education

Department of Education
FREE STATE PROVINCE

CONTROL TEST

GRADE 11

PHYSICAL SCIENCES

MARCH 2019

MARKS: 100

TIME: 2 HOURS

This paper consists of nine pages and two information sheets.

INSTRUCTIONS AND INFORMATION

1. Write your name and other information in the appropriate spaces on the ANSWER BOOK.

2. This question paper consists of EIGHT questions. Answer ALL 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 sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.

6. You may use a non-programmable pocket calculator.

7. You may use appropriate mathematical instruments.

8. You are advised to use the attached DATA SHEETS.

9. Show ALL formulae and substitutions in ALL calculations.

10. Round off your FINAL numerical answers to a minimum of TWO decimal places where applicable.

11. Give brief motivations, discussions, et cetera where required.

12. 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. Choose the answer and write down only the letter A, B, C or D next to the question number (1.1–1.10) in your ANSWER BOOK.

1.1 Which one of the following is an example of a vector quantity?

A Temperature

B Velocity

C Volume

D Mass (2)

1.2 Two vectors are considered to be equal if they have the same magnitude ...

A but different directions.

B and positive directions.

C and the same direction.

D and negative directions. (2)

1.3 Inertia is the tendency of an object to …

A maintain its mass.

B continue in a state of non-uniform motion.

C remain at rest or in a state of uniform motion.

D maintain its velocity when a non-zero net force is acting on it. (2)

1.4 The acceleration due to gravity on the earth is greater than on the moon. Which one of the following statements is correct?

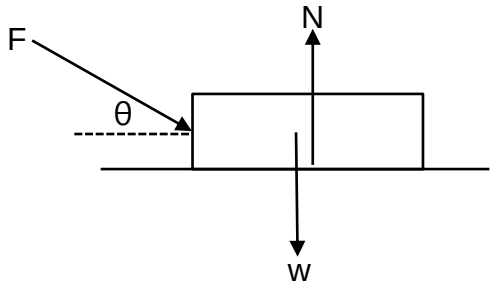
A The weight of an object on the earth is less than on the moon.

B The mass of an object on the earth is greater than on the moon.

C The mass of an object on the earth is the same as on the moon.

D The weight of an object on the earth is the same as on the moon. (2)

1.5 The force diagram below shows the forces acting on a box.



Which one of the following equations for the MAGNITUDE of the normal force *N* is correct?

A $N = w + F\cos\theta$

B $N = w + F\sin\theta$

C $N = w - F\cos\theta$

D $N = w - F\sin\theta$ (2)

1.6 Two forces with magnitudes of 11 N and 5 N act simultaneously on an object. Which one of the following CANNOT be the resultant of the two forces?

A 6 N

B 7 N

C 9 N

D 18 N (2)

1.7 A ball is dropped onto a hard floor and bounces off the floor to the same height from which it was dropped. Which one of the following laws best explains why the ball experiences an upward force?

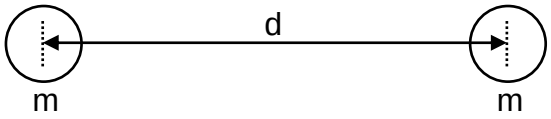
A Newton's first law of motion

B Newton's third law of motion

C Newton's second law of motion

D Newton's law of universal gravitation (2)

1.8 Two objects, each with a mass *m*, are placed a distance *d* apart as shown below. The gravitational force of the one on the other is *F*.



The magnitude of the force increases to 4*F* when the ...

