NATIONAL SENIOR CERTIFICATE

GRADE 11

PHYSICAL SCIENCES:
TERM TEST 1
14 MARCH 2016

MARKS: 100

NAME OF SCHOOL: ……

This question paper consists of 8 pages, including the cover page

INSTRUCTIONS AND INFORMATION

- Answer ALL the questions in the ANSWER BOOK.
- Give brief motivations, discussions, et cetera where required.

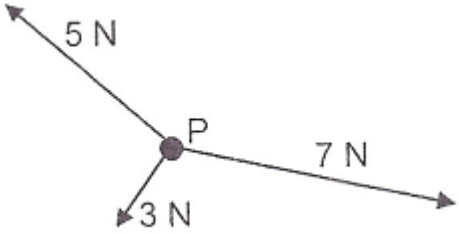
QUESTION 1: (MULTIPLE CHOICE)

Four possible answers are provided for each question. Each question has ONLY one correct answer. Choose the correct answer and write down the corresponding letter (A- D) on the answer book.

1.1 Two forces of magnitude 3N and 4N respectively act on a body. The maximum possible magnitude of the resultant of these two forces is:

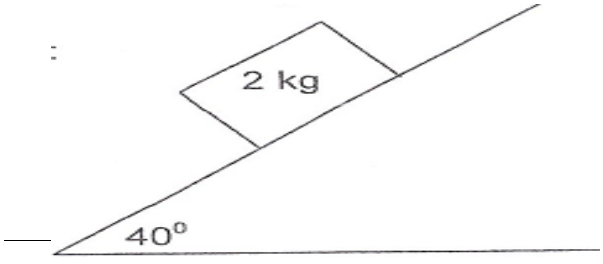
A. 7 N
B. 12 N
C. 5 N
D. 1 N (2)

1.2 The three forces shown, keep point P in equilibrium. If the 3 N force is removed , the magnitude of the resultant force on P will be:



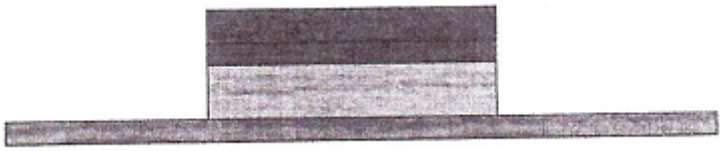
A. 12 N
B. 7 N
C. 5 N
D. 3 N (2)

1.3 A 2 kg block rests on a slope of angle 40^0 as shown in the diagram



The magnitude of the friction force on the block is :
A. 2.sin 40^0
B. 2. Cos 40^0
C. 19,6.sin 40^0
D. 19,6. Cos 40^0 (2)

1.4. A 12 kg piece of wood is placed on the top of another piece of wood. There is 35 N of static friction between them. The coefficient of static friction between the two pieces of wood is:



A. 3
B. 0,3
C. 4116
D. 3,36 (2)

1.5. A boy tries to jump from a rowing-boat to the river bank. Which of the following statements is true?

A. The force exerted by the boy on the boat, is greater than but opposite to the force exerted by the boat on the boy.
B. The force exerted by the boy on the boat, is smaller than but opposite to the force exerted by the boat on the boy.
C. The force exerted by the boy on the boat, is equal but opposite to the force exerted by the boat on the boy.
D. The acceleration of the boy will always be equal and opposite to that of the boat. (2)

1.6. A bond that involves donation of electrons into an empty orbital is a/an.
A. Ironic bond
B. Covalent bond
C. Dative covalent bond
D. Metallic bond (2)

