education

Department of Education
FREE STATE PROVINCE

GRADE 11
PROVINCIAL FORMAL ASSESSMENT TASK

TERM 1 - 2016

PHYSICAL SCIENCES
CONTROL TEST

TIME: 2 HOURS

MARKS: 100

This paper consists of 9 pages and 3 information sheets.

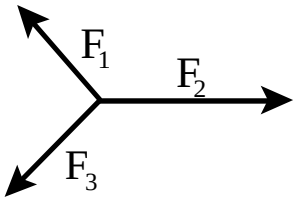
INSTRUCTIONS AND INFORMATION

1. Write your name and grade on the ANSWER BOOK.
2. This question paper consists of seven (7) questions. Answer ALL the questions.
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 sub questions, for example between QUESTION 2.1 and QUESTION 2.2.
6. Write neatly and legibly.
7. Show ALL formulae and substitutions in ALL calculations.
8. You may use a non-programmable calculator.
9. You may use appropriate mathematical instruments.
10. Round off your FINAL numerical answers to a minimum of TWO decimal places.
11. YOU ARE ADVISED TO USE THE ATTACHED DATA SHEETS.
12. 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 (1.1–1.10) in the ANSWER BOOK, for example 1.11 D.

1.1 The diagram represents three forces in equilibrium.



Which ONE of the following is TRUE?

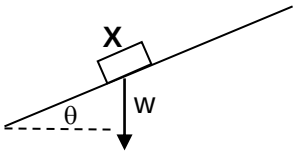
A The sum of the three forces is not zero.

B F_3 is the resultant of $F_1 + F_2$.

C $F_1 + F_2$ is larger than F_3.

D F_2 has the same magnitude as $F_1 + F_3$. (2)

1.2 Object **X** of weight **w** is at rest on a plane inclined at an angle θ with the horizontal as shown below.



Which ONE of the following gives the magnitude of the frictional force on the object?

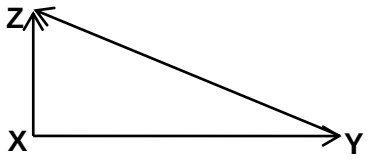
A $w\sin\theta$

B $w\cos\theta$

C $\frac{w}{\sin\theta}$

D $\frac{w}{\cos\theta}$ (2)

1.3 Consider the following vector diagram.



Which ONE of the following correctly represents $\overrightarrow{XY} + \overrightarrow{YZ} + \overrightarrow{XZ}$?

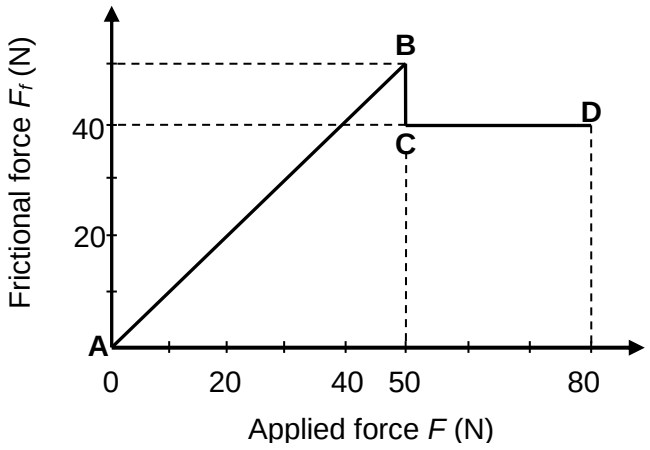
A 0

B $\overrightarrow{XZ}$

C $\overrightarrow{2XZ}$

D $\overrightarrow{4XZ}$ (2)

1.4 The graph below represents the relationship between the frictional force and the applied force on an object that is initially at rest on a rough HORIZONTAL surface.



Which section of the graph represents kinetic friction?

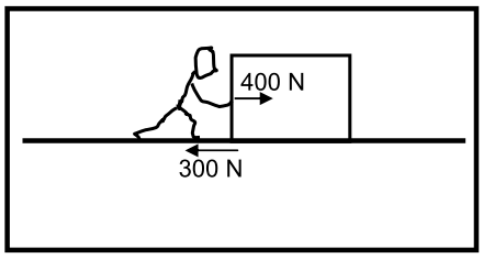
A AB

B BC

C AC

D CD (2)

1.5 A boy applies a force of 400 N to push a crate as shown below. The frictional force acting on the crate is 300 N. The crate accelerates at 0,2 $m \cdot s^{-2}$ in the direction of the applied force.



