LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

GRADE 10

PHYSICAL SCIENCES: CHEMISTRY (P2)
MAY/JUNE 2016

MARKS: 150
DURATION: 2 HOURS
DATE : 15-06-2016

INSTRUCTIONS AND INFORMATION

1. Where needed, data sheet and graph papers will be provided by the school.

2. Answer all the questions.

3. This question paper consists of 9 questions.

4. Start EACH question on a NEW page in the Answer Sheet

5. Non-programmable calculators can be used.

6. Appropriate mathematical instruments may be used.

7. Number the answers correctly according to the numbering system used in this question paper.

8. You are advised to use the Data Sheet provided.

9. Show ALL formulae and substitutions in all calculations

10. Round off your final answer to a minimum of two (2) decimal places, unless otherwise

    stated.

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 (1.1-1.10)

1.1.   A …………………..is a mixture that is uniform where the different components of the

    mixture cannot be seen.   (2)

    A. Heterogeneous mixture

    B. Homogeneous mixture

    C. Mixture of pure substances

    D. Mixture of compounds

1.2.   The process whereby solid substances change directly to gaseous phase is called… (2)

    A. Evaporation

    B. Condensation

    C. Sublimation

    D. Melting

1.3.   Which one of the following substance is a pure substance?   (2)

    A. Steel

    B. Juice

    C. Sulphur

    D. Salt water

1.4. The number of neutrons of $^{24}_{12}Mg$ is : (2)

A. 6

B. 24

C. 36

D. 12

1.5. Air cannot be called an element because: (2)

A. Air can be separated into oxygen atoms.

B. Air is a pure substance.

C. Air contains more than one element.

D. Air can be liquefied.

1.6. In which period of the periodic table is carbon found? (2)

A. 14

B. 2

C. 4

D. 6

1.7. The outer electron structure of a magnesium ion is exactly the same as : (2)

A. Sodium

B. Neon

C. Argon

D. Calcium

1.8. Which one of the following represents the electronic structure of phosphorus (P). (2)

A. $1s^2 2s^2 2p^6 3s^2$

B. $1s^2 2s^2 2p^6 3s^2 3p^6$

C. $1s^2 2s^2 2p^6 3s^2 3p^5$

D. $1s^2 2s^2 2p^6 3s^2 3p^3$

1.9. Ionic bonding occurs between: (2)

A. Two non-metals.

B. Two metals.

C. A metal and a non-metal.

D. A metal and a semi-metal.

1.10. If 30g of reactant A reacts completely 25g of reactants B, which ONE of the following statement is CORRECT? (2)

A. The total mass of products plus any unreacted reactants will be less than 55 g.

B. The total mass of products plus any unreacted reactants will be greater than 55 g.

C. The total mass of products plus any unreacted reactants will be 55 g.

D. The total mass of the products will be equal to 55 g.

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QUESTION 2

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

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 the code system to complete the table below.

Write down the question number 2.1.1 to 2.1.6 0in your answer book and next to each, the answers which correctly complete the table below.

DO NOT COPY THE TABLE!

NAME	FORMULA	CODE
2.1.1	KBr	2.1.2
2.1.3	2.1.4	29,6,8(3)
Sulphur dioxide	2.1.5	2.1.6

(8)

2.2. The mass spectrum of a sample of 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

2.2.1. Define the term isotopes. (2)

2.2.2. Give a reason why isotopes of the same elements have the same chemical properties. (2)

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

2.2.4. Refer to the Periodic Table and write down the Name or SYMBOL of the element. (2)

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QUESTION 3

3.1. A list of properties of metals are listed in the box below.

> Malleable; Ductile; electrical conductors

Select the property which best fits the description in each of questions 3.1.1- 31.3

3.1.1. Copper can be stretched into thin wires. (1)

3.1.2. Aluminium can be moulded into pots and pans. (1)

3.1.3. It is dangerous to push an iron nail into a wall socket. (1)

3.2. Sugar dissolves in water to produce a sugar solution.

3.2.1. Give a reason why a sugar solution is a MIXTURE and not a COMPOUND. (2)

3.2.2. State whether the sugar solution is HOMOGENEOUS or HETEROGENEOUS. (1)

3.2.3. Give a reason for the answer to QUESTION 3.2.2. (2)

3.2.4. Is the dissolution process a PHYSICAL or a CHEMICAL change? (1)

3.3. Eight coloured substances were spotted onto a covered glass tank containing a little propanone. Three were the basic colours RED, BLUE, and YELLOW. The other were dyes, labelled A, B, C, D and E and are represented by dots as shown.

