education

Department: Education
GAUTENG PROVINCE

MAMELODI EAST CLUSTER

CONTROL TEST 1 2016

GRADE 11

PHYSICAL SCIENCES

MARKS: 75

DATE: 8 March 2016

TIME: 1 Hour 30 Minutes

This question paper consists of 10 pages including data sheets.

INSTRUCTIONS AND INFORMATION

1. Write your NAME and SURNAME in the appropriate spaces on the ANSWER BOOK provided.
2. Answer ALL the questions.
3. This question paper consists of TWO sections:

   PAPER 1 (PHYSICS)
   PAPER 2 (CHEMISTRY)

4. You may use a non-programmable calculator.
5. You may use appropriate mathematical instruments.
6. Number the answers correctly according to the numbering system used in this question paper.
7. Data sheets and a periodic table are attached for your use.
8. Give brief motivations, discussions, et cetera where required.

PAPER 1: PHYSICS

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 correct answer and write the letter (A – D) next to the question number (1.1 – 1.4)

1.1 The frictional force acting on a sliding object is …

A dependent of the apparent area of contact.

B proportional to the normal force.

C dependent of the velocity of object.

D independent of the type of surface. (2)

1.2 When a spaceship moves at constant velocity, it means that the resultant force acting on the body is zero. This phenomenon is best explained by

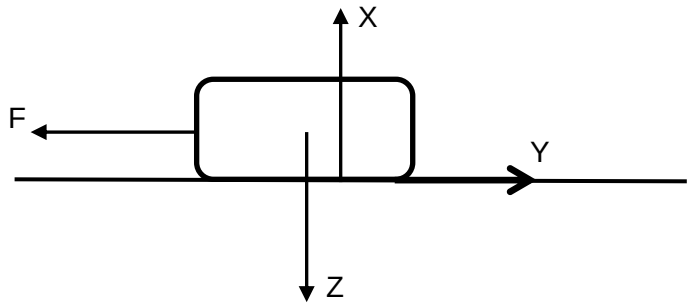
A Newton's First Law.

B Newton's Second Law.

C Newton's Third Law.

D Newton's Universal Gravitational Law. (2)

1.3 A learner pulls a block at a CONSTANT SPEED over a rough horizontal surface with a force F. The force diagram below shows all the forces acting on the block.



Which ONE of the following relationships between the magnitudes of the forces **F**, **X**, **Y** and **Z** is true?

A F > Y and X = Z

B F > Y and X < Z

C F = Y and X = Z

D F = Y and X < Z (2)

1.4 The gravitational force between the earth and a communication satellite in orbit around the earth is F.

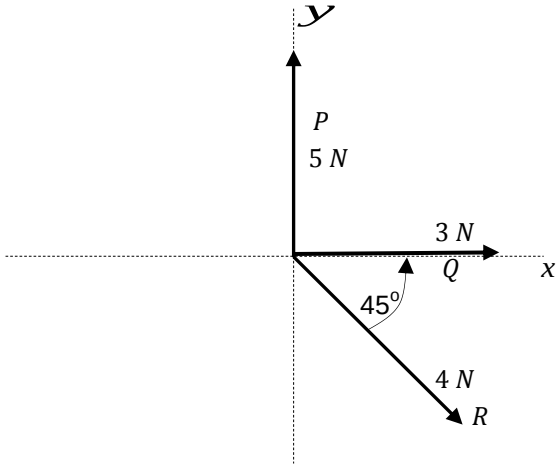
If the distance between the satellite and the centre of the earth is halved, which ONE of the following gives the new force which the earth exerts on the satellite?

A. $\frac{F}{4}$ B. $\frac{F}{2}$ C. $2F$ D. $4F$ (2)

[8]

QUESTION 2

The diagram below shows three forces P, Q and R of 5 N, 3 N and 4 N respectively acting on an object in the same Cartesian plane.



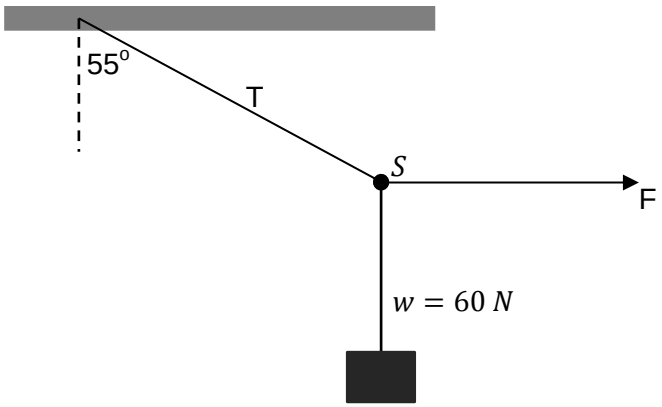
(2)

2.1 Give a reason why the three forces are classified as vectors.

2.2 Determine the magnitude and direction of the resultant force, either by CALCULATION or by ACCURATE CONSTRUCTION AND MEASUREMENT. Use scale 10 mm : 1N

(7)

A box of weight (w) 60 N hangs on a ceiling as shown in the sketch below. A horizontal force F acts horizontally to the right through knot **S**. The knot **S** is in equilibrium.



