



ALEXANDER ROAD HIGH SCHOOL
PHYSICAL SCIENCE CONTROL TEST
GRADE 11
1 HOUR
TOTAL = 60

SEPTEMBER 2009
IC, MA, CO

- Instructions
- The question paper consists of 7 questions.
 - Answer all the questions.
 - Answer section A on the answer sheet provided AND section B on folio sheets.
 - Rule off after each question in Section B.
 - A non-programmable calculator may be used.
 - Number the answers correctly according to the numbering system
 - A data sheet is provided for your use.
 - LO 1,2, 3 AS 1,2, 3

SECTION A

- Answer on the answer sheet -

QUESTION 1: One-word questions

- 1.1 A substance that can act as an acid or a base. (1)
- 1.2 The name of the mixture of products when a phosphate reacts with sulphuric acid. (1)
- 1.3 Atoms of the same element with different mass numbers. [3]

QUESTION 2: False Statements

CORRECT the statement by writing down ONLY the incorrect section correctly.

- 2.1 Addition reactions involve saturated hydrocarbons becoming unsaturated. (2)
- 2.2 Energy is absorbed in all chemical reactions. (2)
- 2.3 The concentration is the amount of a substance that contains the same number of particles as there are present in 12g of carbon-12. (2) [6]

QUESTION 3: Multiple choice

3.1 Consider the following chemical reactions...

- 1) $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$
- 2) $4\text{H}^+ + \text{O}_2 + 4\text{e}^- \rightarrow 2\text{H}_2\text{O}$

Which of the following pairs of statements is correct?

	Reaction (1)	Reaction (2)
A	Cu is reduced	O ₂ is oxidized
B	Cu is reduced	H ⁺ is oxidized
C	Cu is oxidized	H ⁺ is reduced
D	Cu is oxidized	O ₂ is reduced

- 3.2 The heat content of a substance at constant pressure and is represented by H is known as
- A. binding energy B. enthalpy
- C. activation energy D. activated complex
- 3.3 The empirical formula for a substance with 36,5% Sodium, 25,4% sulfur and 38,1 % oxygen per mass is
- A. Na₂S₂O₃ B. Na₂SO₃
- C. Na₂SO₄ D. NaSO₂

[3 x 2 = 6]
SUB - TOTAL: 15

SECTION B

QUESTION 4

4.1 Consider the following reaction.



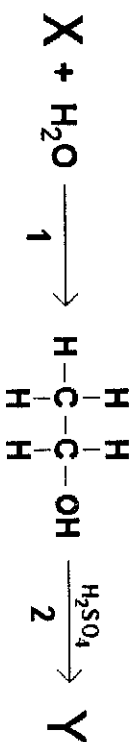
- 4.1.1 Write down the oxidation half reaction. (2)
- 4.1.2 Write down the reduction half reaction. (2)
- 4.1.3 Identify the reducing agent. (1)
- 4.2 The following reaction is an acid-base reaction.



Write down the formula for the following in the reaction...

- a) The acid (1)
- b) The base (1)
- c) The conjugate acid (1)
- d) The conjugate base (1)

4.3 Consider the following sequence of reactions.



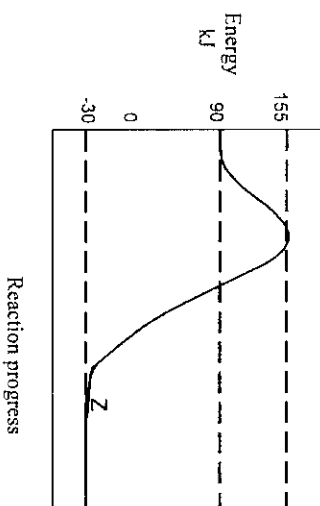
- 4.3.1 Give a possible structural formula for molecule X. (NOT an Alkene) (2)
- 4.3.2 Give the general name for the first reaction. (1)
- 4.3.3 Give the specific name for the second reaction. (1)
- 4.3.4 Is substance "Y" saturated (answer yes or no)? (1)
- 4.3.5 What part does H_2SO_4 play in the second reaction? (1)