1.7. Which ONE of the following species contains a dative covalent bond?

A. NH_3
B. CH_4
C. H_3O^+
D. NF_3 (2)

1.8. Which ONE of the following compounds has dipole-dipole forces between their molecules?

A. CO_2
B. $HC\ell$
C. $C\ell_2$
D. CCl_4 (2)

1.9. Consider the following bonds. Which one will be the most polar?

A. HF
B. NO
C. HCL
D. CF_4 (2)

1.10. Consider the Lewis structure of a compound below:

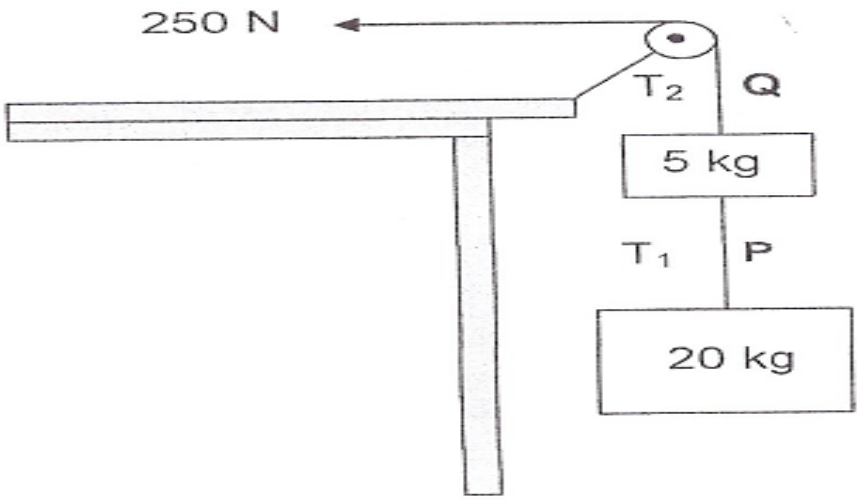
Which of the following is CORRECT?

	Name of element X	Name of element Y	Molecular shape of compound
A	Chlorine	Oxygen	Angular
B	Oxygen	Chlorine	Linear
C	Chlorine	Sulphur	Linear
D	Sulphur	Chlorine	Angular

(2)
[20]

QUESTION 2 (START ON A NEW PAGE)

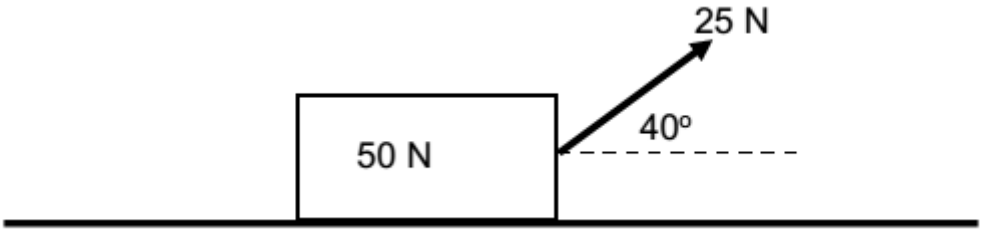
Two blocks of masses 20 kg and 5 kg respectively are connected by a light inextensible string. **P**. A second light inextensible string, **Q**, attached to the 5 kg block, runs over a light frictionless pulley. A constant horizontal force of 250 N pulls the second string as shown in the diagram below. The magnitudes of the tensions in **P** and **Q** are T_1 and T_2 respectively. Ignore the effects of air friction.



2.1. State Newton's Second Law of Motion in words. (2)
2.2. Draw a labelled free-body diagram indicating ALL the forces acting on the **5 kg block.** (3)
2.3. Calculate the magnitude of the tension T_1 in string **P**. (6)
2.4. When the 250 N force is replaced by a sharp pull on the string, one of the two strings break. Which ONE of the two strings, P or Q, will break? (1)
[12]

QUESTION 3 (START ON A NEW PAGE)

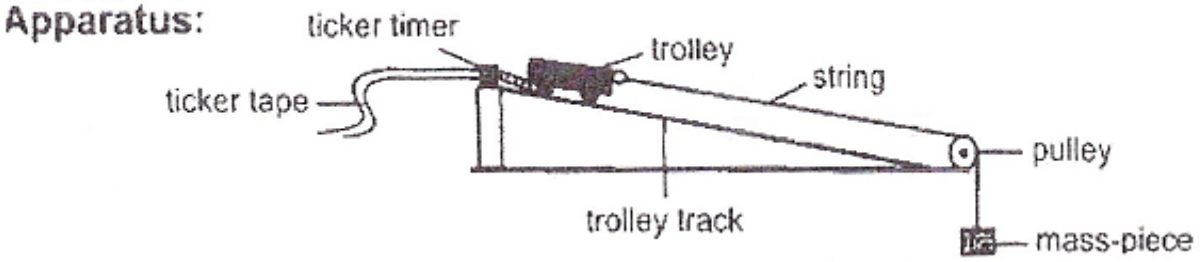
A 50N box is being pulled along a rough concrete floor at constant speed by a constant 25N force applied as shown in the diagram below.



