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.

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.

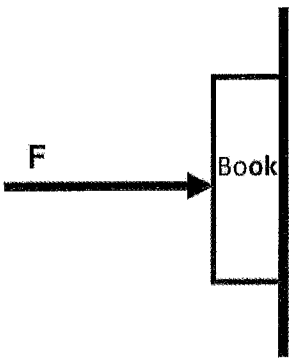
QUESTION 1: MULTIPLE – CHOICE QUESTIONS

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?

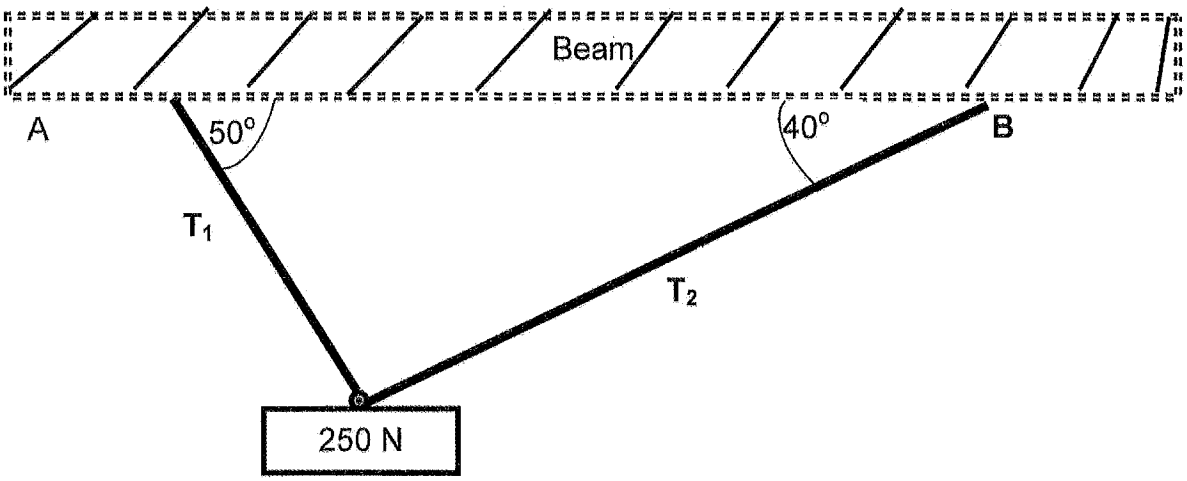
A 4F
B 2F
C ¼F
D ½F

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)

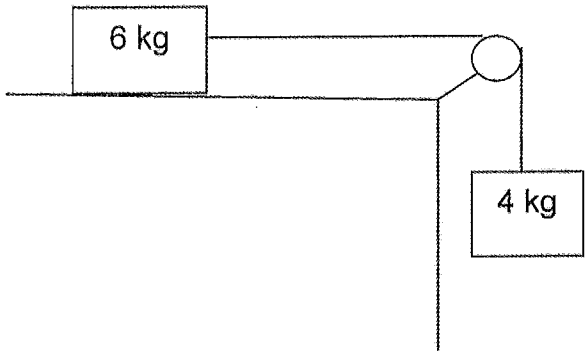
2.2 Draw a triangle vector diagram to represent the forces acting on the weight and indicate at least 2 angles. (4)

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}.**



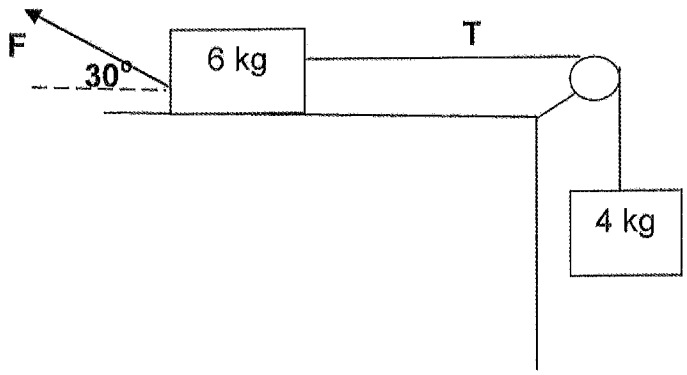
3.1 State Newton's second law of motion in words. (2)

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)

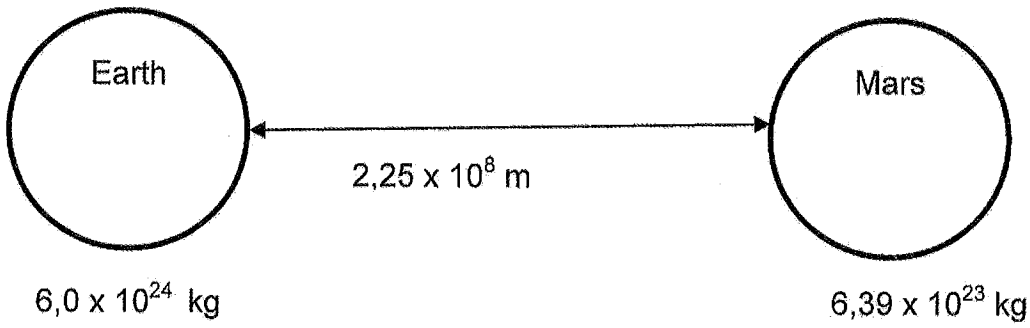
3.6 μ_k. (Choose from: INCREASE, DECREASE OR REMAIN THE SAME) (1)

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

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