[15]

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QUESTION 5

The sketch below represents the potential energy graph for the reaction



- Refer to the diagram and answer the following.
- 5.1 Define activation energy. (1)
- 5.2 What is the value of the activation energy in the graph above? (1)
- 5.3 Calculate the value of the heat of reaction? (2)
- 5.4 Is the reverse reaction EXOTHERMIC or ENDOTHERMIC? Give a reason for your answer. (2)
- 5.5 Draw a potential energy graph indicating the reaction path with a catalyst present for a reaction where $\Delta H > 0$. (2)

[8]

QUESTION 6

6. The smelting of iron ore is done at very high temperatures in a blast furnace. The two important ores of iron are haematite and magnetite which are iron oxides. Coke, a form of carbon and limestone, and iron ore are fed from the top of the furnace and heated up. The carbon from the coke combines with the oxygen from the iron ore to form carbon monoxide gas. Carbon monoxide reduces iron oxide to iron. Limestone helps to remove impurities such as silicon dioxide as slag. The molten iron is then refined to remove most of the carbon to get pig iron.
- 6.1 Write a formula of haematite ore. (1)
- 6.2 What is the function of CO in the blast furnace? (1)

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**DATA FOR PHYSICAL SCIENCES GRADE 11
PAPER 2 (CHEMISTRY)**

TABLE 1: PHYSICAL CONSTANTS/TABEL 1: FISIËSE KONSTANTES

NAME/NAAM	SYMBOL/SIMBOOL	VALUE/WAARDE
Avogadro's constant	N_A	$6,02 \times 10^{23} \text{ mol}^{-1}$
Avogadro-konstante		
Molar gas constant	R	$8,31 \text{ J K}^{-1} \text{ mol}^{-1}$
Molêre gaskonstante		
Standard pressure	p°	$1,013 \times 10^5 \text{ Pa}$
Standarddruk		
Molar gas volume at STP	V_m	$22,4 \text{ dm}^3 \text{ mol}^{-1}$
Molêre gasvolume by STD		
Standard temperature	T°	273 K
Standardtemperatuur		

TABLE 2: FORMULAE/TABEL 2: FORMULES

$p_1 V_1 = p_2 V_2$	$pV = nRT$
$\frac{T_1}{T_2}$	
$n = \frac{m}{M}$	$c = \frac{n}{V}$
$c = \frac{m}{MV}$	$\frac{n_a}{n_b} = \frac{c_a V_a}{c_b V_b}$

- 6.3 Write a chemical equation for the reduction of iron oxide to iron by carbon monoxide. (2)
- 6.4 What is the environmental impact of mining and refining of iron? (2)
- 6.5 South Africa's gold industry has contributed largely to the success of South Africa's economy. To extract the gold from the ore a certain process is used. What is the name of this process? (1)

[7]

QUESTION 7

- 7.1 You are provided with 2 solutions. The concentration of the one solution is $0,015 \text{ mol} \cdot \text{dm}^{-3}$. This $0,015 \text{ M}$ solution turns yellow when Bromothymol blue indicator is added to it. You were also told that the solutions are sodium hydroxide and sulfuric acid. The volume of acid used is $13,8 \text{ ml}$ and the volume of base used is 25 ml . Standardize the other solution by using all the above information in a calculation. (5)
- 7.2 One of the stages in the industrial production of nitric acid is to prepare NO gas. The **incompletely balanced** equation of this process is



You know that there are 750g of each reactant.

- 7.2.1 Rewrite and balance the equation. (1)
- 7.2.2 Determine the limiting reactant. Clearly show your working. (4)
- 7.2.3 Calculate the mass of NO that will be produced. (3)
- 7.2.4 If the percentage yield is actually 85%, what mass of NO is actually formed? (2)

[15]

TOTAL 60 MARKS