2.3 Explain what is meant by the knot S is in equilibrium. (2)

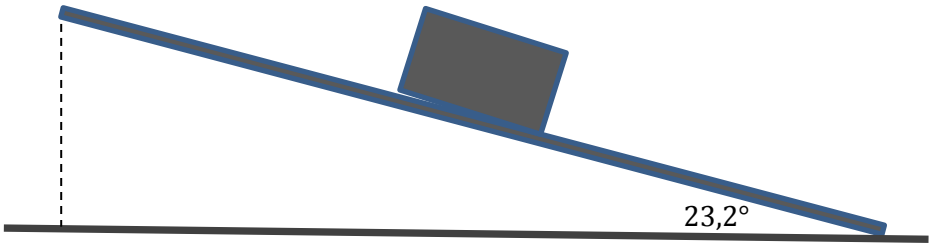
2.4 Draw the triangle of the three forces T, F and w. Clearly label the forces and all the angles. (3)

2.5 Calculate the magnitudes of the force F and the tension T. (4)

[18]

QUESTION 3

A crate of mass 95 kg crate lies on a plank inclined at 23,2^{o}. At this angle the crate is just about to move down the incline. Refer to the diagram below.



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

3.2 Sketch a free body diagram showing the force(s) acting on the crate at its current position. (3)

3.3 CALCULATE:

3.3.1 The magnitude of the static frictional force (3)

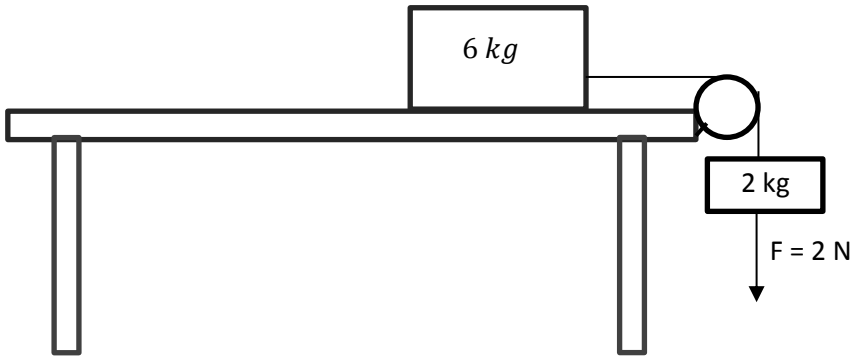
3..3.2 The coefficient of static friction between the plank and the block. (5)

3.4 The plank is now tilted at an angle of 20.0°. State whether the static friction force will be LESS THAN; EQUAL TO; OR GREATER THAN Question 3.3.1 above. (1)

[14]

QUESTION 4

A 6 kg block on a horizontal rough surface is joined to a 2 kg block by a light, inelastic string running over a frictionless pulley. The frictional force between the 6 kg block and the table is 11,76 N. A downwards force F of 2 N is applied to the 2 kg block as indicated in the diagram below.



4.1 State Newton's Second Law of motion in words. (2)

4.2 Identify ONE action-reaction force pair acting on the 6 kg block. (2)

4.3 CALCULATE:

4.3.1 The magnitude of the acceleration of the 6 kg block. (5)

4.3.2 The magnitude of the tension (T) in the string connecting the two blocks (2)

4.4 The rough surface is replaced by a smooth frictionless surface. How will this change affect the answer in QUESTION 4.4.1? Write only INCREASES, DECREASES or REMAINS THE SAME. (1)

4.5 A small hypothetical planet X has a mass of $6,5 \times 10^{20}$ kg and a radius of $5,5 \times 10^{5}$ m.

Calculate the gravitational force (weight) that planet X exerts on a 90 kg rock on this planet's surface. (4)

[16]

PAPER 2: CHEMISTRY

QUESTION 5: 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 the letter (A – D) next to the question number (5.1 – 5.2).

5.1 Which ONE of the following chlorides will most likely have the most ionic character?

A LiCl

B CsCl

C $BeCl_2$

D $CaCl_2$ (2)

5.2 The molecular shape of a molecule with the formula AB_2 is either …

A linear or bent.

B linear or trigonal planar

C linear or tetrahedral

D linear or trigonal bipyramidal (2)

QUESTION 6

6.1 When methane gas (CH_4) reacts with oxygen gas, carbon dioxide gas and water vapour are formed as shown by the following unbalanced reaction:

$$\mathbf{CH_{4\,(g)} + O_{2\,(g)} \rightarrow CO_{2\,(g)} + H_2O_{\,(g)}}$$

Copy the following table onto your answer sheet and complete:

Molecule	**Lewis structure**	**Shape of the molecule**	**Polarity of the bonds**	**Polarity of the molecule**
$\mathbf{CO_{2\,(g)}}$				
$\mathbf{H_2O_{\,(g)}}$				

(10)

6.2 Ammonia (NH_3) dissolves readily in water to form ammonium ions, NH_4^+ (aq). An ammonium ion is formed when an ammonia molecule shares a lone pair of electrons with a hydrogen ion.