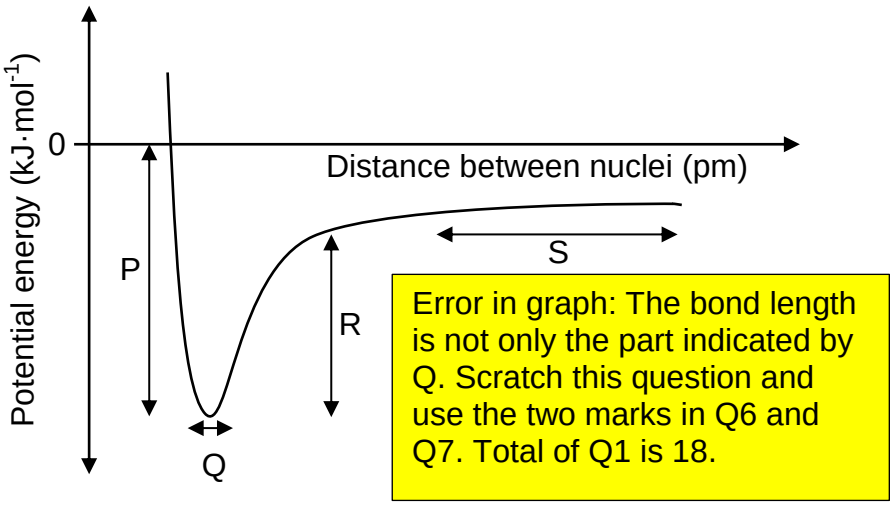
A mass of each object is increased to 4*m* with *d* constant.

B mass of each object is decreased to ¼*m* with *d* constant.

C distance between the objects is decreased to ¼*d* with *m* constant.

D distance between the objects is decreased to ½*d* with *m* constant. (2)

1.9 The graph below shows the change in energy that takes place when two hydrogen atoms (H) approach each other.



Error in graph: The bond length is not only the part indicated by Q. Scratch this question and use the two marks in Q6 and Q7. Total of Q1 is 18.

Which one of the following closely represents the bond length of hydrogen?

A P

B Q

C R

D S (2)

1.10 Which one of the following fluorides is the most ionic salt?

A NaF

B RbF

C BeF_2

D MgF_2 (2)
[20]

QUESTION 2

2.1 A lady drives 130 km north and then 80 km east.

2.1.1 Draw a LABELLED sketch, NOT TO SCALE, of the two displacements using the head-to-tail method. Indicate the symbol for the resultant displacement on the sketch. (3)

Calculate the:

2.1.2 Total distance driven by the lady. (1)

2.1.3 Resultant displacement of the lady (4)

2.2 A postman leaves the post office and drives 22 km in the direction N60°E. Calculate the COMPONENT of his displacement in the easterly direction. (2)

2.3 An athlete runs a distance of 100 m due east in a straight line. He turns around and runs back a distance of 30 m due west in a straight line. Calculate the athlete's resultant displacement. (2)
[12]

QUESTION 3

A 400 g block, with an INITIAL speed of 0,8 $m \cdot s^{-1}$, slides to the right along a horizontal table against a friction force of 0,7 N.

3.1 State *Newton's first law of motion* in words. (2)

3.2 Write down the magnitude and direction of the net force acting on the block. (2)

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

3.4 Define the term *kinetic friction.* (2)

3.5 Calculate the coefficient of friction between the block and the table. (3)

3.6 How will the magnitude of the kinetic frictional force change under the following conditions? Write only INCREASE, DECREASE or REMAINS THE SAME.

3.6.1 The 400 g block is replaced with a 450 g block. (1)

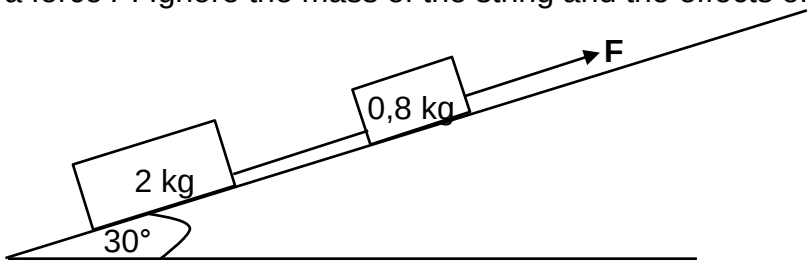
3.6.2 The 400 g block is placed on its narrow side. (1)

3.6.3 The 400 g block is placed on a surface with a smaller coefficient of kinetic friction. (1)

[15]

QUESTION 4

Two objects with masses of 2 kg and 0,8 kg are connected by an inextensible string. They are pulled up an incline, which makes an angle of 30° with the horizontal, by a force *F*. Ignore the mass of the string and the effects of friction.



