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GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

JUNE 2016

GRADE 10

PHYSICAL SCIENCES

(PAPER 2)

TIME: 90 minutes

MARKS: 100

10 pages + 1 data sheet

GAUTENG DEPARTMENT OF EDUCATION
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TIME: 90 minutes

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INSTRUCTIONS

1. Write your name in the appropriate space on the ANSWER BOOK.
2. This question paper consists of EIGHT questions. Answer ALL the questions.
3. You may use a non-programmable calculator.
4. You may use appropriate mathematical instruments.
5. You are advised to use the attached DATA SHEET.
6. Number the answers correctly according to the numbering system used in this question paper.
7. Write neatly and legibly.
8. Start the answers to each question on a NEW page in the ANSWER BOOK.
9. Leave ONE line open between two sub-questions, for example between Question 2.1 and Question 2.2.
10. Show ALL formulae and substitutions in ALL calculations.
11. Round-off your FINAL numerical answers to a minimum of TWO decimal places where needed.
12. Give brief motivations, discussions, et cetera where required.

SECTION A
QUESTION 1

MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A – D) next to the question number (1.1 – 1.10) on the answer sheet.

1.1 The sub-atomic particles that revolve around the nucleus of an atom are …

A neutrons.
B electrons.
C nucleons.
D protons. (2)

1.2 During the formation of ionic compounds, the valence electrons are …

A transferred.
B shared unequally.
C destroyed.
D shared equally. (2)

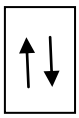
1.3 The scientist that discovered that an atom contains positive and negative particles is ...

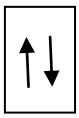
A Rutherford.
B Dalton.
C Bohr.
D Thomson. (2)

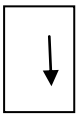
1.4 Elements on the periodic table are arranged in order of the …

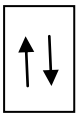
A number of nucleons.
B number of neutrons.
C mass number.
D number of protons. (2)

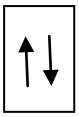
1.5 The electron structure of $^{12}_{6}C$ can be represented as follows:

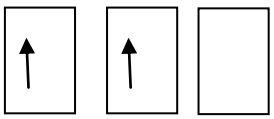
A 2s 

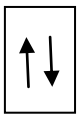
1s 

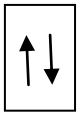
B 2p 

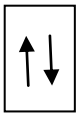
2s 

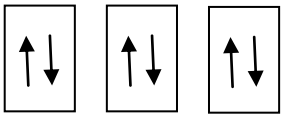
1s 

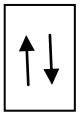
C 2p 

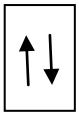
2s 

1s 

D 3s 

2p 

2s 

1s 

(2)

1.6 When a solid changes directly into a gas, … takes place.

A sublimation
B condensation
C dissociation
D evaporation (2)

1.7 The correct chemical formula for ammonium nitrate is …

A $NH_4(NO_3)_2$
B NH_3NO_3
C NH_4NO_3
D NH_4NO_2 (2)

1.8 Hydrochloric acid reacts with magnesium metal to form magnesium chloride and hydrogen gas. This is best represented by …

A $2HCl\ (aq) + 2Mg\ (s) \rightarrow 2MgCl\ (aq) + H_2\ (g)$
B $2HCl\ (l) + Mg\ (s) \rightarrow MgCl_2\ (s) + H_2\ (aq)$
C $2HCl\ (aq) + Mg\ (s) \rightarrow MgCl_2\ (aq) + H_2\ (g)$
D $HCl\ (l) + Mg\ (s) \rightarrow MgCl\ (aq) + H_2(g)$ (2)

1.9 Consider the following reaction for the preparation of ammonia.

$N_2\ (g) + 3H_2\ (g) \rightarrow 2NH_3\ (g)$

The law of constant volume ratio is represented best by:

A	3 cm^3 N_2 (g)	+	2 cm^3 H_2 (g)	→	3 cm^3 NH_3 (g)
B	2 cm^3 N_2 (g)	+	1 cm^3 H_2 (g)	→	3 cm^3 NH_3 (g)
C	1 cm^3 N_2 (g)	+	3 cm^3 H_2 (g)	→	2 cm^3 NH_3 (g)
D	2 cm^3 N_2 (g)	+	6 cm^3 H_2 (g)	→	9 cm^3 NH_3 (g)

(2)

1.10 During an endothermic reaction …

A the potential energy increases and the kinetic energy stays constant.
B the potential energy decreases and the kinetic energy stays constant.
C both the potential energy and the kinetic energy increases.
D both the potential energy and the kinetic energy decreases. (2)

