ALEXANDER ROAD HIGH SCHOOL

March 2021 | **PHYSICAL SCIENCES CONTROL TEST** | 50 MINUTES

JA | **GRADE 11** | TOTAL = 50

Instructions:

- The question paper consists of 4 questions.
- Answer all the questions.
- Answer section A on the answer sheet provided AND section B on folio sheets.
- A non-programmable calculator may be used.
- Number the answers correctly according to the numbering system.
- Round off to two (2) decimal places where necessary.
- A formula sheet has been provided on the back of the answer sheet.

SECTION A

(answer on the answer sheet)

QUESTION 1:

Four possible options are provided as answers to the following questions. Each question has only one correct answer. Choose the correct answer and write the letter (A – D) next to the relevant question number (1.1 – 1.4) on the answer sheet.

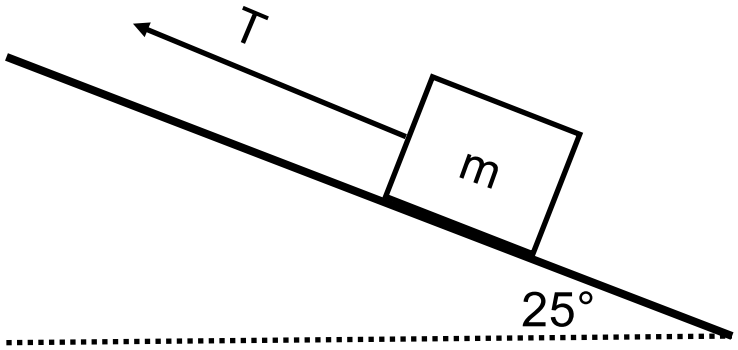
1.1 INERTIA is…

A. the force which causes an object to remain in its state of motion.
B. the tendency of any object to resist a change in motion.
C. the tendency of only stationary objects to resist moving.
D. Newton's first name.

1.2 Johnny is standing on the back of a stationary bakkie when the bakkie begins moving to the right. Relative to the bakkie, Johnny will initially…

A. move to the left because the force of friction will oppose the bakkie's motion.
B. move to the right because the bakkie is moving to the right.
C. move to the right because the force of friction pulls him to the right.
D. move to the left because he will resist changing his state of motion.

1.3 A box with mass m is pulled by a force T up a slope inclined at 25° to the horizontal at a CONSTANT VELOCITY as shown in the diagram below.



Which one of the following is correct?

A. N = m.g.cos25°

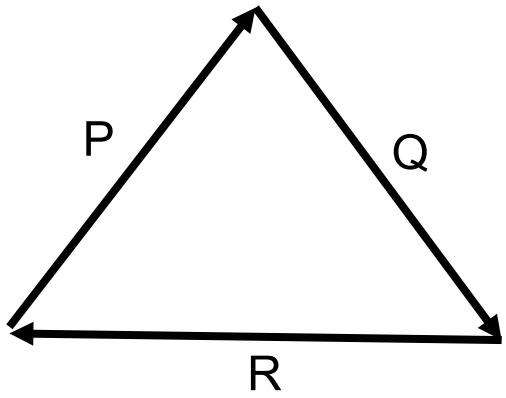
B. N = m.g.sin25°

C. N = m.g.cos25° – T

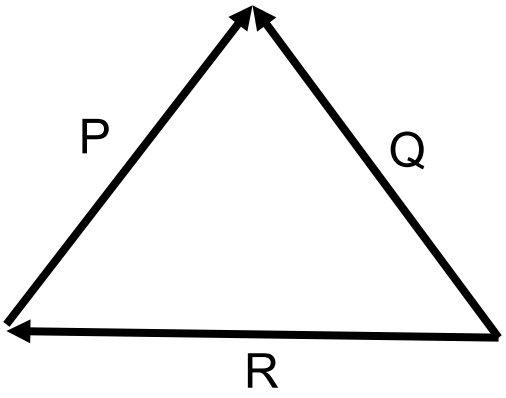
D. N = m.g.sin25° – T

1.4 R is the resultant between two forces P and Q. Which one of the following vector diagrams correctly represents P, Q and R?