According to Newton's Third Law of motion, the magnitude of the reaction force exerted by the crate on the boy is ...

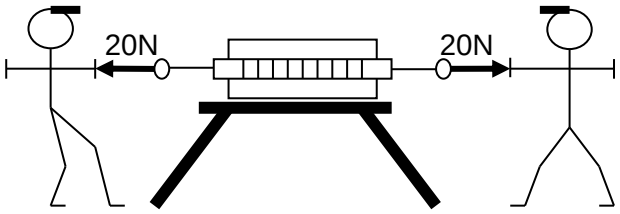
A 20 N.

B 100 N.

C 400 N.

D 700 N. (2)

1.6 Two learners pull in opposite directions on strings attached to each end of a spring balance as shown below. Each learner exerts a force of 20 N.



What will the reading on the spring balance be?

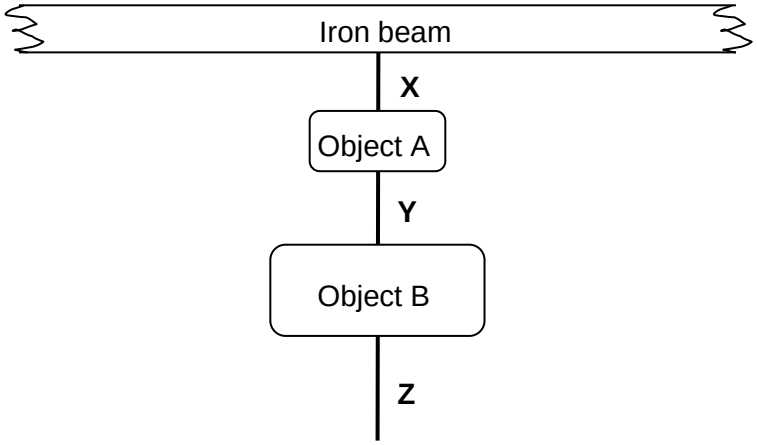
A 40 N

B 20 N

C 10 N

D 0 N (2)

1.7 Two objects, **A** and **B**, are attached to an iron beam and to each other using ropes **X**, **Y** and **Z** as shown below. The ropes are adequately strong enough to hold the objects.

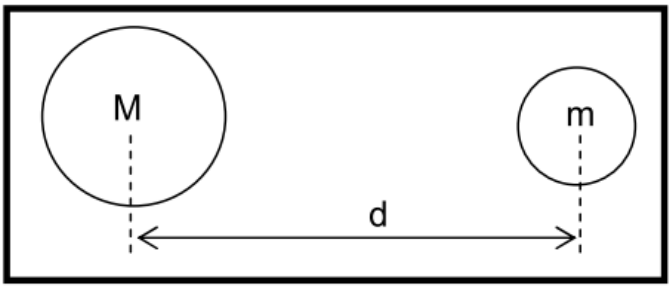


Where will the rope breaks in the following situations.

	Rope Z is quickly pulled	**Rope Z is slowly pulled**
A	**Z**	**X**
B	**Y**	**Y**
C	**X**	**Z**
D	**Y**	**Z**

(2)

1.8 Two small objects with masses **M** and **m** respectively exert a gravitational force **F** on each other when separated by a distance **d**.



What gravitational force would be exerted if the masses change to **3M** and **2m** respectively and the distance to **6d**?

A 36 F

B 6 F

C F

D $\frac{F}{6}$ (2)

1.9 Which ONE of the following pairs of atoms is most likely to form an ionic bond?

A C and F

B Na and F

C N and F

D O and F (2)

1.10 The molecular shape of a molecule with the formula $\mathbf{AX_4}$ is …

A linear or bent.

B trigonal planar.