3.1. Draw a free body diagram showing the forces that act on the object. (4)
3.2. Calculate the:
3.2.1. Magnitude of the frictional force that opposes the motion of the box. (3)
3.2.2. Normal force acting on the box (2)
3.2.3. Coefficient of kinetic friction (μk) between the box and the floor. (3)
[12]

QUESTION 4 (START ON A NEW PAGE)

4.1. A group of learners did the following practical work to explore the relationship between force (F), mass (m) and acceleration (a).



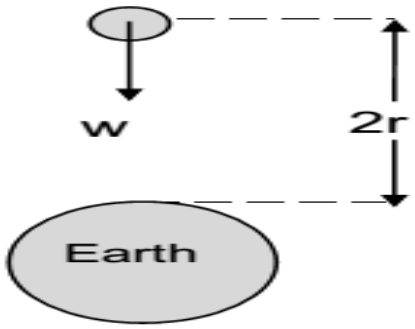
Their results were captured in the table below:

Readings	Force(number of mass pieces)	Acceleration($m.s^{-2}$)	F/a
1	1	0.5	2
2	2	1	2
3	3	1.5	2
4	4	2	2

4.1.1. Explain why the trolley track was raised at an angle rather than using a flat trolley track. (2)
4.1.2. If we were to plot a graph of acceleration versus time, how would you describe such a graph? (2)
4.1.3. Name and state the Law that this experiment was trying to verify. (3)
[7]

QUESTION 5 (START ON A NEW PAGE)

An object has a mass of 100 kg on the surface of the Earth. It is now moved, away from the surface, to a position which is two times the radius of the earth as shown below.



5.1. State the Law of Universal gravitation. (3)
5.2. Calculate how much this object will weigh at the new location. (4)
5.3. Determine by calculation, what the weight will be on a planet which has a mass three times that of the earth and a radius half that of the earth? (3)

[10]

QUESTION 6 (START ON A NEW PAGE)

6.1. Use the periodic table to write symbols for the following species:
6.1.1. 19 protons, 20 neutrons, 18 electrons. (1)
6.1.2. 8 protons, 8 neutrons, 10 electrons. (1)
6.2. What is valence electron? (2)
6.3. Give the electron valency of Mg (1)
6.4. What is electronegativity? (2)
6.5. Draw Lewis diagram for the water molecule. (2)
6.6. Use VSEPR theory to predict the shape of BF_3 and suggest bond angles: (2)

[11]

QUESTION 7 (START ON A NEW PAGE)

In the table below the melting points and boiling points of different substances at standard pressure are given. Use the information to answer 7.1 to 7.5

SUBSTANCE	MELTING POINT	BOILING POIT (^{0}C)
He	-272	-269
H_2O	0	100
H_2S	-82	-60
HI	-51	-35
CO_2	Sublimes at -72	-

7.1. Define **boiling point.** (2)
7.2. Use the information in the table and state and explain in which one of the substances have the weakest intermolecular force exist in the solid-phase? (3)

7.3. State whether the chemical bonds within the hydrogen disulphide molecule are polar or non-polar covalent bonding. Support this statement by performing a calculation using the table of electro-negativities. (4)
7.4. Which one of the following substances is a liquid at -40^0C? (1)
7.5. CO_2 sublimes at -72^0C. What is meant by the term sublimation? (2)
[12]

QUESTION 8

8.1. Most of the substances we encounter in our daily lives occur as electrically neutral combinations of atoms called molecules. Carbon dioxide, ammonia and methane are some examples of such substances.

8.1.1. Give the formula and Lewis structure for each of the substances mentioned above (6)
8.1.2. According to the VSEPR theory, what shape will EACH of the above structures have? (3)
8.1.3. Is the ammonia molecule polar or non-polar? Give an explanation for your answer. (3)
8.1.4. Which one of the three substances (carbon dioxide, ammonia or methane) will have the strongest intermolecular force? (1)
8.1.5. Name the force referred to in QUESTION 8.1.4 above. (2)

8.2. Ammonium nitrate is added to a beaker containing water.
The salt dissociates in the water and the temperature of the solution decreases.
8.2.1. Is this an example of an endothermic or exothermic reaction? (1)
[16]

