PHYSICAL SCIENCES

NATIONAL SENIOR CERTIFICATE

GRADE 10
FORMAL TEST NO 1
20 MARCH 2015

MARKS : 100 **DURATION 1H30min**

INSTRUCTIONS

1. Answer all questions
2. Non-programmable calculators may be used.
3. This question paper has a total mark of 100
4. number the questions correctly according to the numbering system used in the question paper
5. Appropriate mathematical instruments may be used.
6. You must be provided with information sheet.

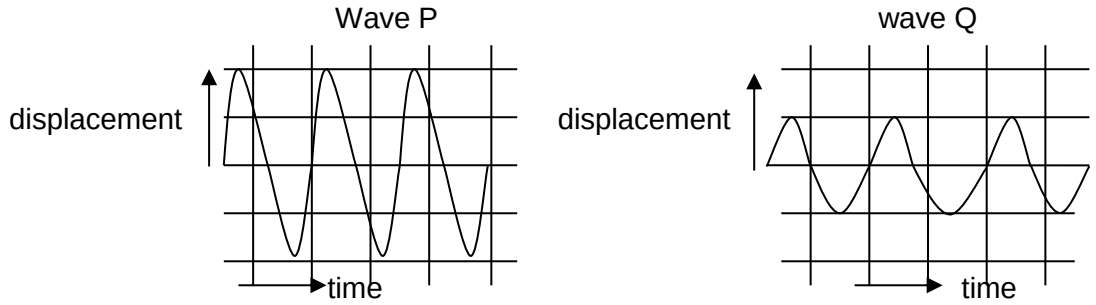
This question paper consists of SIX pages including this one

QUESTION 1

MULTIPLE CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only one correct answer. Write the letter (A – D) of the correct answer next to the question number (1.1 – 1.6)

1.1 The diagram below represents two different sound waves:



How do the frequency and pitch of P compare to the frequency and pitch of Q

	Frequency of P	Pitch of P
A	greater than Q	higher than Q
B	greater than Q	same as Q
C	same as Q	higher than Q
D	same as Q	same as Q

1.2 Two photons of electromagnetic radiation travelling in vacuum have different energies because they differ in

A Amplitude
B Velocity
C Frequency
D intensity

1.3 A permanent magnet is placed close to a bar of soft iron (2)

After some time, what happens to the soft iron bar?

A The pole of the magnet are reversed.
B PQ does not become magnetic
C P becomes the north pole
D P becomes the south pole

1.4. Which one of the following elements has the smallest atomic number (2)

A Oxygen
B Carbon
C Aluminium
D Potassium

(2)

1.5 Petrol is a good example of .....

A a homogeneous mixture
B a heterogeneous mixture
C An element
D A compound

1.6 Metal X forms a sulphate with formula $X_2(SO_4)_3$. Which one of the following is the correct formula for the nitrate of X? (2)

A XNO_3
B $X(NO_3)_2$
C $X(NO_3)_3$
D $X_2(NO_3)_2$

[12]

QUESTION 2

2.1 The s,p-notation of two elements P and Q, is given below:

P: $1s^2\ 2s^2\ 2p^4$
Q: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

Write the **name** or **symbol** of:

2.1.1 P (1)
2.1.2 Q (1)

2.2 Refer to the periodic table and write down the :

2.2.1 Number of the group to which Q belongs (1)
2.2.2 Period in which P is found (1)

2.3 Is element P a metal or non-metal? (1)
2.4 Give the valency of element Q (1)
2.5 Name the type of chemical bond that forms when P and Q react. (1)
2.6 Use the Lewis structure to represent the reaction and the compound formed when P and Q react. (5)

Q reacts with SODIUM metal.

2.7 What type of compound is formed? Write down only IONIC or COVALENT (1)
2.8 Name TWO properties of the compound formed in QUESTION 2.7 (2)

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QUESTION 3

3.1 In order to make computer processing easier, a system using atomic numbers, rather than names or formulae has been developed. The following examples illustrate this code.

NAME	FORMULA	CODE
Sodium Chloride	NaCℓ	11,17
Iron (II) bromide	$FeBr_2$	26,35(2)
Aluminium oxide	Al_2O_3	13(2), 8(3)

Use this coding system to complete the table below.

