PHYSICAL SCIENCES
MARCH CONTROLLED TEST
GRADE 11
2018

MARKS : 75

TIME : 1.5 Hrs

INSTRUCTIONS AND INFORMATION

1. Write your NAME and CLASS in your ANSWER BOOK.
2. This question paper consists of SIX questions. Answer ALL questions.
3. Start each question on a new page.
4. Number the answers according to the numbering system used in this question paper.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. You are advised to use the attached DATA SHEETS.
8. Show ALL formulae and substitutions in ALL calculations.
9. Round-off your FINAL numerical answers to a minimum of TWO decimal places.
10. Write neatly and legibly.

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 – 1.5) in the ANSWER BOOK. For example 1.11 D.

1.1 Vector **Z** and **–Z** are acting on a common point **O**. The angle between the two vectors is… (2)

- A 270°
- B 180°
- C 90°
- D 0°

1.2 A constant net force acts on a trolley moving in a straight line. Which one of the following physical quantities will remain constant? (2)

- A acceleration
- B displacement
- C kinetic energy
- D velocity

1.3 The best explanation why a driver and passengers should wear a seatbelt is … (2)

- A Newton’s First law
- B Newton’s Second law
- C Newton’s Third law
- D Newton’s Universal Gravitation law

1.4 Which ONE of the bonds between the atoms below has the *highest polarity*? (2)

A H – C

B H – Cl

C H – O

D H – N

1.5 The shape of the molecule in which the central atom is surrounded by two lone pairs and two bonding pairs is … (2)

A trigonal planar

B tetrahedral

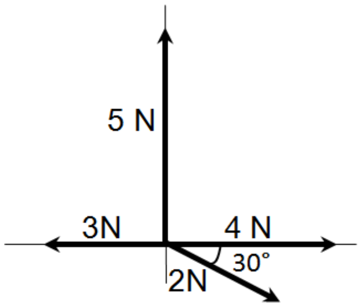
C angular

D linear

[10]

QUESTION 2

The diagram below shows FOUR forces of **2N**; **3N**; **4 N** and **5N** acting on an object on the same plane. The **2N** is 30° *anticlockwise* from the x-axis. The diagram is not drawn to scale.



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

2.2 Calculate the magnitude of the *resultant* of all the:

2.2.1 *horizontal* forces acting on the object. (2)

2.2.2 *vertical* forces acting on the object. (2)

2.2.3 forces acting on the object. (5)

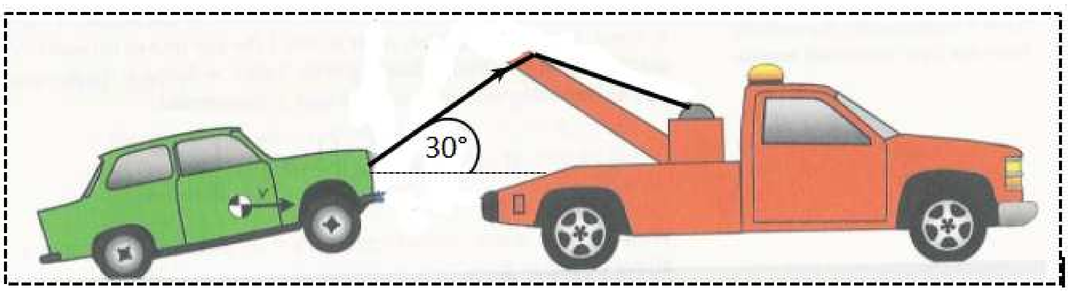
[11]

QUESTION 3

A tow truck is towing a car using an inelastic steel cable (of negligible mass) as shown in the diagram below.

The steel cable forms an angle of **30°** with the horizontal.

Mass of car = **1100 kg** Mass of tow truck = **4000 kg**



The two vehicles move from rest on a straight, horizontal road to the right. The mass of the car is **1100 kg** and the mass of the tow truck is **4000 kg**. The tow truck's engine applies a force of **15 000 N**. A constant frictional force of **1456 N** is acting on the car and a constant frictional force of **4520 N** is acting on the tow truck respectively.

3.1 State *Newton's Second Law* of motion, in words. (2)

3.2 Draw a labelled, *free-body diagram* of all the forces acting on the car. (4)

3.3 Calculate the:

3.3.1 *acceleration* of the car. (6)

3.3.2 magnitude of the *tension* **T** in the cable. (3)

3.5 Using equations of motion, calculate the *distance* that the car will travel in **4s**. (2)

3.6 State *Newton's First Law* of motion, in words. (2)

3.7 Use Newton's laws of motion to explain why towing can be dangerous. (2)

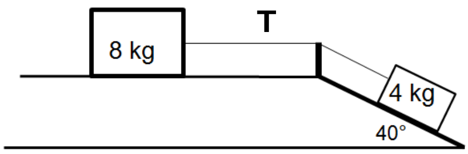
3.8 If the force of horizontal tension in the cable, from the car on the truck is **1890 N**, what is the horizontal force of the truck on the car? Explain with reference to the relevant scientific principles. (2)

[23]

QUESTION FOUR

Two blocks, of mass **8kg** and **4 kg** respectively, are joined with an inelastic string of negligible mass. The string runs over a frictionless pulley. The **8kg** block is on a horizontal surface while the **4 kg** block is on an inclined plane of **40°** with the horizontal. The coefficient of kinetic friction for both blocks is **0,2**. The **4 kg** block accelerates down the slope.