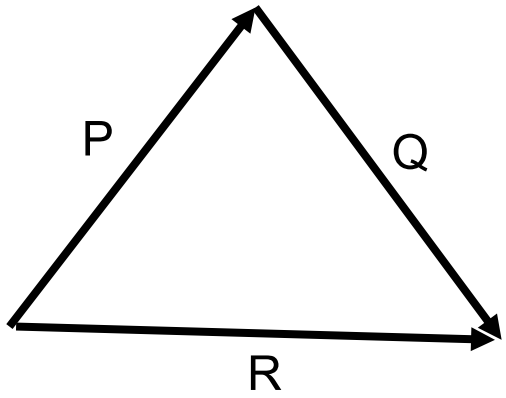
A.



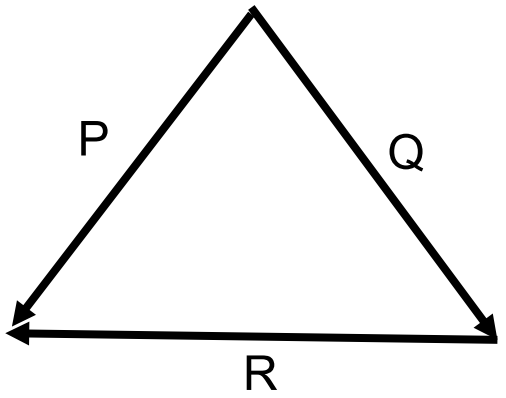
B.



C.



D.



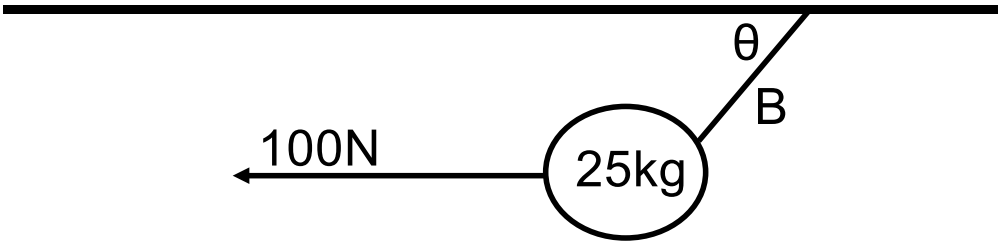
TOTAL SECTION A = [8]

SECTION B

(answer on folio paper)

QUESTION 2:

Vukile pulls a 25kg ball to the left with a force of 100 N. When rope B is at an angle of θ with the horizontal the ball is AT REST as shown in the diagram below.



2.1 Define the term *resultant vector*. (2)

2.2 Draw a VECTOR diagram showing ALL forces acting on the ball. Indicate θ in the diagram. (4)

2.3 Calculate the weight of the ball. (3)

2.4 Calculate the magnitude of the tension in rope B. (2)

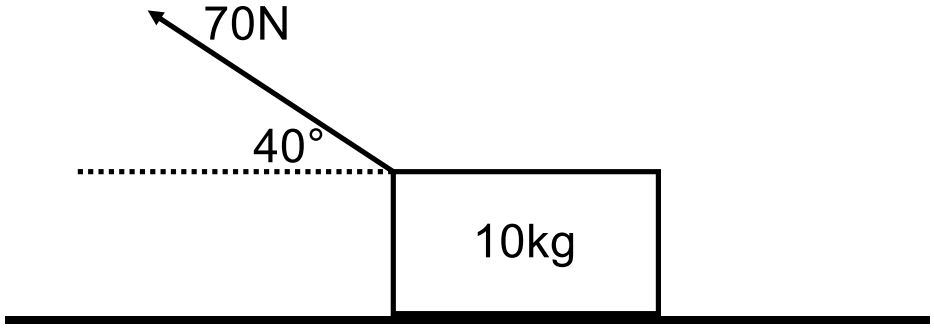
2.5 Calculate θ. (2)

2.6 The 25kg ball is replaced with a box of unknown mass. Vukile pulls the box to the left with the same force of 100 N. However, the box stands still when θ = 60°. Calculate the mass of the box. (4)

[17]

QUESTION 3:

A 10 kg block is being pulled to the left by a 70 N force acting at 40° to the horizontal as shown in the diagram below. The block is moving at a CONSTANT VELOCITY.



