Basic Education

KwaZulu-Natal Department of Basic Education
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCE (P1)
(PHYSICS)

COMMON TEST

MARCH 2016

NATIONAL SENIOR CERTIFICATE

GRADE 11

MARKS: 50

TIME: 1 hour

This question paper consists of 6 pages and a data sheet.

GR 11 PHYSICS P1

INSTRUCTIONS AND INFORMATION TO CANDIDATES

Read these instructions carefully before answering the questions.

1. Answer all the questions.
2. Round off your final numerical answer to a minimum of **TWO DECIMAL** places.
3. Non programmable calculators may be used.
4. Appropriate mathematical instruments may be used.
5. Number the answers correctly accordingly to the numbering system used in this question paper.
6. A data sheet is attached for your use.
7. Whenever a motivation or discussion is required be brief.

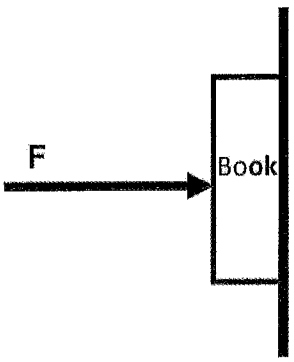
QUESTION 1: MULTIPLE – CHOICE QUESTIONS

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 – 1.3) in your ANSWER book, e.g. 1.3 D.

1.1 Which one of the following pairs can be classified as vectors?

A Frictional force and mass
B Mass and inertia
C Inertia and weight
D Weight and frictional force

1.2 Consider a man pressing a book against a wall with a force **F**



The reaction force to force **F** will be:

A The force with which the wall presses on the book
B The force with which the book presses on the wall
C The force with which the book presses on the man
D The frictional force between the book and the wall

1.3 Two spherical objects $\mathbf{m_1}$ and $\mathbf{m_2}$ with their centres **d** metres apart, exert a gravitational force of **F** on each other. What will be the magnitude of the force if the distance between the objects is halved?

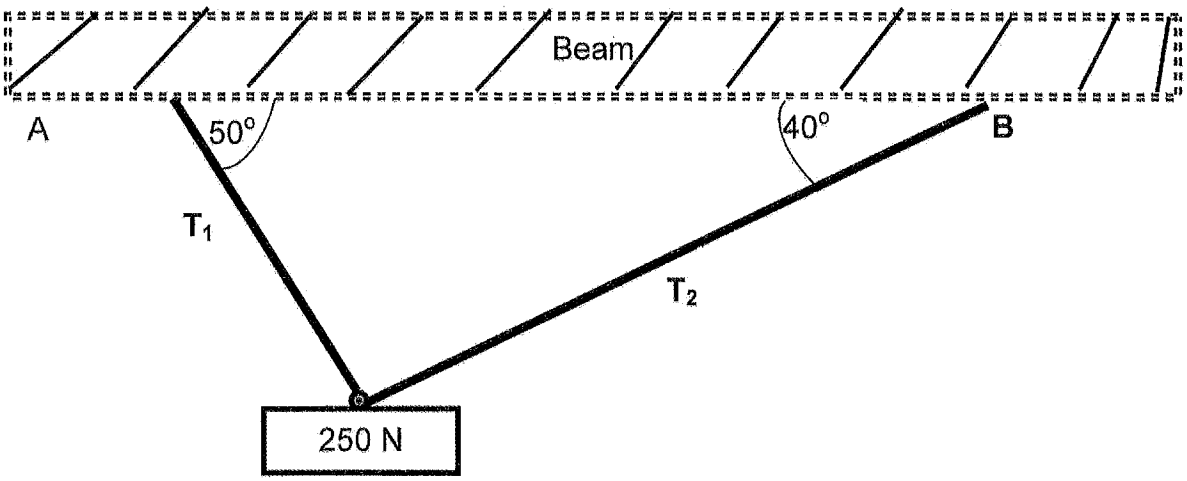
A 4F
B 2F
C ¼F
D ½F

3 x 2 = **[6]**

QUESTION 2

A 250 N weight hangs from a beam by means of two inelastic cords. The cords make angles of 40° and 50° with the beam.

The weight is in equilibrium.