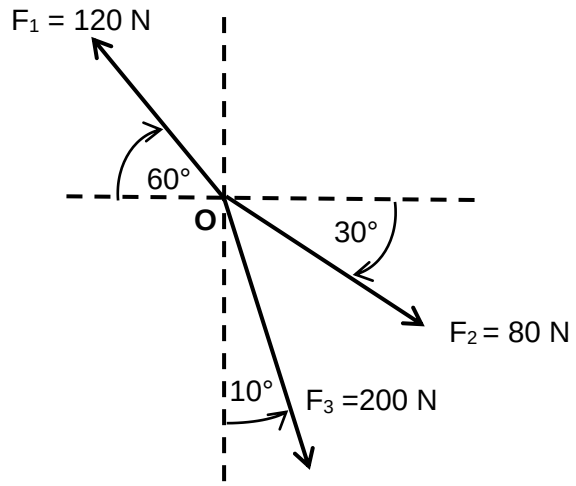
C tetrahedral.

D trigonal bipyramidal. (2)

[20]

QUESTION 2

Three forces, **F_1**, **F_2** and **F_3** act on point **O** as shown in the diagram below.



2.1 Define the term *resultant of forces*. (2)

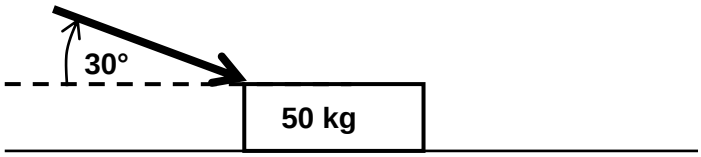
2.2 By means of an accurate scale drawing, determine the vertical component of **F_2**. Use a scale where 10 mm represents 10 N. (4)

2.3 Determine the magnitude of the y-component of **F_1**. (2)

2.4 Determine the magnitude and direction of the resultant force by CALCULATION if the magnitude of the x-component of the resultant force is 44,01 N and the magnitude of the y-component is - 33,04 N. (6)
[14]

QUESTION 3

A 50 kg cement block is pushed across a rough horizontal surface with a force of 250 N at an angle of 30° with the horizontal as shown in the diagram below. The block accelerates at 2 $m \cdot s^{-2}$.



3.1 Define the term *kinetic frictional force.* (2)

3.2 Draw a labelled FORCE DIAGRAM showing ALL the forces acting on the object. (4)

3.3 Calculate the magnitude of the:

3.3.1 Normal force (3)

3.3.2 Frictional force which acts on the cement block (4)

3.3.3 Coefficient of kinetic friction (4)

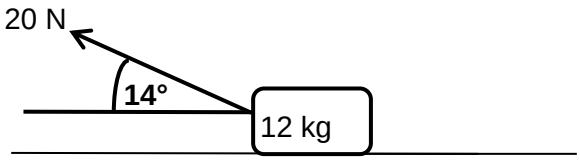
The pushing force above is now replaced with a pulling force of the same magnitude at an angle of 30° with the horizontal.

3.4 How will the ACCELERATION of the block change? Write down only INCREASES, DECREASES OR REMAINS THE SAME. (1)

[18]

QUESTION 4

A 12 kg cement block is pulled across a smooth horizontal surface with a force of 20 N at an angle of 14° with the horizontal as shown in the diagram below.

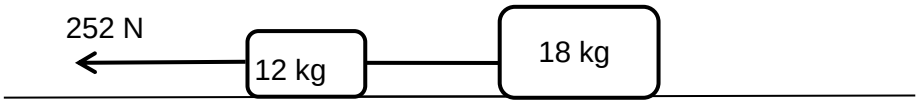


4.1.1 State *Newton's Second Law of Motion* in words. (3)

4.1.2 Draw a labelled free body diagram showing ALL the forces acting on 12 kg block. (3)

4.1.3 Calculate the magnitude of the acceleration of the cement block. The effects of friction may be ignored. (4)

Another block of mass 18 kg are joined to the 12 kg block by a light inextensible string, both on a ROUGH horizontal surface. The two blocks move under the influence of a force of 252 N as shown below. The coefficients of kinetic friction between the surface and the 12 kg and 18 kg blocks are 0,1 and 0,15 respectively.