The tension in the string is **T**



4.1 Calculate the frictional force between the surface and the **4 kg** block. (4)

4.2 Calculate the magnitude of the tension **T** in the string. (5)

4.2 How will the acceleration compare if the positions of the **8 kg** block and the **4kg** block are switched?
Write down only GREATER THAN, LESS THAN or THE SAME. Explain the answer. (2)

[11]

QUESTION 5

Gravitational force exists between the Sun and the Earth.

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

5.2 The mass of the Sun is **250 000** times greater than that of the Earth.
The distance between the centers of the sun and the Earth is **1,27 x 10^9 m**.
Calculate the gravitational force that the sun exerts on the Earth. (4)

5.3 How will the gravitational force that the Earth exerts on the sun compare to the answer to QUESTION 5.2?
Write only GREATER THAN, LESS THAN or EQUAL TO.
Give a reason for your answer. (2)

[08]

QUESTION 6

6.1 Define the term *electronegativity*. (2)

6.2 Study the following molecules and answer the questions that follow:

CH_4 CO_2 H_2O

For each molecule

6.2.1 Provide the *shape*. (3)

6.2.2 Draw the *Lewis diagram* (3)

6.2.3 State whether each molecule is polar or non-polar. (3)

6.3 Write down the type of intermolecular forces that exists between water molecules? (1)

[12]

TOTAL = 75

4.2 Information sheets – Paper 1 (Physics)

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	$6{,}38 \times 10^6\ m$
Coulomb's constant *Coulomb se konstante*	k	$9{,}0 \times 10^9\ N\cdot m^2\cdot C^{-2}$
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	$3{,}0 \times 10^8\ m\cdot s^{-1}$
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}\ C$
Electron mass *Elektronmassa*	m_e	$9{,}11 \times 10^{-31}\ kg$
Mass of the Earth *Massa van die Aarde*	M	$5{,}98 \times 10^{24}\ kg$

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*

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

KEY/*SLEUTEL*

Atomic number
Atoomgetal

Electronegativity
Elektronegatiwiteit

29
1,9 Cu
63,5

Symbol
Simbool

Approximate relative atomic mass
Benaderde relatiewe atoommassa

1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
1 2,1 **H** 1																	2 **He** 4
3 1,0 **Li** 7	4 1,5 **Be** 9											5 2,0 **B** 11	6 2,5 **C** 12	7 3,0 **N** 14	8 3,5 **O** 16	9 4,0 **F** 19	10 **Ne** 20
11 0,9 **Na** 23	12 1,2 **Mg** 24											13 1,5 **Aℓ** 27	14 1,8 **Si** 28	15 2,1 **P** 31	16 2,5 **S** 32	17 3,0 **Cℓ** 35,5	18 **Ar** 40
19 0,8 **K** 39	20 1,0 **Ca** 40	21 1,3 **Sc** 45	22 1,5 **Ti** 48	23 1,6 **V** 51	24 1,6 **Cr** 52	25 1,5 **Mn** 55	26 1,8 **Fe** 56	27 1,8 **Co** 59	28 1,8 **Ni** 59	29 1,9 **Cu** 63,5	30 1,6 **Zn** 65	31 1,6 **Ga** 70	32 1,8 **Ge** 73	33 2,0 **As** 75	34 2,4 **Se** 79	35 2,8 **Br** 80	36 **Kr** 84
37 0,8 **Rb** 86	38 1,0 **Sr** 88	39 1,2 **Y** 89	40 1,4 **Zr** 91	41 **Nb** 92	42 1,8 **Mo** 96	43 1,9 **Tc**	44 2,2 **Ru** 101	45 2,2 **Rh** 103	46 2,2 **Pd** 106	47 1,9 **Ag** 108	48 1,7 **Cd** 112	49 1,7 **In** 115	50 1,8 **Sn** 119	51 1,9 **Sb** 122	52 2,1 **Te** 128	53 2,5 **I** 127	54 **Xe** 131
55 0,7 **Cs** 133	56 0,9 **Ba** 137	57 **La** 139	72 1,6 **Hf** 179	73 **Ta** 181	74 **W** 184	75 **Re** 186	76 **Os** 190	77 **Ir** 192	78 **Pt** 195	79 **Au** 197	80 **Hg** 201	81 1,8 **Tℓ** 204	82 1,8 **Pb** 207	83 1,9 **Bi** 209	84 2,0 **Po**	85 2,5 **At**	86 **Rn**
87 0,7 **Fr**	88 0,9 **Ra** 226	89 **Ac**															

58 **Ce** 140	59 **Pr** 141	60 **Nd** 144	61 **Pm**	62 **Sm** 150	63 **Eu** 152	64 **Gd** 157	65 **Tb** 159	66 **Dy** 163	67 **Ho** 165	68 **Er** 167	69 **Tm** 169	70 **Yb** 173	71 **Lu** 175
90 **Th** 232	91 **Pa**	92 **U** 238	93 **Np**	94 **Pu**	95 **Am**	96 **Cm**	97 **Bk**	98 **Cf**	99 **Es**	100 **Fm**	101 **Md**	102 **No**	103 **Lr**