The resulting chromatogram is shown below.
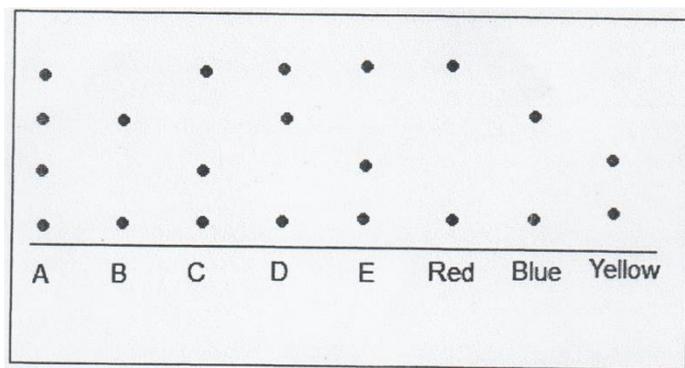
3.3.1. Explain what the term CHROMATOGRAPHY means. (2)

3.3.2. Write down the letter which represents a dye that contains only one basic colour. (1)

3.3.3. Refer to the chromatogram and explain why red is the basic colour which is MOST soluble in propanone. (2)

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QUESTION 4

A chemist conducts an investigation to determine the first ionisation energies of the first 18 elements.

The results obtained are shown in the table below.

Atomic number	Ionisation energy (kj.mol^{-1})	Atomic number	Ionisation energy (kj.mol^{-1})
1	1317	10	2087
2	2378	11	502
3	526	12	744
4	905	13	577
5	807	14	786
6	1092	15	1060
7	1049	16	996
8	1319	17	1256
9	1687	18	1520

4.1. Define the term IONISATION ENERGY when used in connection with atoms. (2)

4.2. For this investigation, write down the:

    4.2.1. Independent variable. (1)

    4.2.2. Dependent variable. (1)

4.3. Describe any trends that are observed from the table. (2)

4.4. Use the periodic Table together with the information in the table to deduce the PERIOD on the periodic table that has the lowest ionisation energy. (2)

4.5. Give a reason for the answer to QUESTION 4.4 above. (2)

   In your answer refer to the valence electrons and their position relative to the nucleus of the atom

4.6. Refer to the information in the table and write down the NAME of the element whose nucleus exerts the GREATEST force of attraction on its electrons. Give a reason for your answer.

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QUESTION 5

5.1. Consider the following electron-dot formulas for elements X and Y.
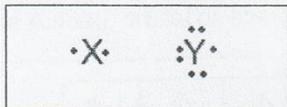
    5.1.1. Will a compound formed by the combination of X and Y be IONIC, COVALENT or

      METALIC? (1)

    5.1.2. Write down the FORMULA of the compound by the combination of X and Y. (2)
    5.1.3. Draw the Lewis diagram of the compound formed when X and Y. (2)
    5.1.4. Refer to the Periodic table and explain why magnesium bromide is ionic. (2)

5.2. Consider the Lewis diagram for the covalent compound drawn below:
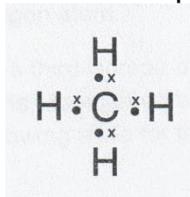
    5.2.1. Define the term COVALENT BOND. (2)
    5.2.2. Write down the FORNULA for the compound shown above. (2)

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QUESTION 6

6.1. The Aufbau,orbital or energy level diagram for a sulphur atom is given as:
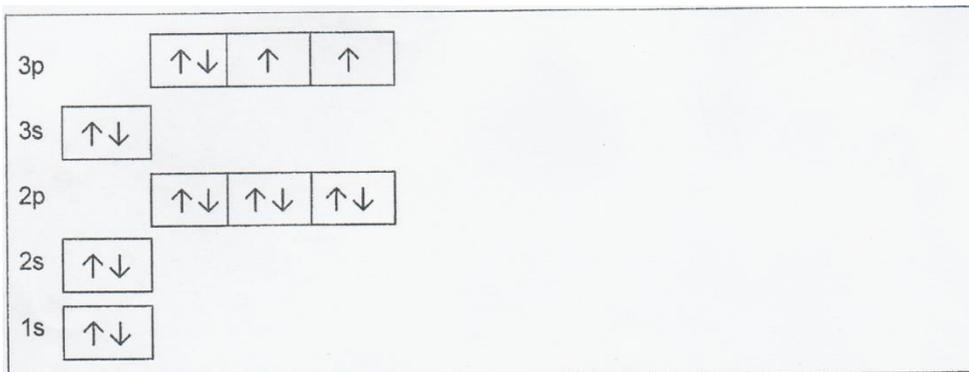
Use the Aufbau diagram to answer the following question:

    6.1.1. How many valence electrons are there in this sulphur atom? (2)
    6.1.2. Write down the electron configuration of sulphur in the ground state. (3)
    6.1.3. Draw the Aufbau diagram for oxygen atom. (3)

6.2. Carbon has two isotopes, there is a third isotope of carbon called carbon -14 which is radioactive. When half of the atoms of carbon-14 decay nitrogen-14 is formed. Copy and complete the following table for the atoms of carbon and nitrogen.