Calculate the:

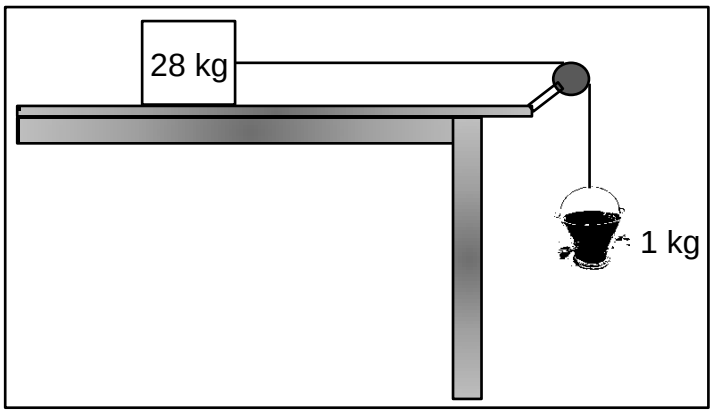
4.1 Tension in the string if the speed of the objects increases at 1,5 $m \cdot s^{-2}$. (4)

4.2 Magnitude of *F* if the objects move up the incline at CONSTANT VELOCITY. (5)

[9]

QUESTION 5

A stationary 28 kg block is connected to an EMPTY 1 kg bucket by a light, inextensible cord running over a frictionless pulley. The coefficient of static friction between the table and the block is 0,45 and the coefficient of kinetic friction between the table and the block is 0,32. Sand is gradually added to the bucket until the system is **AT THE POINT of moving**.



5.1 State *Newton's second law of motion* in words. (2)

5.2 Draw a labelled free-body diagram of all the forces acting on the 28 kg block. (4)

5.3 Calculate:

5.3.1 The MINIMUM force required TO MOVE the 28 kg block. (4)

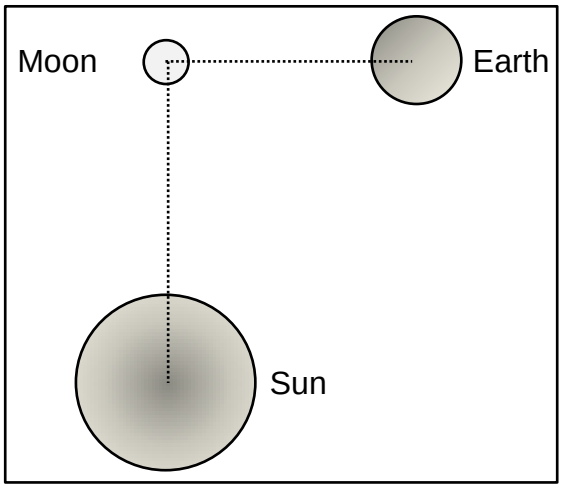
5.3.2 The MINIMUM mass of SAND needed in the bucket in order to move the 28 kg block. (4)

5.3.3 The acceleration of the system if 12,6 kg of sand is in the bucket. (5)

[19]

QUESTION 6

The earth, the moon and the sun are arranged as shown. The masses of these bodies are 5,98 x 10^{24} kg, 7,35 x 10^{22} kg and 1,99 x 10^{30} kg respectively. The distance between the centres of the earth and the moon is 3,84 x 10^{8} m and the distance between the centres of the moon and the sun is 1,5 x 10^{11} m.



6.1 State *Newton's law of universal gravitation* in words. (2)

6.2 Calculate the magnitude of the NET force on THE MOON due to the gravitational attraction of both the earth and the sun. Assume they are at right angles to each other. Changed to eight marks. (7)

[9]

QUESTION 7

The table shows compounds **A** to **E**. Use the table to answer the questions that follow.

