Province of the
EASTERN CAPE
EDUCATION

OR TAMBO INLAND DISTRICT

GRADE 11

PHYSICAL SCIENCES TOPIC TEST

TOPIC: NEWTON'S LAWS

FEBRUARY 2025

MARKS: 50
TIME: 1HOUR

This question paper consists of 6 pages including the data sheet

GRADE 11 TOPIC TEST, COMPILED BY DLULANE

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various 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 (1.1–1.5) in the ANSWER BOOK. E.g. 1.6 E

1.1 A free-moving block slides down an inclined plane at a CONSTANT VELOCITY. This means that the …

A. frictional force acting on the block is zero.
B. net force acting on the block is in the direction down the slope of the plane.
C. net force acting on the block is zero.
D. component of weight parallel to the plane is greater than the frictional force.   (2)

1.2 A book of 80g is at rest on a horizontal surface
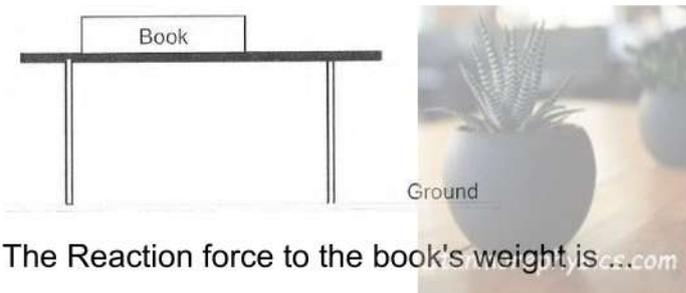
The Reaction force to the book's weight is …

A. The force exerted by the book on the table.
B. The force exerted by the table on the book.
C. The force of the Earth on the book
D. The force of the book on the Earth.   (2)

1.3 The mass of a man on planet R is **m** kg. The acceleration due to gravity on planet S is **twice** the acceleration due to gravity on planet R. The mass of the same man on planet S will be ...

A. **m** kg
B. 2**m** kg
C. $\frac{1}{2}$**m** kg
D. 4**m** kg   (2)

**1.4** A block with a mass of 4 kg is pulled upwards along a frictionless slope, inclined at an angle θ, with a force F, as shown in the sketch below.

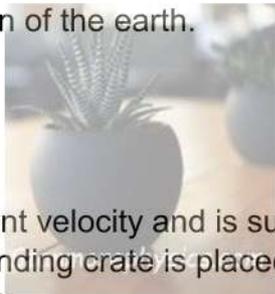Which ONE of the following equations can be used to calculate the magnitude of the normal force (N)?

A. N = (4) (9,8) sin θ
B. N = F - (4) (9,8) cos θ
C. N = F + (4) (9,8) cos θ
D. N= (4) (9,8) cos θ   (2)

1.5 The following graph shows the relationship between gravitational force and the mass of the object near the surface of the earth.
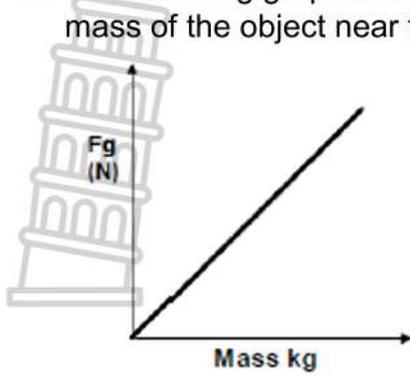
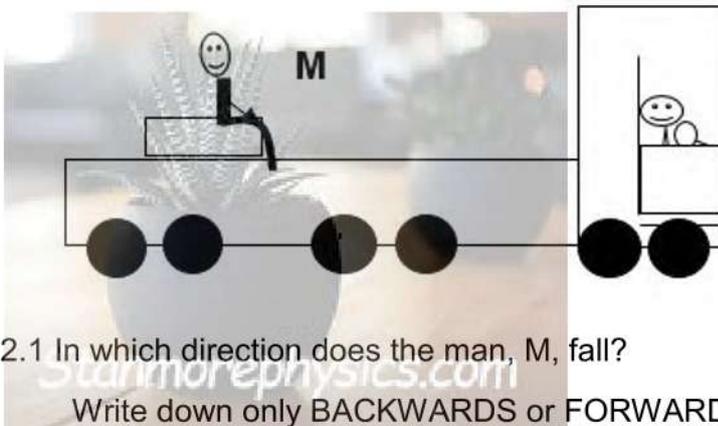The gradient of the graph represents ...
A. mass of the earth.
B. radius of the earth.
C. gravitation acceleration of the earth.
D. weight of the object.   (2)
                                                                                      [8]

