education

Department:
Education
PROVINCE OF KWAZULU-NATAL

NATIONAL SENIOR CERTIFICATE

GRADE 11

PHYSICAL SCIENCE: CHEMISTRY (P1)

COMMON TEST

MARCH 2019

TIME: 1 hour

MARKS: 50

This question paper consists of 7 pages and 1 data sheet.

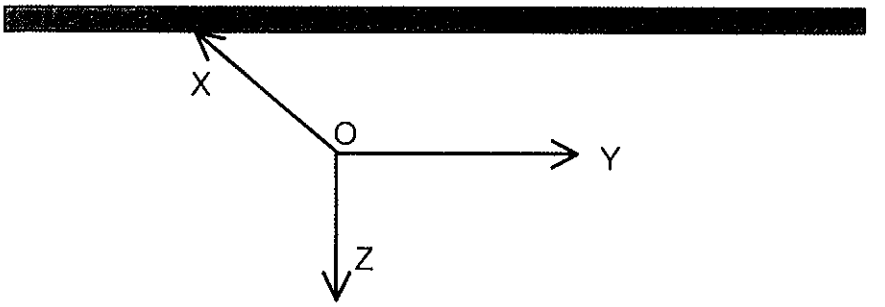
NSTRUCTIONS AND INFORMATION TO CANDIDATES

1. Write your name on the **ANSWER BOOK.**
2. This question paper consists of EIGHT questions. Answer ALL the questions in the ANSWER BOOK.
3. Start EACH question on a NEW page in the ANSWER BOOK.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave ONE line between two subquestions, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable calculator.
7. You may use appropriate mathematical instruments.
8. You are advised to use the attached DATA SHEET.
9. Show ALL formulae and substitutions in ALL calculations.
10. Round off your final numerical answers to a minimum of TWO decimal places.
11. Give brief motivations, discussions, et cetera where required.

QUESTION 1 : MULTIPLE CHOICE QUESTIONS

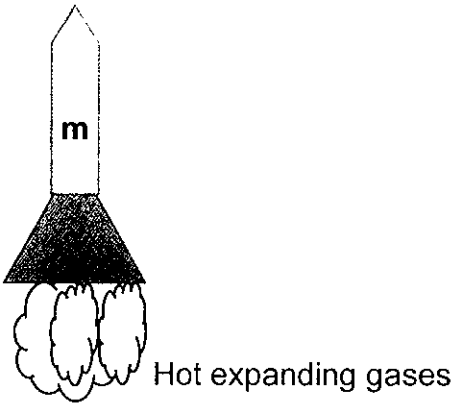
Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A - D) next to the question number (1.1 — 1.4) in the ANSWER BOOK, for example 1.5 D.

1.1 Three forces X,Y and Z act at a point O and are in equilibrium.
Which of the following statements is INCORRECT?



A The vector sum of all the forces is zero.
B X is equal to the resultant of Y and Z
C Z is the equilibrant of X and Y
D The resultant of X,Y and Z is zero. (2)

1.2 A rocket of mass m is launched vertically upwards from the ground.
The engine of the rocket converts the fuel to hot expanding gases which it ejects during its motion.

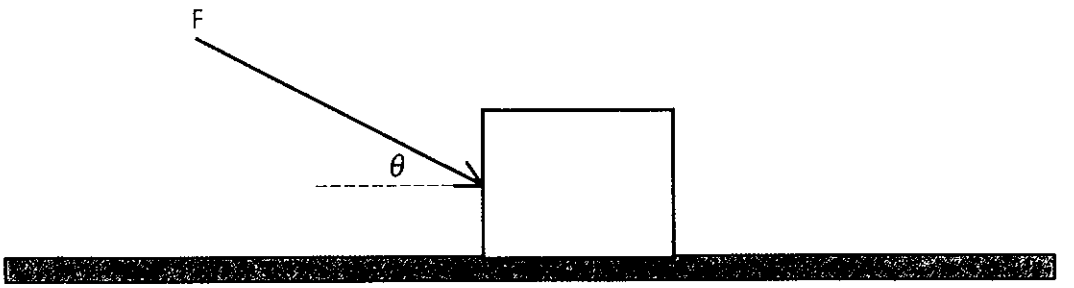


Ground

Which one of the following statements best describes the cause of the rocket's upward acceleration?