Write down the question numbers 3.1.1. to 2.1.6 in your answer book and next to each the answers which correctly complete the table below.
DO NOT COPY THE TABLE

(6)

NAME	**FORMULA**	**CODE**
3.1.1	KBr	**3.1.2.**
3.1.3	**3.1.4**	29,6 , 8(3)
Sulphur dioxide	**3.1.5**	**3.1.6**

3.2. The mass spectrum of a sample of a certain metal provides the information shown in the table below.

Relative atomic mass	50	52	53	54
Relative abundance %	4,3	83,8	9,5	2,4

3.2.1 Define the term isotope. (2)
3.2.2 Give a reason why isotopes of the same element have the same chemical properties. (2)

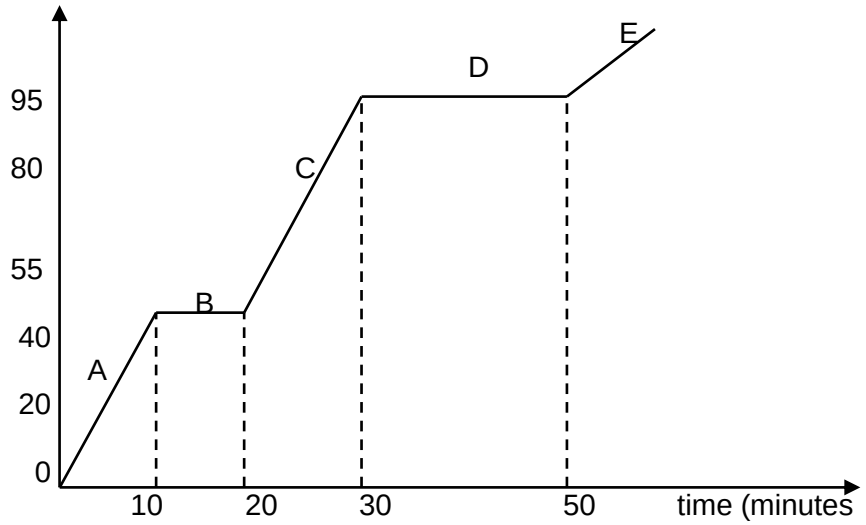
3.2.3 Use the data in the table above to calculate the relative atomic mass of the element in the sample. (2)

3.2.4 Refer to the Periodic Table and write down the NAME or SYMBOL of the element (1)

[14]

QUESTION 4

Mpule, a grade 10 learner investigates the relationship between the phase changes and the temperature of an unknown powder. A sample of the powder is placed in a test tube. The test tube is placed in a water bath and heated.
She records the temperature for the different times and uses the results to draw the graph shown below.



4.1 For this investigation write down:

4.1.1 an investigative question (2)

4.1.2 the independent variable (1)

4.1.3 the dependent variable (1)

4.1.4 two actions that must be taken to ensure a fair test (2)

4.2 Describe briefly how accuracy and reliability of the readings may be ensured. (2)

4.3 Define boiling point of a liquid. (2)

4.4 Refer to the graph and and write down, for the unknown powder, the:

4.4.1 Melting point (1)

4.4.2 Boiling point (1)

4.5 Refer to the graph and write down the letter that shows a phase in which:

4.5.1 only a solid is present (1)

4.5.2 only a gas is present (1)

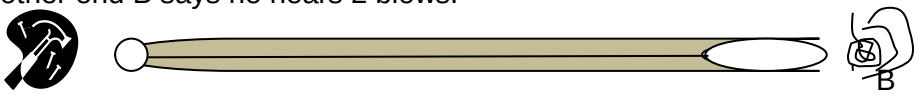
4.5.3 only a liquid is present (1)

4.5.4 both a solid and liquid are present (1)

[16]

QUESTION 5

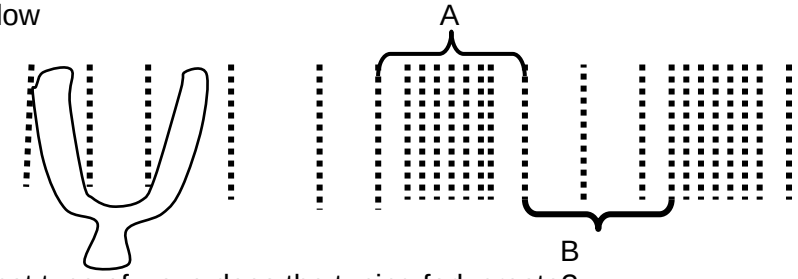
5.1 A steel pipe, 100 m long, is hit at one end by a boy with a hammer. His friend at the other end B says he hears 2 blows.