4.2.1 Draw a labelled free body diagram showing ALL the forces acting on 12 kg block. (5)

4.2.2 Determine the tension **T**, in the string. (8)

[23]

QUESTION 5

The organisation Mars One wants to establish a permanent human settlement on Mars. You are involved in the design of a shuttle to transport people to the surface of Mars. The shuttle has a mass of 4000 kg on Earth. Mars has a mass of $6,42 \times 10^{23}$ kg and its radius is $3,4 \times 10^{6}$ m.

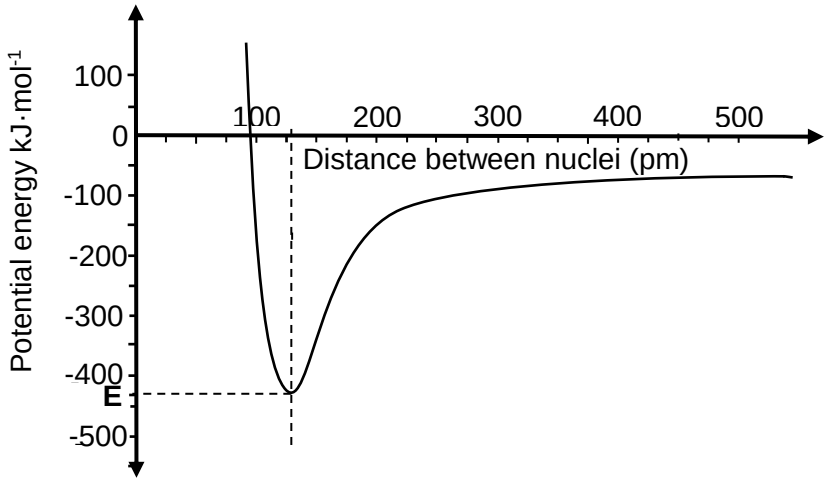
5.1 State *Newton's Law of Universal Gravitation* in words. (3)

5.2 Calculate the magnitude of the weight of the shuttle on the surface of Mars. (4)

[7]

QUESTION 6

The graph below shows the change in energy that takes place when a hydrogen (H) atom approaches a chlorine (Cℓ) atom.



6.1 Define the term *bond length*. (2)

6.2 From the graph, write down the:

6.2.1 Bond length, in pm, of the H-Cℓ bond. (2)

6.2.2 Energy, in $kJ \cdot mol^{-1}$, needed to break the H-Cℓ bond (2)

6.2.3 Name of the potential energy represented by **E** (1)

6.3 How will the bond energy of an H-I bond compare to that of the H-Cℓ bond? Write down EQUAL TO, SMALLER THAN or BIGGER THAN. Give a reason for the answer. (2)
[9]

QUESTION 7

Molecules such as CO_2 and H_2O are formed through covalent bonding.

7.1 Define the term *covalent bonding*. (2)

7.2 H_3O^+ is formed when H_2O forms a dative covalent bond with an H^+ ion.

7.2.1 Draw the Lewis diagram for H_3O^+. (2)

7.2.2 State TWO conditions for the formation of such a bond. (2)

7.3 The polarity of molecules depends on the DIFFERENCE IN ELECTRONEGATIVITY and the MOLECULAR SHAPE.

7.3.1 Define the term *electronegativity*. (2)

7.3.2 Calculate the difference in electronegativity between C and O in CO_2 (1)
[9]

GRAND TOTAL: 100

DATA FOR PHYSICAL SCIENCES GRADE 11 (PHYSICS)
CONTROL TEST - TERM 1

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 11 (FISIKA)
KONTROLETOETS - KWARTAAL 1

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

NAME / *NAAM*	SYMBOL / *SIMBOOL*	VALUE / *WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	9,8 $m \cdot s^{-2}$
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	3,0 x 10^8 $m \cdot s^{-1}$
Gravitational constant *Swaartekragkonstante*	G	6,67 x 10^{-11} $N \cdot m^2 \cdot kg^{-2}$
Coulomb's constant *Coulomb se konstante*	k	9,0 x 10^9 $N \cdot m^2 \cdot C^{-2}$
Charge on electron *Lading op elektron*	e	-1,6 x 10^{-19} C
Electron mass *Elektronmassa*	m_e	9,11 x 10^{-31} kg
Permittivity of free space *Permittiwiteit van vry ruimte*	ε_0	8,85 x 10^{-12} $F \cdot m^{-1}$