TOTAL SECTION A: 20

SECTION B
QUESTION 2

A group of Grade 10 learners combined different substances to make **heterogeneous** and **homogeneous** mixtures with water. Among these were the following:

A – Oil and water

B – Sand and water

C – Concentrated Oros juice and water

D – Salt and water

2.1 Define the following terms and give an example of each from the above mixtures.

2.1.1 Heterogeneous mixture (3)
2.1.2 Homogeneous mixture (3)

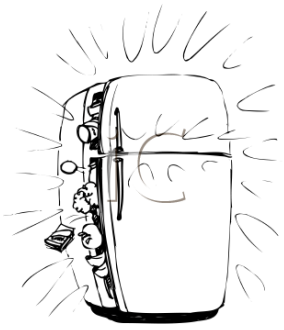
2.2 Name the separation method that will be used to separate:

2.2.1 B (1)
2.2.2 D (1)

2.3 Explain how the learners would be able to separate a mixture of iron filings and sulphur powder. (2)
[10]

QUESTION 3

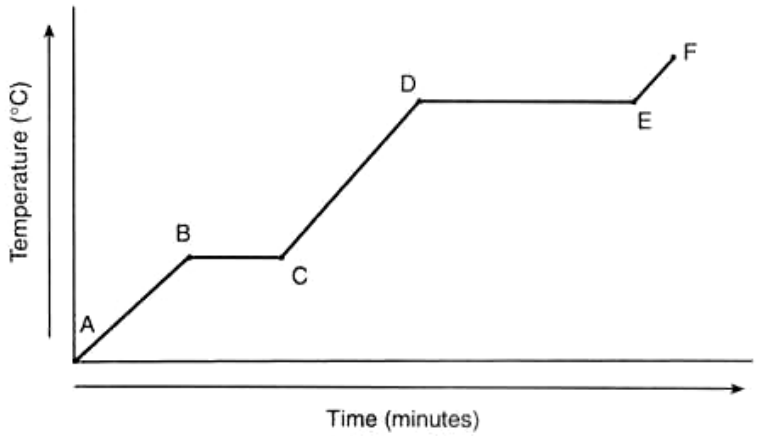
One night an explosion in a learner's house awakened the family. To his mother's surprise, the cause of the explosion was inside the freezer. When they opened it, it was full of broken glass and chunks of ice. The learner admitted that he had wanted to do his own little science experiment to see if water can really turn into ice, but he had used his mother's jam bottles that are made of glass to freeze the water.



To separate the glass from the ice chunks, the learner's mother threw all the pieces into a pot and put it on the stove. The learner thought this would be the perfect opportunity to see how long the ice would take to melt.

Look at the following graph and answer the questions that follow.

3.1 Write down the aim of the experiment that the learner conducted with his mother.



(2)

3.2 Match the following phases/processes with the stages indicated on the above graph.

AB	BC	CD	DE	EF

3.2.1 evaporation
3.2.2 melting
3.2.3 solid (3)

3.3 Referring to the increase in temperature, intermolecular forces and average kinetic energy between molecules, explain what is happening between parts:

3.3.1 A and B (3)
3.3.2 E and F (3)

3.4 Give THREE characteristics of any ONE of the phases (gas, liquid, solid). (3)

[14]

QUESTION 4

BELOW IS A LIST OF SUBSTANCES:

Copper metal, ceramic, plastic, glass, muesli, air we breathe, water, NaCl crystals.

4.1 Use the list to identify the materials based on the following properties.

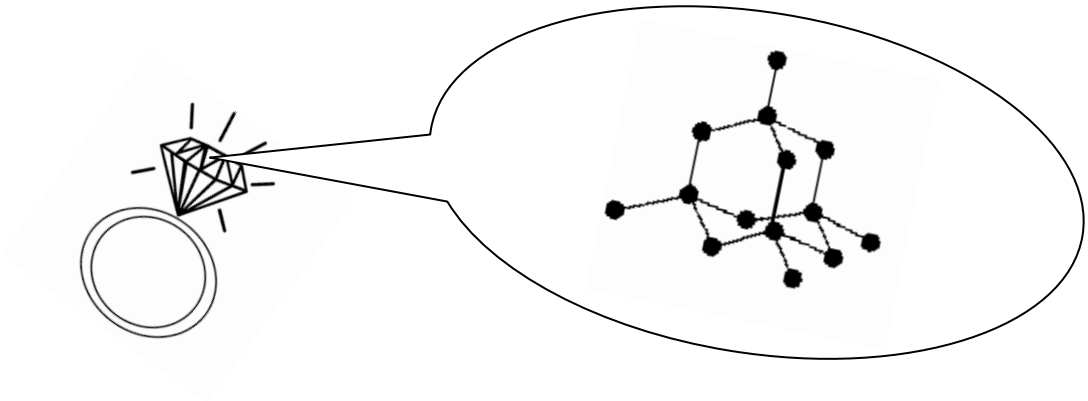
4.1.1 An ionic compound that, when dissolved in water, can conduct an electric current (1)