5.1.1 Explain why the friend hears two blows. (3)

5.1.2 If sound travels at 500 $m \cdot s^{-1}$ through the steel pipe, calculate the time it takes the sound to travel through the steel pipe from one end to the other. (3)

5.2 A turning fork, with a frequency of 200 Hz, created a sound wave as illustrated in the sketch below



5.2.1 What type of wave does the tuning fork create? (1)
5.2.2 Write down what the letters A and B (2)
5.2.3 A learner in your class makes the following statement: you hear the sound from a tuning fork because the air particles move from the tuning fork to your ears in the same way as a soccer ball moves from one player to another player. Do you agree with the statement? Explain the answer. (3)

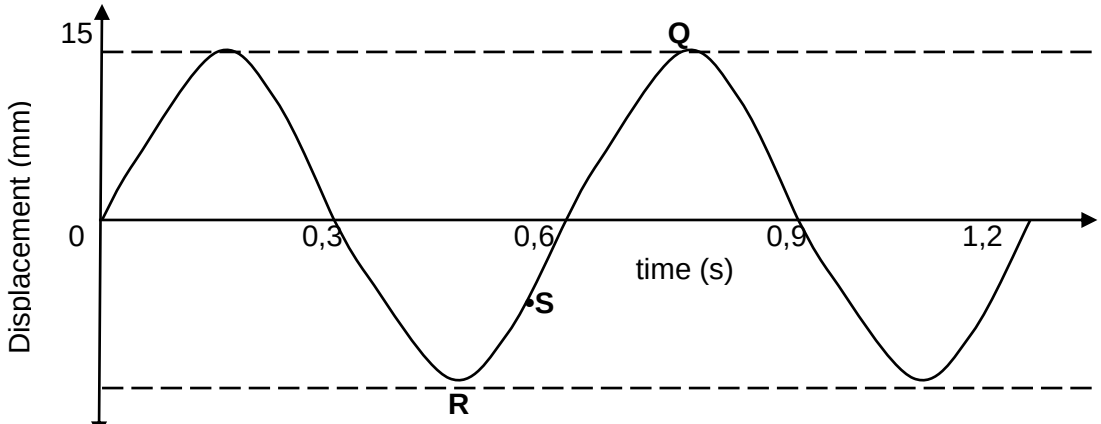
[12]

QUESTION 6

6.1 The distance between 13consecutive wave crest in a ripple tank is 180 mm. the waves travel through the water at a speed of 0,225 $m \cdot s^{-1}$.

6.1.1 Define the term wavelength of a wave in words. (2)
6.1.2 Calculate the:
6.1.2.1. the wavelength on the wave, in meters (3)
6.1.2.2. frequency of the wave (3)

6.2 The graph below shows the displacement of a leaf on a dam at intervals of 0,3 s after a disturbance has moved through the water at 12 $m \cdot s^{-1}$



6.2.1 At position S, is the leaf moving upwards or downwards? (1)
6.2.2 Consider the points P,Q, R and S in the diagram. Identify TWO points which are in phase. (1)
6.2.3 Calculate :
6.2.3.1. the frequency of the wave (2)
6.2.3.2. wavelength produced (3)
6.2.4 What is meant by the term amplitude of a wave? (2)
6.2.5 The amplitude of the wave is now doubled. What is the value, in m, of the new amplitude of the wave? (2)

[19]

QUESTION 7

The diagram below represents the electromagnetic spectrum.

Radio waves	**Micro waves**	**infrared**	**Visible light**	**ultraviolet**	**x-rays**	**Gamma rays**

7.1 Briefly describe how are electromagnetic waves generated. (1)

7.2 Name the type of electromagnetic radiation that:
7.2.1 Has the shortest wavelength (1)
7.2.3 Is used for satellite communication (1)
7.3 State ONE difference between electromagnetic waves and sound waves (2)
7.4 A certain FM transmitter broadcasts radio waves on 100 MHz. calculate the energy of a photon with this frequency. (3)

[8]

