerates uniformly from rest for x seconds after which it continues with a constant velocity. Which one of the following graphs is the **correct** representation of the body's motion?

( )

A

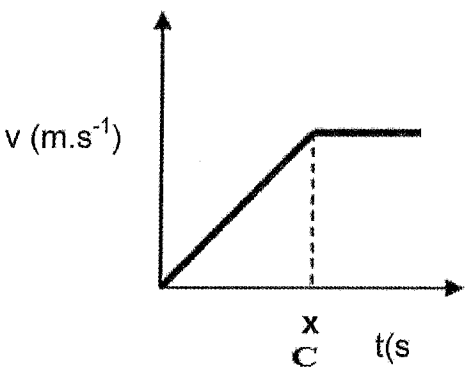


B

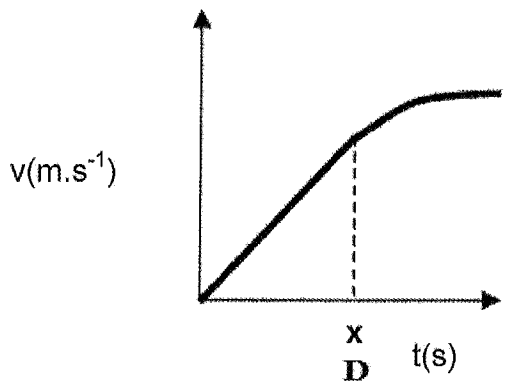


( )

C



D



(2)

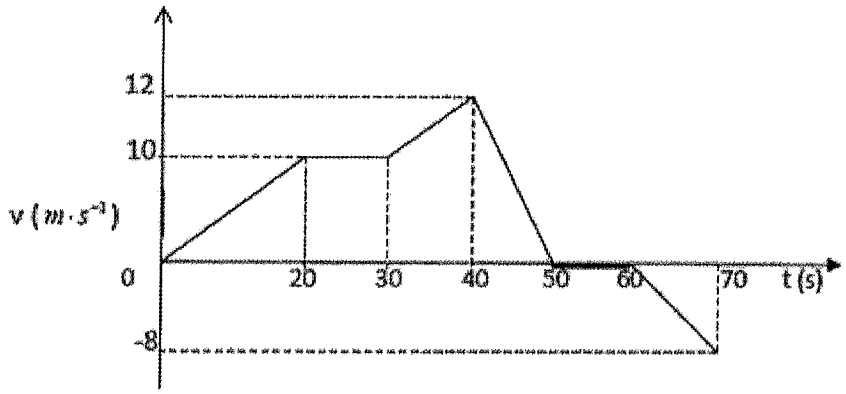
1.3 In the equation $\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$ the part $\frac{1}{2} a \Delta t^2$ represents.....

A time
B velocity
C displacement
D acceleration (2)

[6]

QUESTION 2

The velocity –time graph below illustrates the motion of a man riding on a motorcycle, initially in an easterly direction, for a period of 70s.



IN ANSWERING THE FOLLOWING QUESTIONS, NO EQUATIONS OF MOTION MUST BE USED.

2.1 Describe the motion of the motorcycle from 20s to 60s. (4)

2.2 What happened to the motorcycle at 60s? (1)

2.3 Use the graph to calculate the acceleration during the following time intervals:

2.3.1 0 – 20 seconds (2)

2.3.2 60s - 70s (2)

2.4 Use the graph to calculate the:

2.4.1 Displacement of the motorcycle during the time interval 40 – 70 seconds. (6)

2.4.2 Distance covered by the motorcycle during the time interval 40 – 70 seconds (2)

2.5 THE FOLLOWING QUESTION MUST BE ANSWERED WITHOUT DOING A CALCULATION:

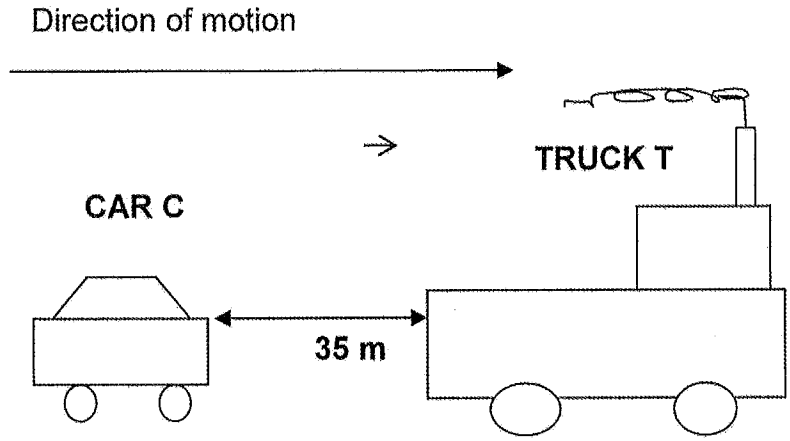
Which time interval was the acceleration greater?