QUESTION 2

A truck is moving at a constant velocity and is suddenly hit from the rear (back) by a fast-moving bus. A loose-standing crate is placed on the back of the truck and a man, M, is sitting on the crate


2.1 In which direction does the man, M, fall?

Write down only BACKWARDS or FORWARDS.   (1)

2.2 State in words Newton's laws of motion you used to answer QUESTION 2.1. (2)

2.3 Luxolo and Kay with masses 80 kg and 50 kg respectively are standing on roller-skates facing each other. Initially they are at rest. They push against each other and both move away in opposite directions. (IGNORE FRICTION)
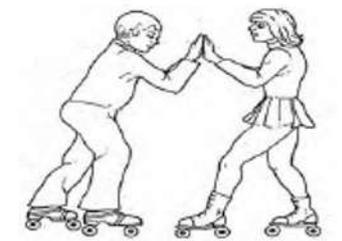
2.3.1 How does the force exerted on Kay compare to the force exerted on Luxolo?

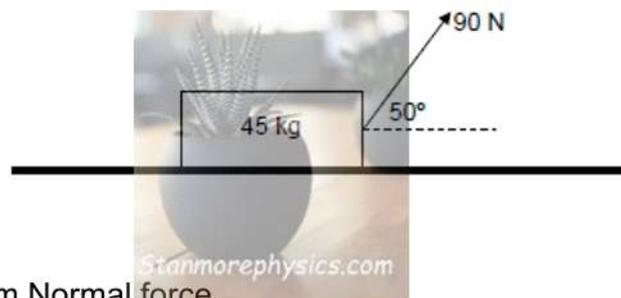Write only GREATER, SMALLER or EQUAL TO.   (1)

2.3.1 How does acceleration of Luxolo compare to that of Kay

Write only GREATER, SMALLER or EQUAL TO. Explain your answer.   (3)

[7]

QUESTION 3

A box, with a mass of 45 kg, is pulled with a force of 90 N at an angle of 50° to the horizontal. The box moves at a CONSTANT VELOCITY.

3.1

3.1.1 Define the term Normal force.   (2)

3.1.2. Calculate the Magnitude of the Normal force   (3)

3.1.3 Calculate the magnitude of the kinetic frictional force   (2)
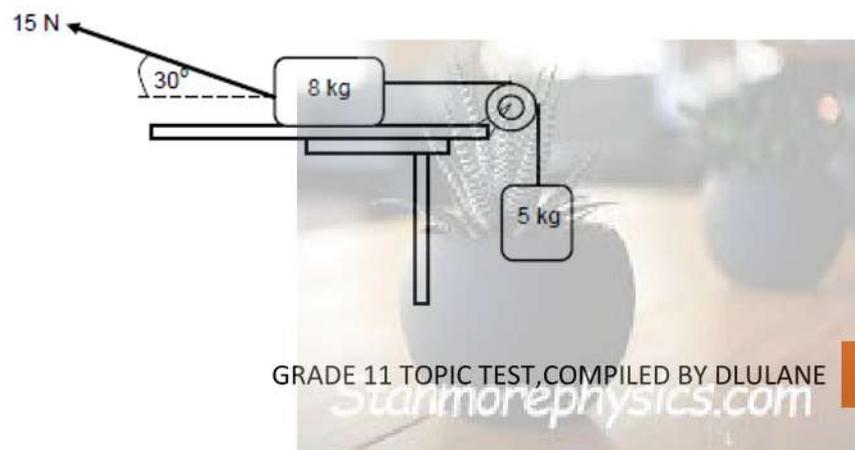
3.1.4 Calculate the coefficient of kinetic friction.   (3)

3.2 Will the coefficient of kinetic friction change if the angle of the applied force is decreased? Write only YES or NO and give a reason.   (2)

[12]

QUESTION 4

A block of mass 8 kg resting on a rough horizontal table is connected by a light inextensible string which passes over a light frictionless pulley to another block of mass 5 kg. The 5 kg block hangs vertically as shown in the diagram below. A 15 N force is applied to the 8 kg block at an angle of $30°$ to the horizontal, causing the block to slide to the left.

The coefficient of kinetic friction between the 8 kg block and the surface of the table is 0,25. Ignore the effects of air friction.