TABLE 2: FORMULAE / *TABEL 2: FORMULES*

MOTION / *BEWEGING*

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ or/*of* $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^{\,2} = v_i^{\,2} + 2a\Delta x$ or/*of* $v_f^{\,2} = v_i^{\,2} + 2a\Delta y$	$\Delta x = \left(\frac{v_f + v_i}{2}\right)\Delta t$ or/*of* $\Delta y = \left(\frac{v_f + v_i}{2}\right)\Delta t$

FORCE / *KRAG*

$F_{net} = ma$	$p = mv$
$F_{net}\Delta t = \Delta p$ $\Delta p = mv_f - mv_i$	$F = \frac{Gm_1m_2}{r^2}$ $\quad$ $g = \frac{GM}{r^2}$
$\mu_s = \frac{f_s(max)}{N}$ / $\mu_s = \frac{f_s(maks)}{N}$	$\mu_k = \frac{f_k}{N}$

WEIGHT AND MECHANICAL ENERGY / *GEWIG EN MEGANIESE ENERGIE*

$w = mg$ or/*of* $F_g = mg$	$U = mgh$ or/*of* $E_p = mgh$
$K = \frac{1}{2}mv^2$ or/*of* $E_k = \frac{1}{2}mv^2$	

DATA FOR PHYSICAL SCIENCES GRADE 11 (CHEMISTRY)
CONTROL TEST - TERM 1

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 11 (CHEMISTRY)
KONTROLETOETS - KWARTAAL 1

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

NAME / *NAAM*	SYMBOL / *SIMBOOL*	VALUE / *WAARDE*
Avogadro's constant *Avogadrokonstante*	N_A	$6{,}02 \times 10^{23}$ mol^{-1}
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	22,4 dm^3·mol^{-1}
Standard pressure *Standaarddruk*	p^θ	$1{,}013 \times 10^5$ Pa
Standard temperature *Standaardtemperatuur*	T^θ	273 K
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}$ C
Molar gas constant *Molêre gaskonstante*	R	8,31 J·K^{-1}·mol^{-1}

TABLE 2: FORMULAE / *TABEL 2: FORMULES*

$\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$	$pV = nRT$
$n = \frac{m}{M}$	$c = \frac{n}{V}$
$c = \frac{m}{MV}$	$\frac{n_a}{n_b} = \frac{c_aV_a}{c_bV_b}$ / $\frac{n_s}{n_b} = \frac{c_sV_s}{c_bV_b}$

TABLE 3: THE PERIODIC TABLE OF ELEMENTS
TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE

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)
2,1 H 1																	2 He 4
1,0 Li 7	1,5 Be 9											2,0 B 11	2,5 C 12	3,0 N 14	3,5 O 16	4,0 F 19	10 Ne 20
0,9 Na 23	1,2 Mg 24											1,5 Aℓ 27	1,8 Si 28	2,1 P 31	2,5 S 32	3,0 Cℓ 35,5	18 Ar 40
0,8 K 39	1,0 Ca 40	1,3 Sc 45	1,5 Ti 48	1,6 V 51	1,6 Cr 52	1,5 Mn 55	1,8 Fe 56	1,8 Co 59	1,8 Ni 59	1,9 Cu 63,5	1,6 Zn 65	1,6 Ga 70	1,8 Ge 73	2,0 As 75	2,4 Se 79	2,8 Br 80	36 Kr 84
0,8 Rb 86	1,0 Sr 88	1,2 Y 89	1,4 Zr 91	41 Nb 92	1,8 Mo 96	1,9 Tc	2,2 Ru 101	2,2 Rh 103	2,2 Pd 106	1,9 Ag 108	1,7 Cd 112	1,7 In 115	1,8 Sn 119	1,9 Sb 122	2,1 Te 128	2,5 I 127	54 Xe 131
0,7 Cs 133	0,9 Ba 137	57 La 139	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	1,8 Tℓ 204	1,8 Pb 207	1,9 Bi 209	2,0 Po	2,5 At	86 Rn
0,7 Fr 87	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