3.1 State *Newton's First Law* in words. (2)

3.2 Draw a free-body diagram showing ALL forces acting on the block. (4)

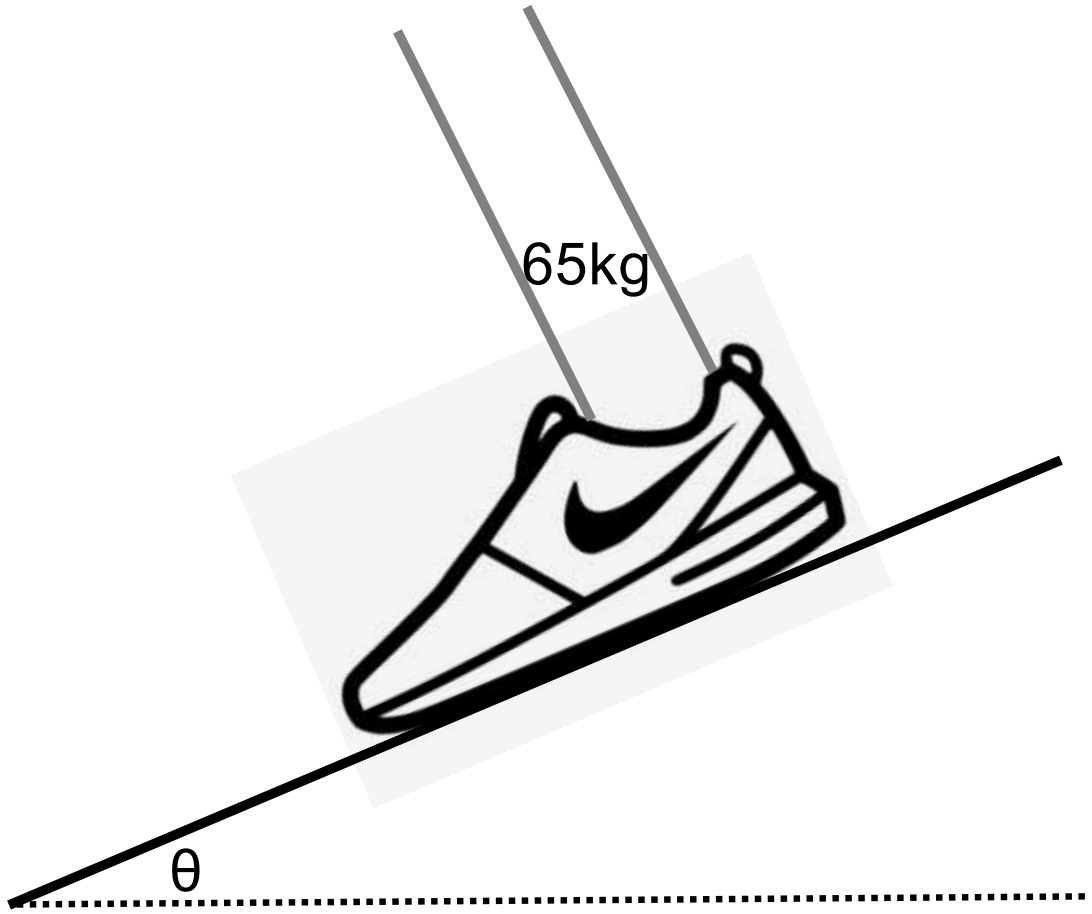
3.3 Calculate the magnitude of the normal force acting on the block. (3)

3.4 Calculate the coefficient of kinetic friction between the block and the surface. (4)

[13]

QUESTION 4:

To test the grip on their latest shoe, a 65 kg Nike employee stands on a rough surface inclined at θ° to the horizontal as shown in the diagram below.



4.1 Define the term *static friction*. (2)

4.2 Draw a free-body diagram showing ALL forces acting on the shoe. (3)

4.3 The coefficient of static friction between the shoe and the surface is 0,6. Calculate the maximum angle θ for which the Nike employee will remain stationary. (5)

4.4 If θ is decreased, will the coefficient of static friction INCREASE, DECREASE or REMAIN THE SAME? Give a reason for your answer. (2)

[12]

TOTAL SECTION B = [42]

Formula Sheet

Physical Constants:

Name	Symbol	Value
Acceleration due to gravity	g	9,8 $m.s^{-2}$

Formulae:

MOTION

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

FORCE

$F_{net} = ma$	$w = mg$
$\mu_k = \frac{f_k}{N}$	$\mu_s = \frac{f_{s(max)}}{N}$