4.1 Draw a free-body diagram showing ALL the forces acting on the 8 kg block. (5)

4.2 State Newton's second law in words (2)

4.3 Calculate the Tension in the string connecting the two blocks (7)

[14]

QUESTION 5

The relationship between gravitational acceleration and the ratio of the mass to the square of the radius $\frac{M}{R^2}$ of different planets are investigated. The graph below is obtained from the data collected.

Graph of g versus $\frac{M}{R^2}$
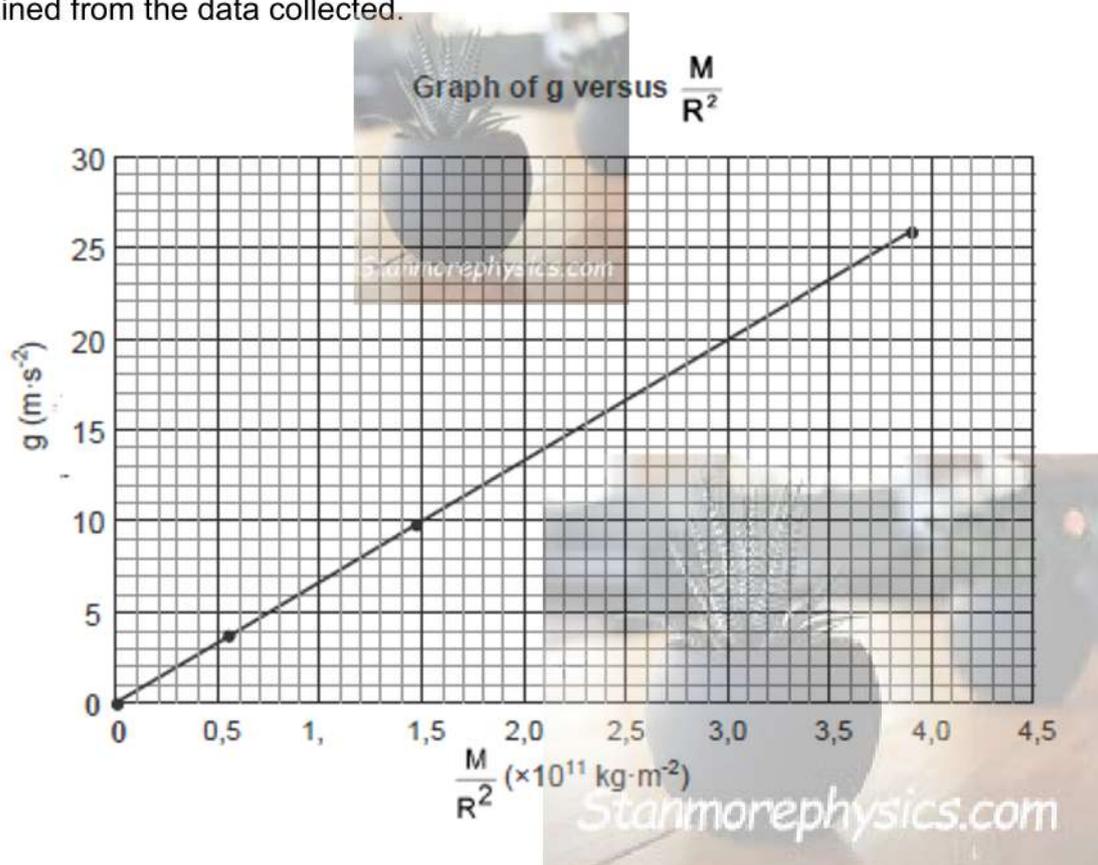
5.1 What relationship between g and $\frac{M}{R^2}$ can be deduced from the graph? (1)

5.2 Calculate the gradient of the graph. (3)

5.3 Which physical constant is represented by the gradient of the graph? (1)

5.4 The gravitational acceleration on Uranus is $9 \ ms^{-2}$. Use the graph to determine the $\frac{M}{R^2}$ value for Uranus. (2)

5.5 Calculate the mass of Uranus if the radius is $2,54 \times 10^7$ m. (2)

[9]

PAPER 1 (PHYSICS)

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	$9.8 \, ms^{-2}$
Universal Gravitational Constant	G	$6.67 \times 10^{-11} Nm^2 kg^{-2}$
Radius of Earth	R_E	$6.38 \times 10^6 m$
Mass of Earth	M_E	$5.98 \times 10^{24} kg$

TABLE 2: FORCES

$F_{net} = ma$	$w = mg$
$F = \dfrac{Gm_1 m_2}{r^2}$	$g = \dfrac{Gm}{r^2}$
$f_k = \mu_k N$	$f_{s(max)} = \mu_s N$