A The hot expanding gases exert a downward force on the ground.
B The hot expanding gases exerts an upward force on the rocket.
C The rocket exerts a downward force on the ground.
D The rocket exerts a downward force on the hot expanding gases. (2)

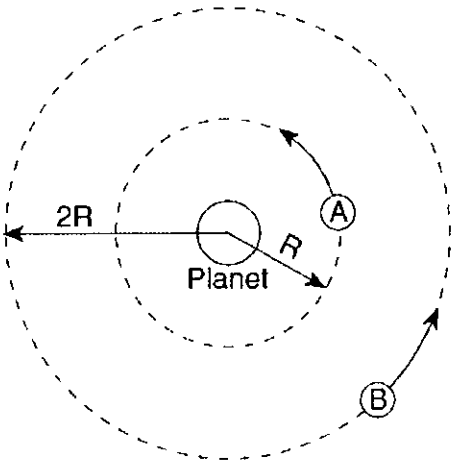
.3 The diagram below shows a force of magnitude F applied to a block at angle θ relative to a horizontal frictionless surface.



As angle θ is increased, the frictional force acting on the block, and the acceleration of the block will change as follows:

	Frictional force	**Acceleration**
A	decreases	increases
B	decreases	decreases
C	increases	decreases
D	increases	increases

The diagram below represents two satellites A and B of equal mass in circular orbits around a planet.



distances of satellites A and B from the centre of the planet are R and 2R respectively,if gravitation force that the planet exerts on A is F, then the gravitational force that the et exerts on B will be

A 2 F

B ½ F

C 4 F

D ¼ F (2)

QUESTION TWO

Four forces A, B, C and D act at a common point O as shown in the diagram below. The magnitudes of forces are as follows: A is 5 N, force B is 8 N, force C is 6 N and force D has an unknown magnitude.

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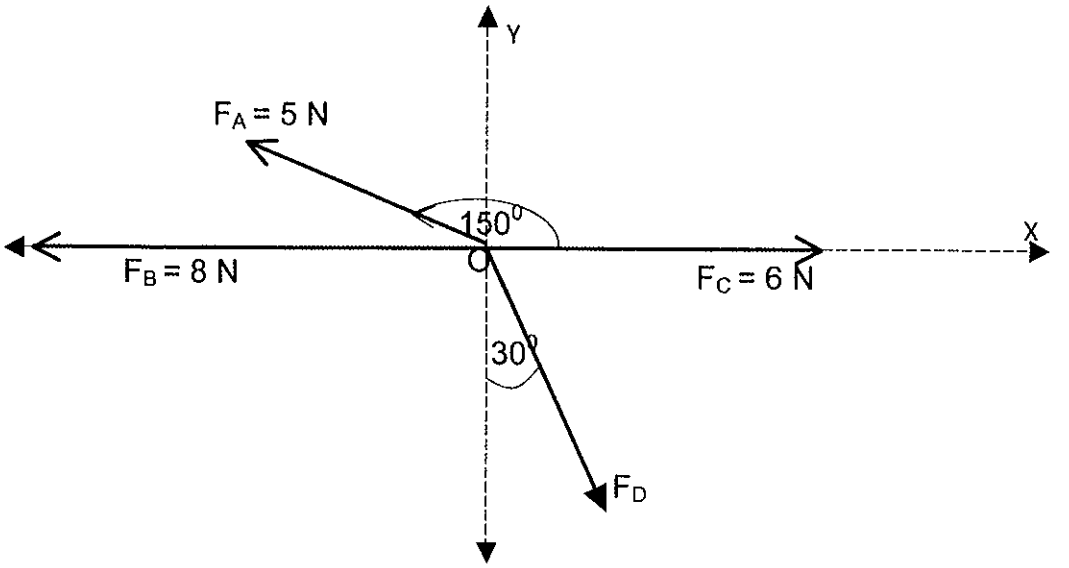


2.1 Define resultant vector. (2)

2.2 Calculate the magnitude of the resultant of force B and force C. (2)

The net horizontal component for the forces F_A, F_B ,F_C and F_D is equal to 1.25 N.