TOTAL MARKS: 100

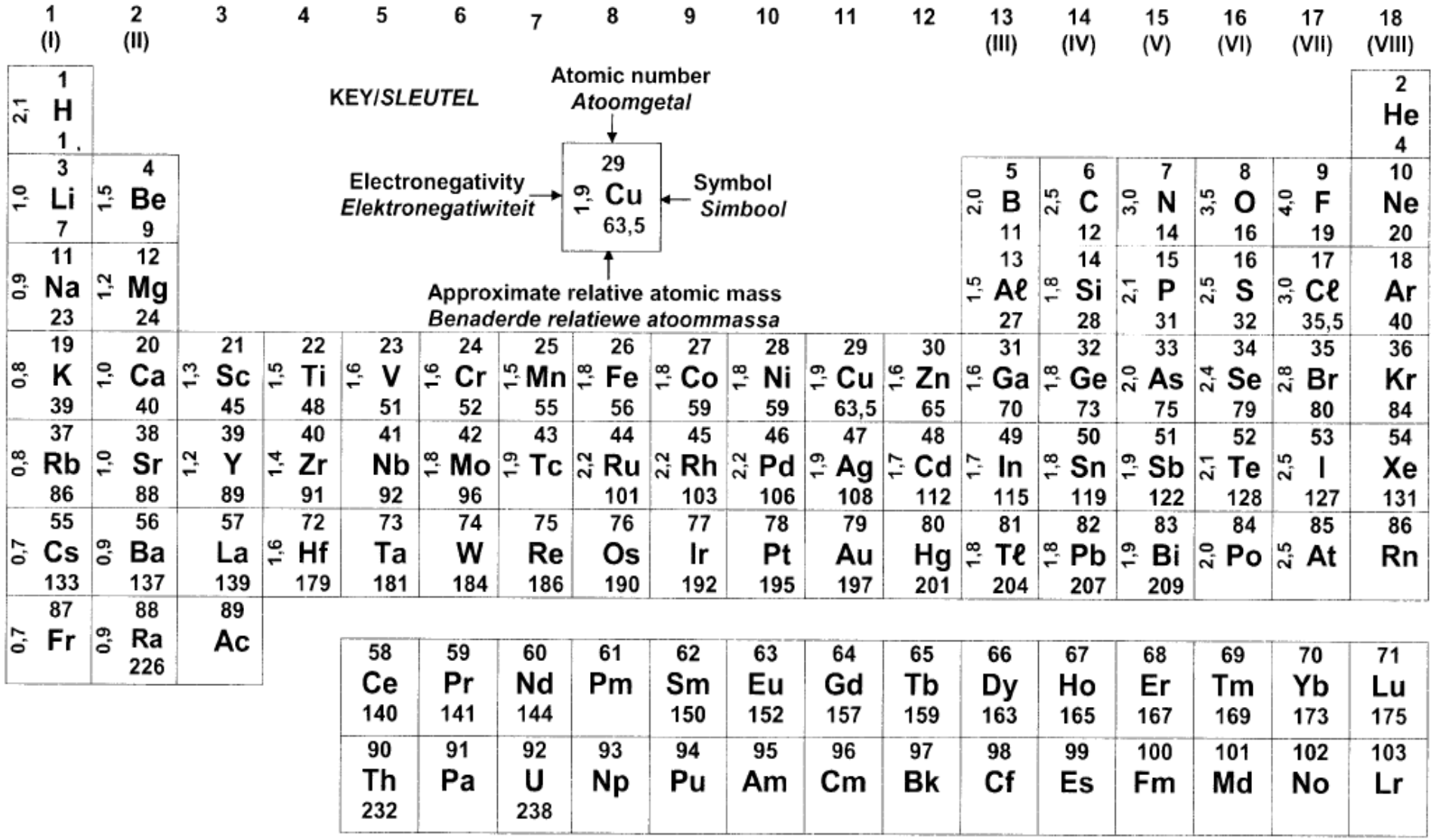
Table 1

FORCE/*KRAG*

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

WEIGHT AND MECHANICAL ENERGY/*GEWIG EN MEGANIESE ENERGIE*

$F_g = mg$	$U = E_p = mgh$
$K = E_k = \frac{1}{2}mv^2$	


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)
KEY/SLEUTEL
Atomic number
Atoomgetal
Electronegativity
Elektronegatiwiteit
Symbol
Simbool
29
1,9
Cu
63,5
Approximate relative atomic mass
Benaderde relatiewe atoommassa
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
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
La 139
1,6 Hf 179
Ta 181
W 184
Re 186
Os 190
Ir 192
Pt 195
Au 197
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
0,9 Ra 226
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