4.1.2 A good conductor of heat and electricity, that has a high melting point and can be beaten into a shape (1)

4.1.3 Bends easily, melts at a relatively low temperature and cannot conduct heat and electricity (1)

4.1.4 A mixture of which the components cannot be seen (1)

4.2 Look at the following diagram and answer the questions that follow.



4.2.1 Write down the element that makes up this compound. (1)

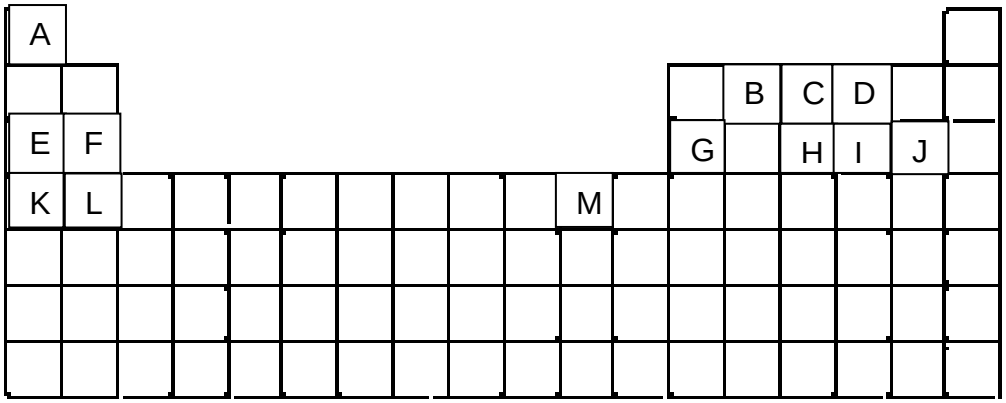
4.2.2 Explain why the compound in the diagram above cannot conduct electricity? (2)

4.2.3 Which compound that consists of the element identified in Question 4.2.1 is able to conduct electricity? Explain how this is possible. (4)

[11]

QUESTION 5

Use the following periodic table marked with letters A – M, which represent elements in the periodic table, to answer the following questions.



5.1 Write down the number of valence electrons of letter H. (1)

5.2 Write down the valency of letter H. (1)

5.3 Two rules must be followed to fill orbitals. Name these rules and state them. (6)

5.4 Write down the name of the element found in Period 2, Group 6. (1)

5.5 Draw the Aufbau diagram for the element identified in Question 5.4. (3)

5.6 Write down the electron configuration for the ion that forms from letter L. (4)
[16]

QUESTION 6

Naturally occurring elements have isotopes.

6.1 From the above statement, which sub-atomic particle is responsible for the occurrence of isotopes? (1)

6.2 Using a suitable calculation determine the relative atomic mass of Neon, consisting of:

88,48% Ne-20
0,27% Ne-21
11,25% Ne-22 (3)
[4]

QUESTION 7

7.1 Write down the FOUR characteristics that indicate that a chemical change took place during a chemical reaction. (4)

7.2 Differentiate between a *decomposition reaction* and a *synthesis reaction*. (2)

7.3 Identify the reactions below as **a physical** or **a chemical** change.

7.3.1	Ice melting	(1)
7.3.2	Nail rusting	(1)
7.3.3	Bread toasting	(1)
7.3.4	A glass breaking	(1)
		[10]

QUESTION 8

8.1 Draw Lewis diagrams of the following.

8.1.1	CO_2	(2)
8.1.2	Na^+	(1)
8.1.3	CH_4	(1)

8.2 Write down the correct chemical formulae for the following substances.

8.2.1	Ammonia	(1)
8.2.2	Carbonate ion	(1)

8.3 Write down the balanced equation of: $NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$ (2)

8.4 Write down a balanced equation for:
calcium hydroxide + sulphuric acid → calcium sulphate + water (3)

8.5 Write down the names of the following compounds.

8.5.1	$FeCl_3$	(2)
8.5.2	$KMnO_4$	(2)
		[15]

TOTAL SECTION B: 80

TOTAL: 100

END

THE PERIODIC TABLE OF ELEMENTS / *DIE PERIODIEKE TABEL VAN ELEMENTE*