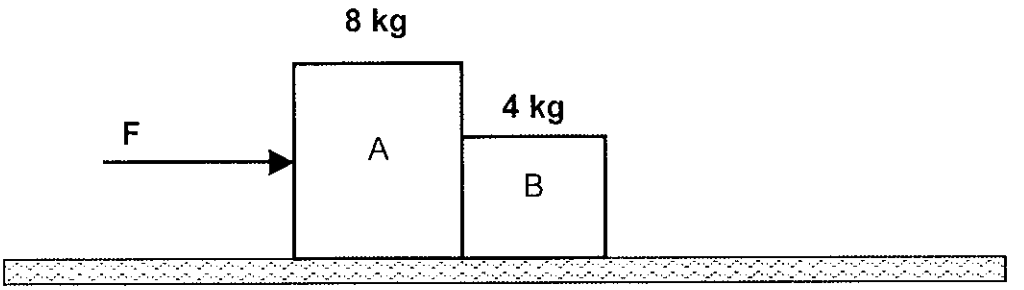
2.3 Calculate the magnitude of force D , (3)

2.4 Hence, calculate the magnitude of the resultant force acting at point O. (5)

[12]

QUESTION THREE

Two boxes, A and B, having masses 8 kg and 4 kg respectively, are placed in contact next to each other on a horizontal, rough surface as shown below.



A horizontal force of magnitude F is applied to box A and the system accelerates uniformly to the right. The net force acting on block B during its motion is 12.5 N and the coefficient of kinetic friction between each block and the surface is 0.2. Take the motion of the system to the right as positive.

3.1 State Newton's Second law in words. (2)

3.2 Draw a labeled free body diagram to show all the horizontal forces acting on block B. (2)

3.3 Calculate:

3.3.1 the acceleration of the system. (3)

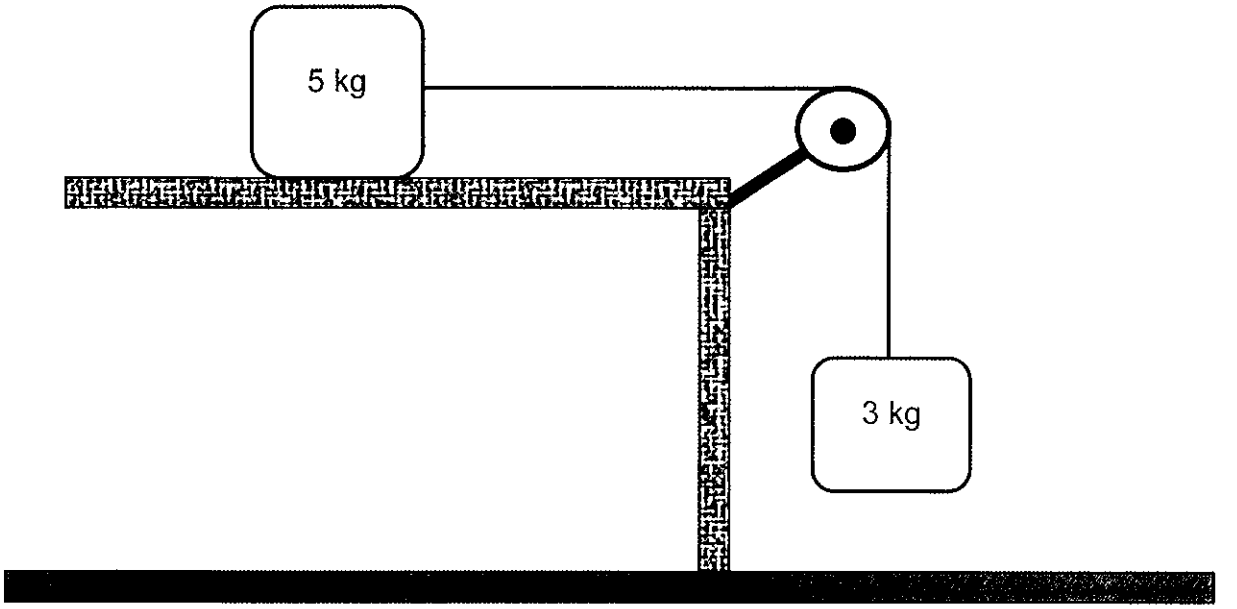
3.3.2 the magnitude of the kinetic frictional force acting on block B (3)