COMPOUND	CHEMICAL FORMULA
A	$MgBr_2$
B	BF_3
C	$NaC\ell$
D	H_2S
E	SF_6

7.1 Define the term *chemical bond*. (2)

7.2 What TYPE of bond takes place in **C**? Changed to two marks. (1)

7.3 Consider compound **D**.

7.3.1 How many valence electrons does one sulphur atom have? Changed to two marks. (1)

7.3.2 How many lone pairs does one sulphur atom have in the compound H_2S? Changed to two marks. (1)

7.4 Draw the Lewis structure for **A**. (2)

Q7.4: Due to conflicting information (at the level of learners; exam guidelines say 2,1, but other sources say something else) we rather scratch this question. The two marks are added to Q6 and Q7.

7.5 Use the VSEPR theory to determine the shape of the following:

7.5.1 **B** (2)

7.5.2 **D** (2)

7.5.3 **E** (1)

[12]

QUESTION 8

The table shows the bond energy of two compounds in $kJ \cdot mol^{-1}$. Use the table to answer the questions that follow.

COMPOUND	BOND ENERGY ($kJ \cdot mol^{-1}$)
H-F	570
H-Cℓ	432

8.1 Define the term *bond energy.* (2)

8.2 The bond energy of HF is more than that of HCℓ. Explain this difference by referring to bond length and energy. (2)

[4]

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 $m \cdot s^{-2}$
Gravitational constant *Swaartekragkonstante*	G	6,67 x 10^{-11} $N \cdot m^2 \cdot kg^{-2}$
Radius of Earth *Straal van Aarde*	R_E	6,38 x 10^6 m
Coulomb's constant *Coulomb se konstante*	K	9,0 x 10^9 $N \cdot m^2 \cdot C^{-2}$
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	3,0 x 10^8 $m \cdot s^{-1}$
Charge on electron *Lading op elektron*	e	-1,6 x 10^{-19} C
Electron mass *Elektronmassa*	m_e	9,11 x 10^{-31} kg
Mass of the earth *Massa van die Aarde*	M	5,98 x 10^{24} kg

TABLE 2: FORMULAE / *TABEL 2: FORMULES*

MOTION / *BEWEGING*

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ 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*

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

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* $E_k = \frac{1}{2}mv^2$	

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 1 H 1
1,0 3 Li 7	1,5 4 Be 9											2.0 5 B 11	2.5 6 C 12	3.0 7 N 14	3.5 8 O 16	4.0 9 F 19	10 Ne 20
0,9 11 Na 23	1,2 12 Mg 24											1.5 13 Aℓ 27	1.8 14 Si 28	2.1 15 P 31	2.5 16 S 32	3.0 17 Cℓ 35,5	18 Ar 40
0,8 19 K 39	1,0 20 Ca 40	1,3 21 Sc 45	1.5 22 Ti 48	1.6 23 V 51	1,6 24 Cr 52	1.5 25 Mn 55	1.8 26 Fe 56	1.8 27 Co 59	1.8 28 Ni 59	1.9 29 Cu 63,5	1.6 30 Zn 65	1.6 31 Ga 70	1.8 32 Ge 73	2.0 33 As 75	2.4 34 Se 79	2.8 35 Br 80	36 Kr 84
0,8 37 Rb 86	1,0 38 Sr 88	1,2 39 Y 89	1.4 40 Zr 91	41 Nb 92	1,8 42 Mo 96	1.9 43 Tc	2.2 44 Ru 101	2.2 45 Rh 103	2.2 46 Pd 106	1.9 47 Ag 108	1.7 48 Cd 112	1.7 49 In 115	1.8 50 Sn 119	1.9 51 Sb 122	2.1 52 Te 128	2.5 53 I 127	54 Xe 131
0,7 55 Cs 133	0,9 56 Ba 137	57 La 139	1,6 72 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 81 Tℓ 204	1.8 82 Pb 207	1.9 83 Bi 209	2.0 84 Po	2.5 85 At	86 Rn
0,7 87 Fr	0,9 88 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

KEY/*SLEUTEL*