6.2.1 Name the type of bond formed between an ammonia molecule and a hydrogen ion. (1)

6.2.2 Represent the formation of an ammonium ion with the aid of Lewis structures. (4)

GRAND TOTAL :75

DATA FOR PHYSICAL SCIENCES

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	$9{,}8\ m\cdot s^{-2}$
Universal gravitational constant	G	$6{,}67 \times 10^{-11}\ N\cdot m^2\cdot kg^{-2}$
Electron mass	m_e	$9{,}11 \times 10^{-31}\ kg$
Mass of Earth	M_E	$5{,}98 \times 10^{24}\ kg$
Radius of Earth	R_E	$6{,}38 \times 10^{6}\ m$

TABLE 2: FORMULAE

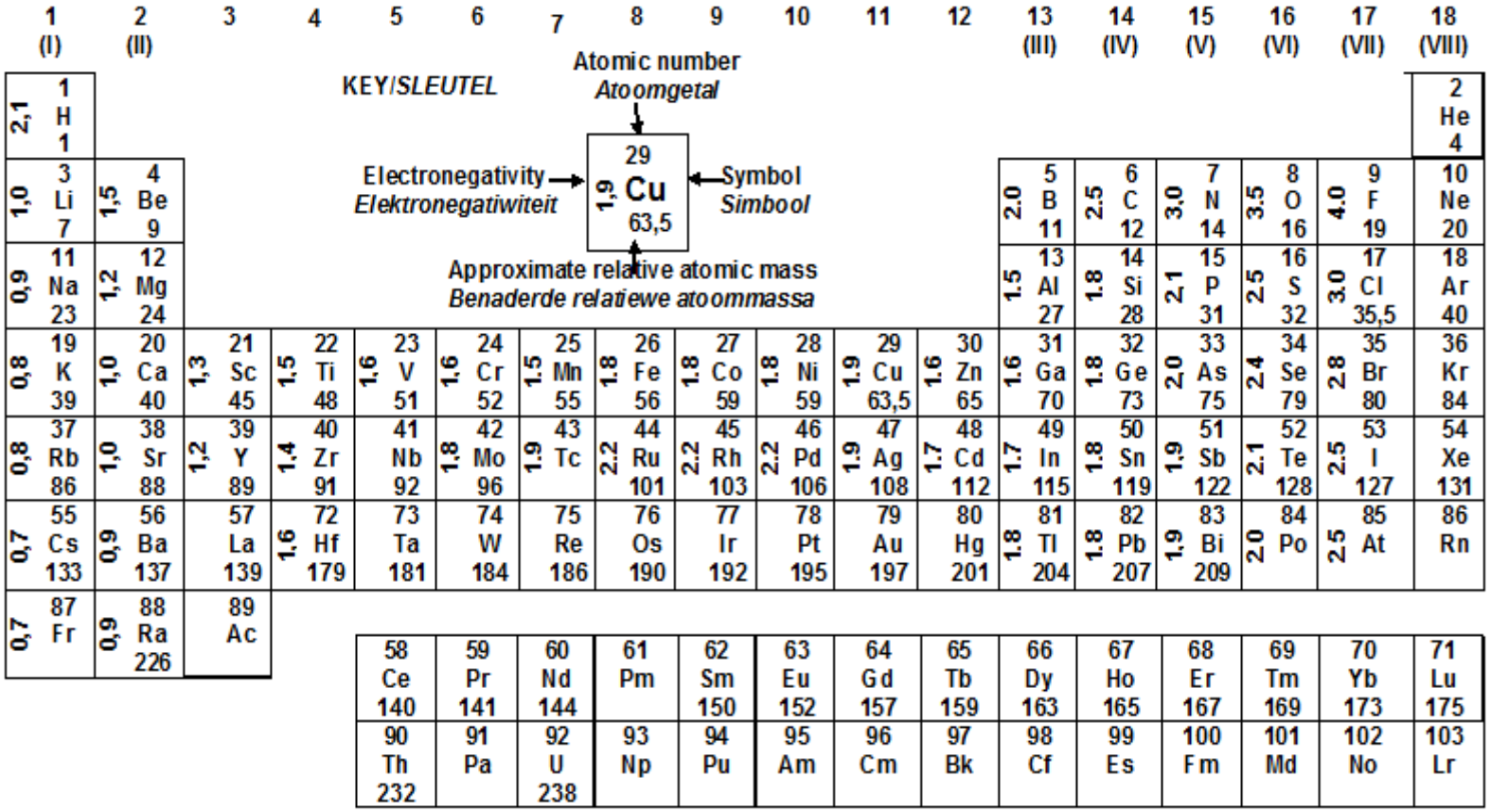
MOTION

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

FORCE

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

TABLE 3: THE PERIODIC TABLE OF ELEMENTS



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																	2 He 4
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