3.3.3 the magnitude of force that block A exerts on block B (3)

[13]

QUESTION FOUR

In the diagram below, a 5 kg mass on a rough horizontal surface is joined to a 3 kg mass by a light, inextensible string running over a frictionless pulley. The system is initially at rest.



The kinetic friction between the 5 kg mass and the surface is 4.5 N.

4.1 Draw a free body diagram showing all the horizontal forces acting on the 5 kg mass. (2)

4.2 Calculate the acceleration of the system. (4)

4.3 Describe the motion of the 5 kg block when the 3 kg block lands on the floor. Assume that the 5 kg block does not reach the pulley. (2)

[8]

QUESTION FIVE

5.1 State Newton's Law of Universal Gravitation in words. (2)

5.2 A man of mass 90 kg is standing on the surface of the earth.

5.2.1 Calculate the force that the earth exerts on the man. (3)

5.2.2 Use your answer in Q 5.2.1 to calculate the mass of the Earth, if the radius of the Earth is 6.38×10^6 m (4)

[9]

TOTAL MARKS: [50]

DATA FOR PHYSICAL SCIENCES GRADE 11
PAPER 1 (PHYSICS)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 11
VRAESTEL 1 (FISIKA)

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	$9,8\ m{\cdot}s^{-2}$
Gravitational constant *Swaartekragkonstante*	G	$6,67 \times 10^{-11}\ N{\cdot}m^2{\cdot}kg^{-2}$
Radius of Earth *Straal van Aarde*	R_E	$6,38 \times 10^6\ m$

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

MOTION/*BEWEGING*

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

FORCE/*KRAG*

$F_{net} = ma$	$w = mg$
$F = \frac{Gm_1m_2}{r^2}$	$\mu_s = \frac{f_{s(max)}}{N}$
$\mu_k = \frac{f_k}{N}$	

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PHYSICAL SCIENCES P1
MARKING GUIDELINE
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GRADE 11

This marking guideline consists of 5 pages.

QUESTION ONE

1.1 B ✓✓
1.2 B ✓✓
1.3 C ✓✓
1.4 D ✓✓

4 x 2 = [8]

QUESTION TWO

2.1 It is a single vector that can represent a number of vectors acting on an object in both magnitude and direction. ✓✓ (2 or 0) (2)
OR
It is a single vector which has the same effect as all the other vectors acting together. ✓✓ (2 or 0)

2.2 $F_{resultant} = -8 + 6$✓ or $F = -2$ ✓ magnitude is 2N✓ (2)

2.3 **Positive marking from Q 2.2.**

OPTION 1 : $\Sigma Rx = (-2) + (-5\cos 30^0)$ ✓ $+F_D \cos 60^0$ ✓$= 1.25$
$F_D = 15.16$ N✓ (3)

OPTION 2 : $\Sigma Rx = (-2) + (-5\sin 60^0)$ ✓ $+F_D \sin 30^0$ ✓$= 1.25$
$F_D = 15.16$ N✓ (3)