2.1 What is meant by equilibrium? (2)

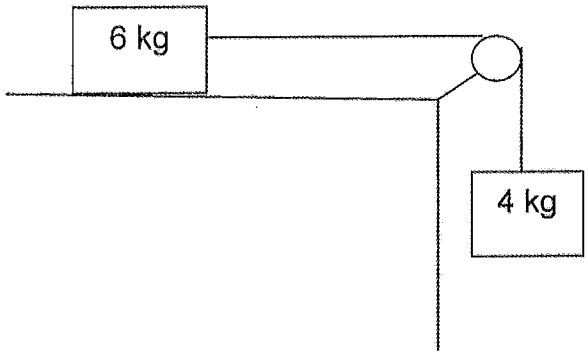
2.2 Draw a triangle vector diagram to represent the forces acting on the weight and indicate at least 2 angles. (4)

2.3 Determine the tensions, T_1 and T_2 in the cords. (4)

[10]

QUESTION 3

A **6 kg** block placed on a rough horizontal surface is connected to a **4 kg** block by a piece of string that runs over a frictionless pulley as shown in the figure below. The blocks accelerate at **0,75 m.s^{-2}.**



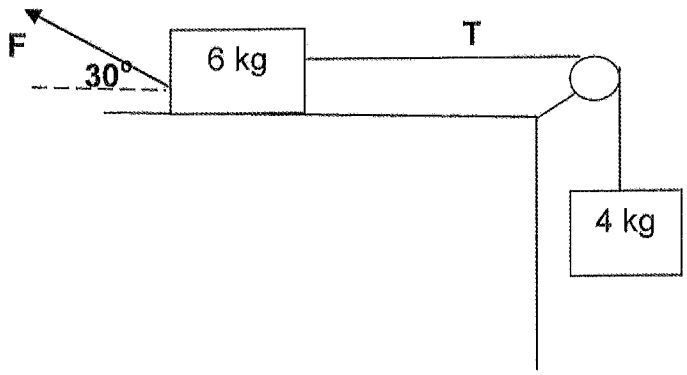
3.1 State Newton's second law of motion in words. (2)

3.2 Draw a force diagram for the **6 kg** block. (4)

3.3 By applying Newton's second law to each of the blocks, determine the magnitude of the frictional force acting on the **6 kg** block as it moves. (6)

3.4 Determine μ_k, coefficient of kinetic friction. (3)

A force F is now applied on the 6kg block as shown, such that the blocks are now at rest.



How will this now affect the following:

3.5 The magnitude of the frictional force? Explain (3)

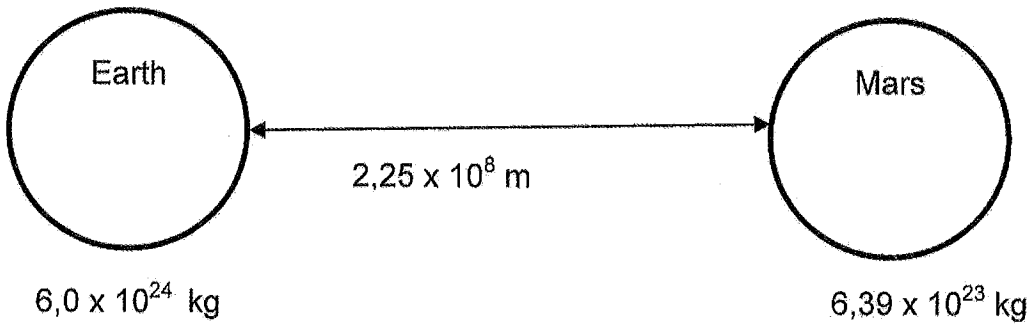
3.6 μ_k. (Choose from: INCREASE, DECREASE OR REMAIN THE SAME) (1)

3.7 The tension T in the string. (Choose from: INCREASE, DECREASE OR REMAIN THE SAME) (2)

[21]

QUESTION 4

The Earth and Mars are positioned in the universe such that they are 2,25 x 10^8 m apart. The radius of the Earth is 6,37 x 10^6 m.
If the radius and mass of Mars is 3,39 x 10^6 m and 6,39 x 10^{23} kg respectively.



4.1 State Newton's Universal Law of gravitation. (2)

4.2 Calculate the force that Mars exerts on Earth. (5)

4.3 Is the force calculated in 4.2 a contact or non-contact force? (1)

4.4 Calculate the acceleration due to gravity on Mars. (4)

4.5 What will be the force that the Earth exerts on Mars? (1)
[13]

TOTAL: 50

DATA FOR PHYSICAL SCIENCES PAPER I (PHYSICS)

TABLE 1: PHYSICAL CONSTANT

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	$9,8\ m.s^{-2}$
Gravitational constant	G	$6,67 \times 10^{-11}\ N.m^2.kg^{-2}$
Charge on electron	e^-	$-1,6 \times 10^{-19}\ C$
Speed of light in a vacuum	c	$3,0 \times 10^8\ m.s^{-1}$
Coulomb's constant	k	$9,0 \times 10^9\ N.m^2C^{-2}$
Electron mass	m_e	$9,11 \times 10^{-31}\ kg$
Permittivity of free space	ε_0	$8,85 \times 10^{-12}\ F.m^{-1}$