0 – 20 seconds or 30 – 40 seconds
Give a reason. (2)

[19]

QUESTION 3

A car C and a truck T are both travelling at a constant velocity of 30 $m.s^{-1}$ east. The driver of the car C follows the truck T, keeping a distance of 35 m between them. Seeing a herd of cattle ahead on the road, the driver of the truck T brakes to reduce the speed uniformly to stop in 12 s.



3.1 Convert 108 $km.h^{-1}$ to metres per second ($m.s^{-1}$). (2)

3.2 Define **acceleration.** (2)

3.3 Calculate the acceleration of the truck while slowing down. (4)

3.4 Calculate the distance travelled by the truck during the 12 s braking period. (4)

3.5 If the car continued at its original motion, how far ahead of the truck will the car be when the truck stops? (5)

[17]

QUESTION 4

4.1 A boy walks at 2 $m.s^{-1}$ east in a train that is moving at 15 $m.s^{-1}$ east. What will his velocity be relative to:

4.1.1 a person sitting in the train. (2)

4.1.2 a person sitting on the road observing the train go past. (2)

4.2 Will a change in velocity <u>always</u> produce a change in speed? (**YES** or **NO**). Explain the answer. (4)

[8]

GRAND TOTAL= [50]

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 1 (PHYSICS)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10
VRAESTEL 1 (FISIKA)

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

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* $\Delta y = \left(\frac{v_f + v_i}{2}\right)\Delta t$

Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCES

PHYSICS (P1)

MEMORANDUM

NATIONAL SENIOR CERTIFICATE

GRADE 10

MARKS: 50

TIME: 1 hour

N.B. This memorandum consists of 4 pages.

QUESTION 1

1.1 A ✓✓ (2)
1.2 C ✓✓ (2)
1.3 C ✓✓ (2)

[6]

QUESTION 2

2.1 The motorcycle is travelling at constant velocity✓ of 10 m.s^{-1} for 10 seconds, It then accelerates uniformly✓ (increasing velocity) until it reaches velocity of 12 m.s^{-1} in 10 seconds. It then slows down (decreasing velocity) uniformly✓ for 10s and comes to a stop✓ for 10s. (4)

2.2 changed directions (started to move west)✓ (1)

2.3.1 $a = \frac{\Delta V}{\Delta t} = \frac{(10-0)m.s^{-1}}{(20-0)} = 0,5m.s^{-2}$ ✓✓ (2)

2.3.2 $a = \frac{\Delta V}{\Delta t} = \frac{(-8-0)m.s^{-1}}{(70-60)} = 0,8m.s^{-2}$ ✓✓ (2)

2.4.1

displacement travelled given by area under graph:

Interval 40s to 50s :

$A = \frac{1}{2}b.h$
$A = \frac{1}{2}(10)(12)$ ✓
$A = 60$ m ✓

Interval 60s to 70s:

$A = \frac{1}{2}b.h$
$A = \frac{1}{2}(10)(-8)$ ✓
$A = -40$m ✓

displacement = 60m + 0 + (-40m)✓ = 20 m✓ (6)

2.4.2 Total distance = 60m + 0 + 40m✓ = 100 m✓ (2)

2.5 30 – 40 s ✓
gradient is steeper.✓ (2)

[19]

QUESTION 3

3.1 $108\ km.h^{-1} = \frac{108 \times 1000}{3600}$ ✓

$= 30\ m.s^{-1}$✓ (2)

3.2 acceleration is the rate of change of velocity. ✓✓ (2)

3.3

$v_f = v_i + a\Delta t$ ✓
$0 = 30 + a(12)$ ✓
$a = -2,5 m.s^{-2}$
$a = 2,5\ m.s^{-2}$ ✓west✓

(4)

3.4 (Positive marking from 3.3)

OPTION 1

$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$= 30(12) + \frac{1}{2}(-2,5)(12^2)$
$= 180\ m$ ✓

OPTION 2

$v_f^2 = v_i^2 + 2a\Delta x$✓
$0 = 30^2$✓ $+ 2(-2,5)\Delta x$✓
$\Delta x = 180m$ ✓

OPTION 3

$\Delta x = \frac{v_i + v_f}{2}\Delta t$ ✓ ✓
$= \frac{30+0}{2}(12)$ ✓
$= 180m$ ✓

(4)

3.5 The truck stops in 12 s and the distance covered by the car in 12s is:

$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$= 30\ (12)$ ✓ $+ 0$
$= 360\ m$✓

The truck travels 180 m in 12s as calculated above
∴the car distance away from where the stopped truck = 360 – 180 m✓ - 35 m ✓= 145 m✓(5)

[17]

QUESTION 4

4.1.1 $2\ m.s^{-1}$✓ east ✓ (2)

4.1.2 $2 + 15 = 17\ m.s^{-1}$ ✓ east ✓ (2)

4.2 No, ✓

Velocity has magnitude and ✓ direction. When direction changes, velocity ✓ changes.
This has no effect on magnitude. ✓ Hence speed remains the same. (4)

[8]

GRAND TOTAL: [50]