OPTION 3 : $\Sigma Rx = (-2) + (5\cos 150^0)$ ✓ $+F_D \cos 300^0$ ✓$= 1.25$
$F_D = 15.16$ N✓ (3)

2.4 **Positive marking from Q 2.3.**

OPTION 1 : $\Sigma Ry = 5\sin 30^0 + (-15.16 \sin 60^0)$ ✓
$= -10.63$ N✓

OPTION 2 ; $\Sigma Ry = (5\cos 60^0) + (-15.16 \cos 30^0)$ ✓
$= -10.63$ N✓

OPTION 3 : $\Sigma Ry = (5 \sin 150^0) + 15.16 \sin 300^0$ ✓

$= -10.63$ N✓

$R_{NET}^2 = R_x^2 + R_y^2$

$= (1.25)^2$ ✓$+ (-10.63)^2$✓

$R_{NET} = 10.70$ N ✓ (5)

[12]

QUESTION THREE

3.1 If a non zero NET force acts on an object, then the object accelerates in the direction of the NET force where the acceleration of the object is directly proportional to the NET force✓ and inversely proportional to the mass of the object. ✓ (2)

3.2

(2)

3.3.1 $F_{NET} = m \cdot a$ ✓

$12.5 = 4 \cdot a$ ✓

$a = 3.125\ ms^{-2}$ right✓ (3)

3.3.2 $f_{KB} = \mu_K \cdot N$✓

$= 0.2\ (4 \times 9.8)$ ✓

$= 7.84$ N✓ (3)

3.3.3 **Consider box B**

$F_{NET} = m \cdot a$

$F_{A \to B} + (-f_B) = m \cdot a$

$F_{A \to B} + (-f_B) = 12.5$ ✓ (any one)

$F_{A \to B} - 7.84 = 12.5$✓

$F_{A \to B} = 20.34$ N✓ (3)

[13]

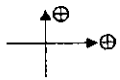
QUESTION FOUR

4.1

(2)

4.2 **OPTION 1**

Take the motion of the system to the right as Positive



5 kg

$F_{NET} = m \cdot a$

$F_T + (-F_f) = m \cdot a$ ✓ (any one)

$F_T + (-4.5) = 5a$ ✓

$F_T = 5a + 4.5$ .....(1)

$F_{NET} = m \cdot a$

$F_T + (-W) = m \cdot a$

$F_T + (-3 \cdot 9.8) = 3(-a)$ ✓

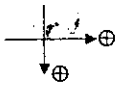
$F_T = 29.4 - 3a$ .....(2)

$5a + 4.5 = 29.4 - 3a$

$a = 3.11\ ms^{-2}$✓

OPTION 2

Take the motion of the system downwards as positive.



5 kg

$F_{NET} = m \cdot a$

$F_T + (-F_f) = m \cdot a$ ✓ (any one)

$F_T + (-4.5) = 5a$ ✓

$F_T = 5a + 4.5$ .....(1)

3 kg

$F_{NET} = m \cdot a$
$-F_T + W = m \cdot a$
$-F_T + (3 \cdot 9.8) = 3a$ ✓
$F_T = -3a + 29.4$. .....(2)

$5a + 4.5 = -3a + 29.4$
$a = 3.11\ ms^{-2}$✓

(4)

4.3 Velocity decreases✓, until it comes to a stop. ✓ (2)

[8]

QUESTION FIVE

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

5.2.1 W/Fg $= m \cdot g$ ✓
$= 90 \cdot 9.8$ ✓
$= 882$ N ✓ (3)

Positive marking from Q 5.2.

5.2.2 $F = \frac{G \cdot m_1 \cdot m_2}{r^2}$ ✓

882✓ $= \frac{6,67 \times 10^{-11} \times 90 \times m_2}{(6,38 \times 10^6)^2}$ ✓

$m_2 = 5.98 \times 10^{24}$ kg✓ (4)

[9]

TOTAL MARKS: 50