TABLE 2: FORMULAS

MOTION

$vf = vi + a\Delta t$	$\Delta x = vi\Delta t + \frac{1}{2}a\Delta t^2$
$vf^2 = vi^2 + 2a\Delta x$	$\Delta x = \left(\frac{v_f + v_1}{2}\right)\Delta t$

FORCE

$Fnet = ma$	$P = mv$
$F = \frac{Gm_1m_2}{r^2}\ (G = 6,67 \times 10^{-11}\ N.m^2.kg^{-2})$	$F\Delta t = \Delta p = mv_f - mv_1$
$\mu_s = \frac{f_s(max)}{F_N}$	$\mu_k = \frac{f_k}{F_N}$
$\tau = Fr$	

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PHYSICAL SCIENCES P1 (CHEMISTRY)

COMMON TEST MARCH 2016

MEMORANDUM

NATIONAL SENIOR CERTIFICATE

GRADE 11

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TIME : **1 hour**

N.B: This memorandum consists of 4 pages.

QUESTION 1

1.1 D ✓✓

1.2 C ✓✓

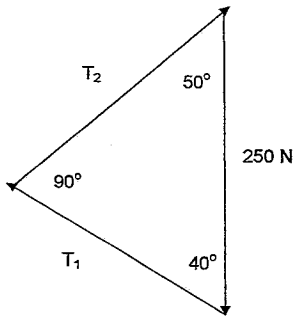
1.3 A✓✓

[6]

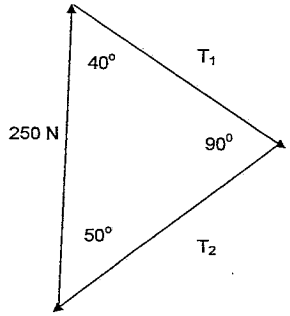
QUESTION 2

2.1 Equilibrium means that all the forces on the system have a net force of zero. **OR** are balanced✓✓ (2)

2.2



Or



Criteria for marking	Marks
Correct labels	✓
Correct direction	✓
All angles correct	✓✓

(4)

2.3 $T_1 = 250 \text{ Sin } 50° \checkmark = 191,51 \text{ N} \checkmark$

Or

$T_1 = 250 \text{ Cos } 40° \checkmark = 191,51 \text{ N} \checkmark$

And

$T_2 = 250 \text{ Cos } 50° \checkmark = 160,70 \text{ N} \checkmark$

Or

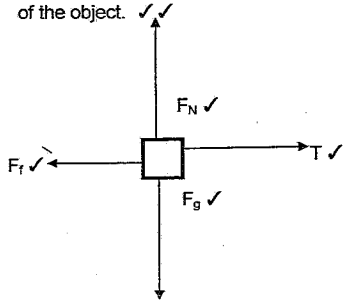
$T_2 = 250 \text{ Sn } 40° \checkmark = 160,70 \text{ N} \checkmark$ (4)

[12]

QUESTION 3

3.1 If a net force is exerted on an object, the object will accelerate with an acceleration that is directly proportional to the net force and inversely proportional to the mass of the object. ✓✓ (2)

3.2



(4)

3.3 **For the 4 kg block:**

Fnet = ma✓

Fg – T = 4 x 0,75 ✓

4 x 9,8✓ –T = 4 x 0,75

T = 36,20 N✓

For the 6 kg block:

Considering horizontal forces only:

$F_{net} = ma$

$T - F_f = ma$

$T - F_f = 6 \times 0,75$ ✓

$36,20 - F_f = 4,5$

$F_f = 31,70 \text{ N} \checkmark$

(6)

3.4 $\mu_k = \frac{F_f}{F_N} = \frac{31,70}{6 \times 9,8} = 0,54$ ✓ (3)

3.5 Frictional force decreases.✓ The force F has a vertical component that applies a lifting effect on the 6 kg block. ✓ This reduces the normal force on the block.✓ (3)

3.6 Remain the same.✓ (1)

3.7 Increases. ✓✓ (2)

[21]

QUESTION 4

4.1 Everybody in the Universe attracts every other body with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres. ✓✓ (2)

4.2 $F = \frac{Gm1m2}{d^2}$ ✓

$\frac{6,67 \times 10^{-11} \times 6,0 \times 10^{24} \times 6,39 \times 10^{23}}{(6,37 \times 10^6 + 2,25 \times 10^8 + 3,39 \times 10^6)^2}$ ✓✓✓

$F = 4,64 \times 10^{21} \text{ N} \checkmark$ attractive.

(5)

4.3 Non contact ✓ (1)

4.4 $g = \frac{GM}{d^2}$ ✓= $\frac{6,67x10^{-11}x6,39x10^{23}}{(3,39 \times 10^{6})^2}$ ✓✓= 3,71 m.s^{-2} ✓ (4)

4.5 4,64 x 10^{21} N (1)

[13]

Total Marks: 50

✓