QUESTION 8

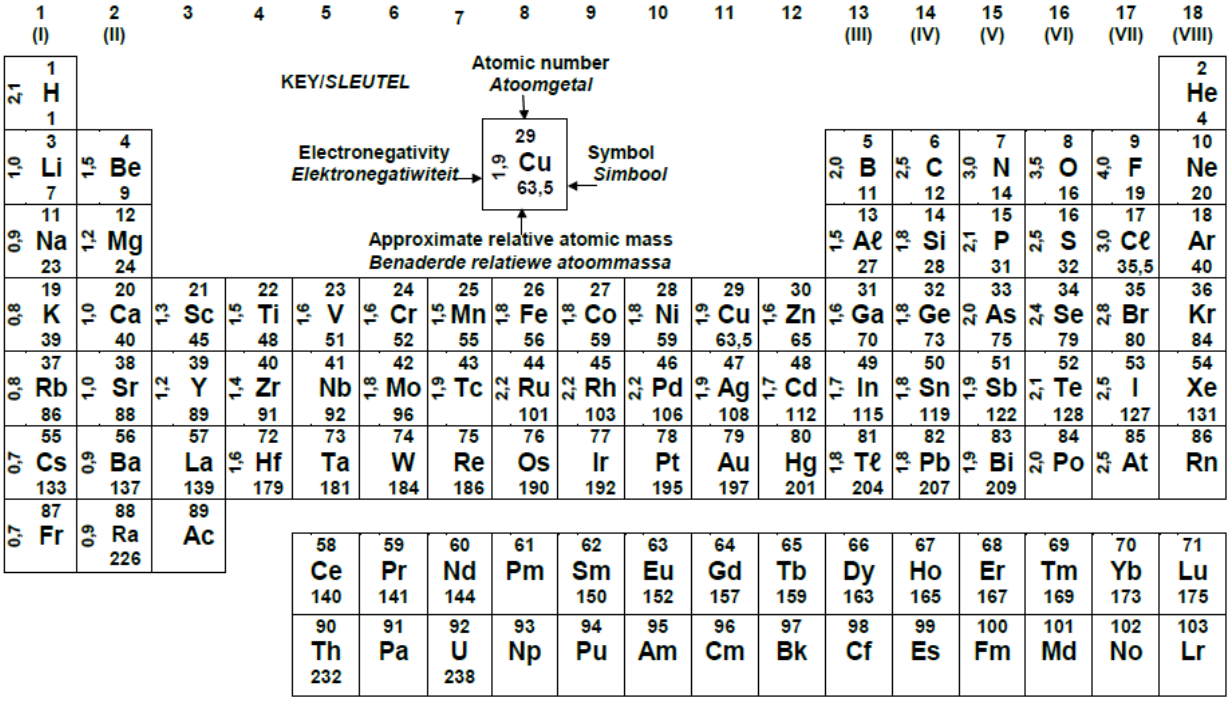
Two bar magnets are placed closeto one another as shown in the diagram below:

8.1 Name the instrument used to determine the direction of a magnetic field (1)
8.2 Define the term magnetic field. (1)
8.3 Draw the magnetic field pattern between the two magnets. (2)
8.4 The magnets are now moved closer to each other. How will the field lines drawn in 8.3 change? Write down only: remain the SAME, move CLOSER or FURTHER APART? (1)

[5]

TOTAL = 100 MARKS

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 43	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	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

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	$3,0 \times 10^{8}\ m{\cdot}s^{-1}$
Gravitational constant *Swaartekragkonstante*	G	$6,67 \times 10^{-11}\ N{\cdot}m^{2}{\cdot}kg^{-2}$
Coulomb's constant *Coulomb se konstante*	k	$9,0 \times 10^{9}\ N{\cdot}m^{2}{\cdot}C^{-2}$
Charge on charge *Lading op elektron*	e^{-}	$-1,6 \times 10^{-19}\ C$
Electron mass *Elektronmassa*	m_e	$9,11 \times 10^{-31}\ kg$
Permittivity of free space *Permittiwiteit van 'n vakuum*	ε_0	$8,85 \times 10^{-12}\ F{\cdot}m^{-1}$

WAVES, SOUND AND LIGHT/*GOLWE, KLANK EN LIG*

$v = f\lambda$ or/*of* $v = \nu\lambda$	$T = \frac{1}{f}$ or/*of* $T = \frac{1}{\nu}$
$f_L = \frac{v \pm v_L}{v \pm v_s} f_s$	$E = hf$ or/*of* $E = h\nu$ or/*of* $E = h\frac{c}{\lambda}$
$\sin\theta = \frac{m\lambda}{a}$	$hf = W_0 + \frac{1}{2}mv^2 = hf_0 + \frac{1}{2}mv^2$

ELECTRIC CIRCUITS/*ELEKTRIESE STROOMBANE*

$R = \frac{V}{I}$	$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$
$R_s = R_1 + R_2 + \ldots$	emf/*emk*(ε) = I(R + r)
$q = I\Delta t$	$W = Vq = VI\Delta t = I^2R\Delta t = \frac{V^2\Delta t}{R}$
$P = \frac{W}{\Delta t} = VI = I^2R = \frac{V^2}{R}$	