Atom	^{12}C	^{13}C	^{14}C	^{14}N
Number of protons				
Number of electrons				
Number of neutrons				
Number of nucleons				

(16)

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QUESTION 7

7.1. Use the key below to answer questions 7.1.1-7.1.3
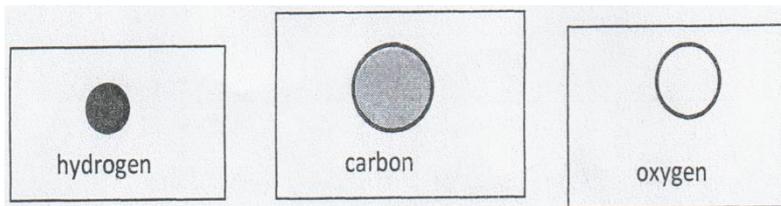
7.1.1. Draw diagrams of the following molecules.

      7.1.1.1. Water (2)

      7.1.1.2. Ethane (C_2H_6) (2)

7.1.2. Write chemical formulae for the following molecules:
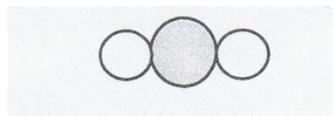
      7.1.2.1. (2)
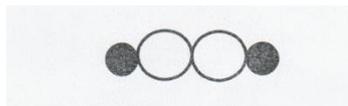
      7.1.2.2. (2)

7.2. Consider the compound MgO

      7.2.1. Write down the chemical NAME for this compound. (1)

      7.2.2. Draw the Lewis diagram for the Oxygen atom. (2)

      7.2.3. State whether the bond between Mg and O is IONIC or COVALENT. (1)

7.3   Phosphorus has three stable allotropes, namely: White Phosphorus, Red Phosphorus and Black   Phosphorus. The following figures represent the respective structures of the three allotropes:

White Phosphorus

Melting Point: 44.2 °C

Red Phosphorus

Melting Point: 590 °C

Black Phosphorus

Melting Point: 610 °C
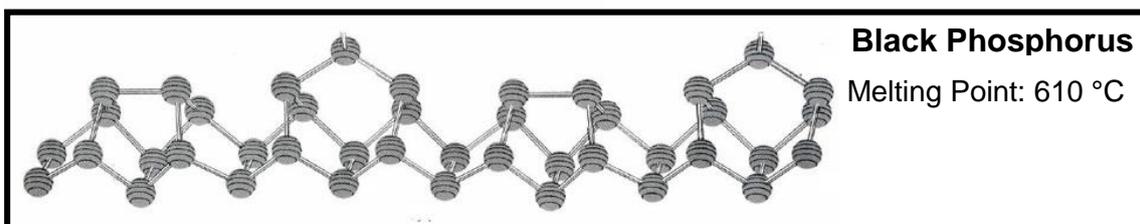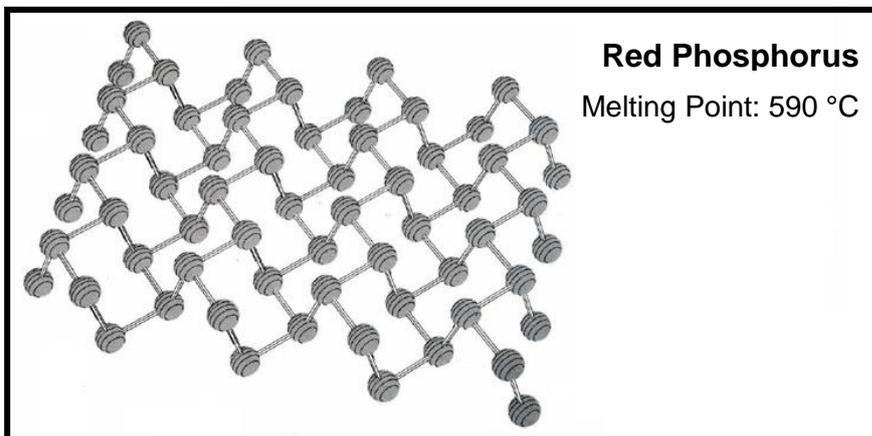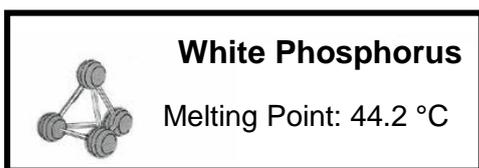
7.3.1   Choose from the list of terms the correct term to best describe the structure of Red Phosphorus and write the term next to the question number:

           The structure of Red Phosphorus is an example of _____:

A   a covalent molecular structure.
B   a covalent network structure.
C   a crystal lattice.   (2)

7.3.2   What is the type of forces called which holds the individual atoms in the structure of White Phosphorus together?   (2)

7.3.3   Why do you think there is such a huge difference in the melting points of White Phosphorus and Red Phosphorus?   (2)

7.4   Glucose is a molecule that consists only of carbon-, hydrogen- and oxygen atoms.
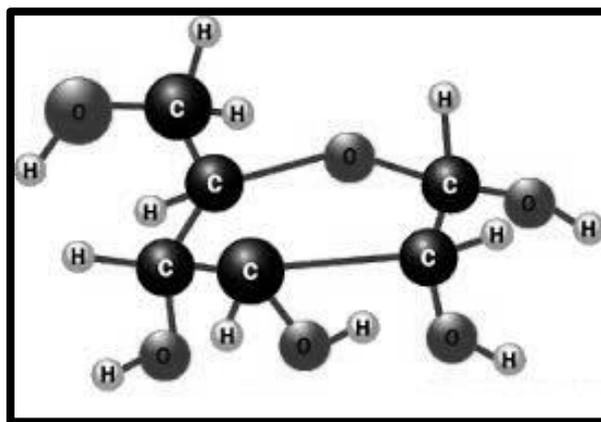
7.4.1   Give the molecular formula of glucose.   (2)
7.4.2   Give the empirical formula of glucose.   (2)

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QUESTION 8
The heating curve for a pure substance at atmospheric pressure is shown in the graph below.

Time (minutes)
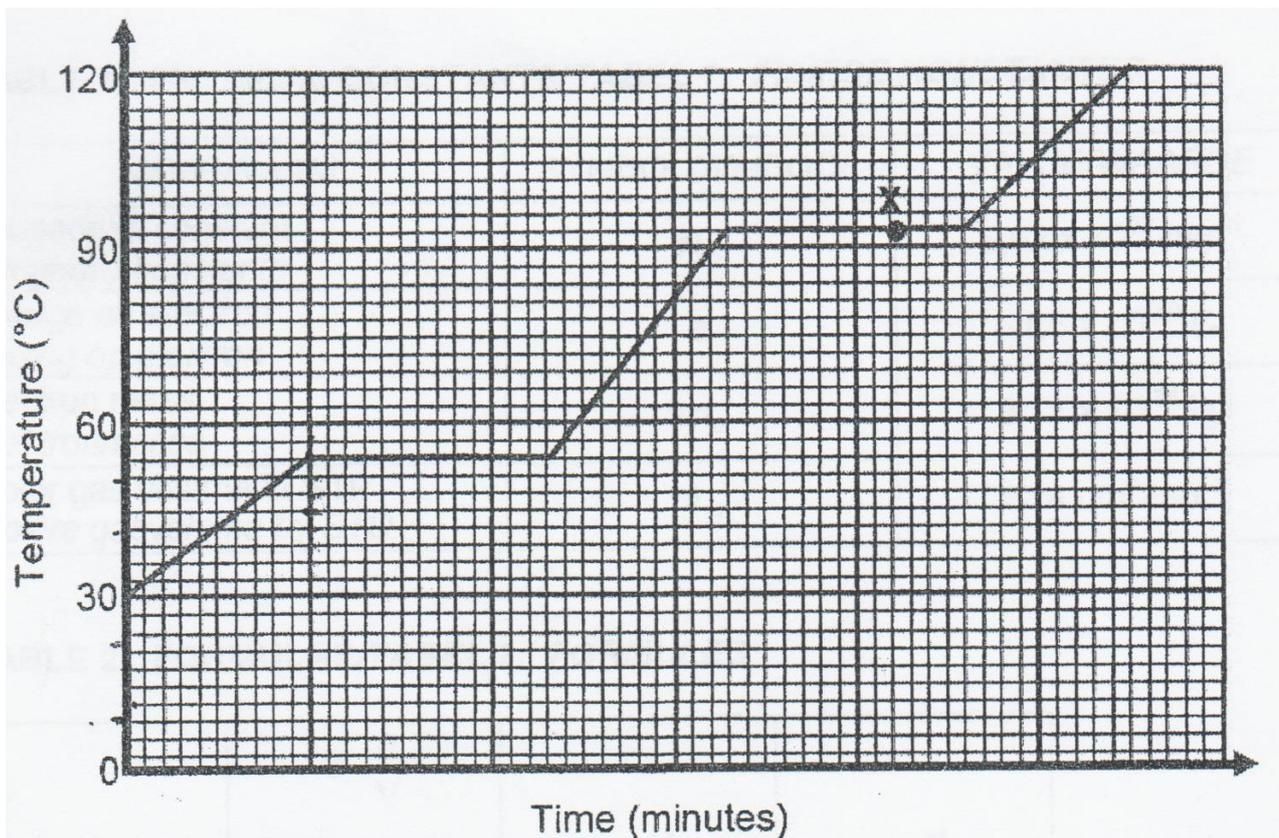
8.1 Write down the following for this pure substance:

    8.1.1. Melting point   (1)

    8.1.2. Boiling point   (1)

8.2. Is this pure substance water? Give a reason for the answer.   (2)

8.3. What is the physical state of the substance at:

    8.3.1. Point X shown on the graph. (2)

    8.3.2. Room temperature. (1)

8.4. What happens to the temperature while the substance melts? Explain this observation. (3)

8.5. Define the concepts:

    8.5.1. Boiling point. (2)

    8.5.2. Freezing point. (2)

    8.5.3. Melting point. (2)

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QUESTION 9

9.1. Consider the reaction between sodium carbonate and hydrochloric acid. It reacts to produce sodium chloride, carbon dioxide and water.

    9.1.1. What is the common name for sodium chloride? (2)

    9.1.2. Complete and balance the chemical equation (4)

$$Na_2CO_3 \text{ (s)} + HCl \text{ (aq)} \longrightarrow$$

    9.1.3. State the Law of Conservation of Matter. (2)

    9.1.4. Show that the mass is conserved in the reaction. (6)

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GRAND TOTAL 150

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 1																	2 **He** 4
1,0 **Li** 3 7	1,5 **Be** 4 9											2,0 **B** 5 11	2,5 **C** 6 12	3,0 **N** 7 14	3,5 **O** 8 16	4,0 **F** 9 19	10 **Ne** 20
0,9 **Na** 11 23	1,2 **Mg** 12 24											1,5 **Aℓ** 13 27	1,8 **Si** 14 28	2,1 **P** 15 31	2,5 **S** 16 32	3,0 **Cℓ** 17 35,5	18 **Ar** 40
0,8 **K** 19 39	1,0 **Ca** 20 40	1,3 **Sc** 21 45	1,5 **Ti** 22 48	1,6 **V** 23 51	1,6 **Cr** 24 52	1,5 **Mn** 25 55	1,8 **Fe** 26 56	1,8 **Co** 27 59	1,8 **Ni** 28 59	1,9 **Cu** 29 63,5	1,6 **Zn** 30 65	1,6 **Ga** 31 70	1,8 **Ge** 32 73	2,0 **As** 33 75	2,4 **Se** 34 79	2,8 **Br** 35 80	36 **Kr** 84
0,8 **Rb** 37 86	1,0 **Sr** 38 88	1,2 **Y** 39 89	1,4 **Zr** 40 91	**Nb** 41 92	1,8 **Mo** 42 96	1,9 **Tc** 43	2,2 **Ru** 44 101	2,2 **Rh** 45 103	2,2 **Pd** 46 106	1,9 **Ag** 47 108	1,7 **Cd** 48 112	1,7 **In** 49 115	1,8 **Sn** 50 119	1,9 **Sb** 51 122	2,1 **Te** 52 128	2,5 **I** 53 127	54 **Xe** 131
0,7 **Cs** 55 133	0,9 **Ba** 56 137	1,1 **La** 57 139	1,6 **Hf** 72 179	**Ta** 73 181	**W** 74 184	**Re** 75 186	**Os** 76 190	**Ir** 77 192	**Pt** 78 195	2,4 **Au** 79 197	1,9 **Hg** 80 201	1,8 **Tℓ** 81 204	1,8 **Pb** 82 207	1,9 **Bi** 83 209	2,0 **Po** 84	2,5 **At** 85	86 **Rn**
0,7 **Fr** 87	0,9 **Ra** 88 226	**Ac** 89															

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

Atomic number
Atoomgetal

Electronegativity
Elektronegatiwiteit

29
Cu
1,9
63,5

Symbol
Simbool

Approximate relative atomic mass
Benaderde relatiewe atoommassa