



ALEXANDER ROAD HIGH SCHOOL

MARCH 2017

1 HOUR

PHYSICAL SCIENCE CONTROL TEST

CO, KB, MH

TOTAL = 60

GRADE 11

Instructions

- The question paper consists of 4 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.
- Round off to two (2) decimal places where necessary.
- Formulas and a periodic table have been included at the end of the question paper

SECTION A

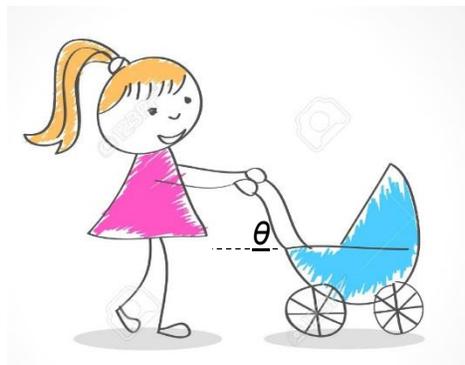
- Answer on the answer sheet -

QUESTION 1: Multiple choice

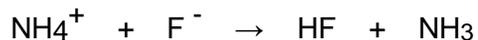
Four possible options are provided as answers to the following questions. Each question has only 1 correct answer. Choose the correct answer and write the letter (A – D) next to the relevant question number (1.1 – 1.6) on the answer sheet.

- 1.1 An athlete starts a race by pushing hard against the starting blocks. If the force which the athlete exerts on the starting blocks has a magnitude F , then the force with which the starting blocks push back on the athlete is ...
- A equal to F
 - B greater than F
 - C smaller than F
 - D dependant on the athlete's weight

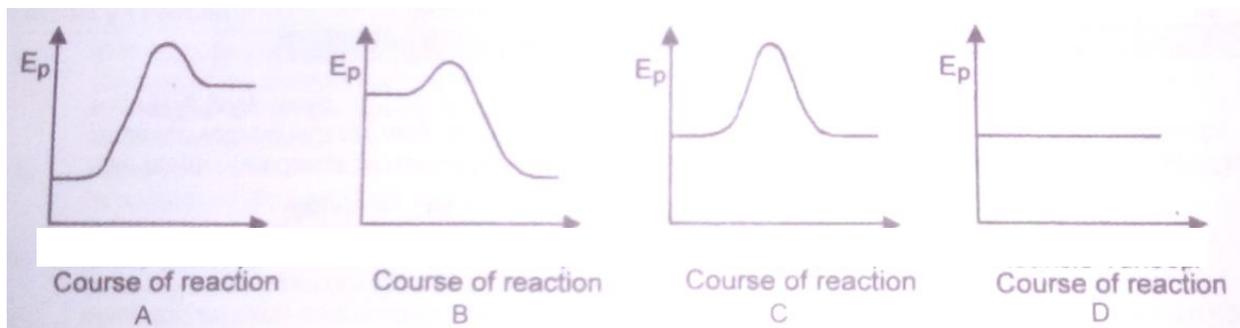
- 1.2 A girl pushes her doll in a pram. A force F is exerted by the handle onto the pram and makes an angle, θ , with the horizontal. The pram moves with constant velocity because...



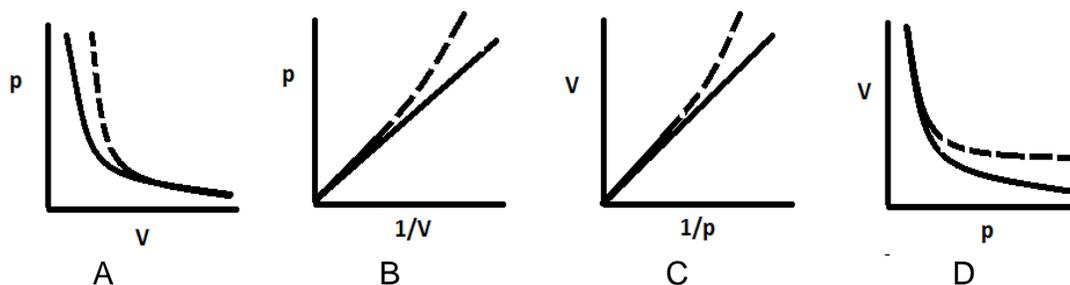
- A the pram exerts an equal and opposite force on the girl/handle.
 B the girl exerts no force on the pram.
 C the force of friction is equal to $F \cos \theta$.
 D the weight of the pram is balanced by the reaction of the road.
- 1.3 Identify the correct conjugate acid-base pair in the following reaction:



- A $\text{NH}_4^+ \rightarrow \text{HF}$
 B $\text{NH}_4^+ \rightarrow \text{NH}_5^+$
 C $\text{NH}_4^+ \rightarrow \text{F}^-$
 D $\text{NH}_4^+ \rightarrow \text{NH}_3$
- 1.4 Phosphorus ignites spontaneously to release large amounts of energy. Which ONE of the graphs below is the best representation of the energy changes taking place during this reaction?



1.5 The following graphs shows how a real gas deviates from an ideal gas at different pressure/volume values. Which one is INCORRECT?



1.6 Which one of the following gases will deviate the most from ideal gas behaviour?

- A CO_2
- B He
- C H_2
- D CH_4

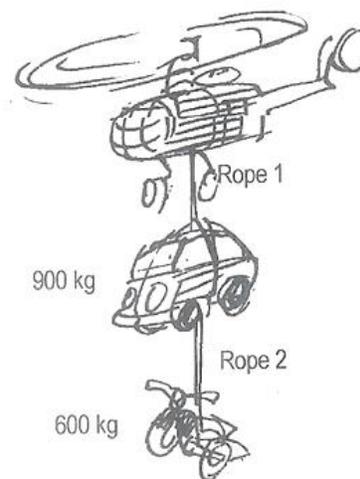
[2 x 6 = 12]

SECTION B

QUESTION 2

2.1 State Newton's second law of motion in words. (3)

2.2 A helicopter is lifting a car (mass 900kg) and a motorbike (mass 600kg) as shown in the diagram. Ignore air friction and any horizontal movement by the helicopter.



2.2.1 Draw a free-body diagram of all forces acting on the car. (3)

2.2.2 Draw a free-body diagram of all forces acting on the motorbike. (2)

2.2.3 If the maximum tension in rope 1 cannot exceed 18 000N, calculate the maximum magnitude of the acceleration of the helicopter if the rope is not to break. (8)

2.2.4 The acceleration calculated in 2.2.3 is exceeded and rope 1 snaps. The car and the motorbike are now both falling towards the ground. What is the magnitude of the tension in rope 2. (1)

[17]

QUESTION 3

3.1.1 Define an Arrhenius base. (2)

3.1.2 HSO_4^- forms during an acid's ionisation reaction. Is this substance a base or an acid in **this** reaction? (1)

3.1.3 What will the colour of bromothymol blue be in this ionisation reaction? (1)

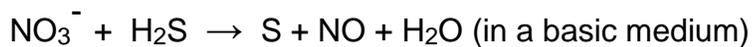
3.1.4 If HSO_4^- acts as a base in another reaction, give the NAME of its conjugate acid. (1)

3.2 Define:

3.2.1 reduction (2)

3.2.2 reducing agent (1)

3.3.1 Consider the following reaction:



Balance the equation by using the ion-electron method. (6)

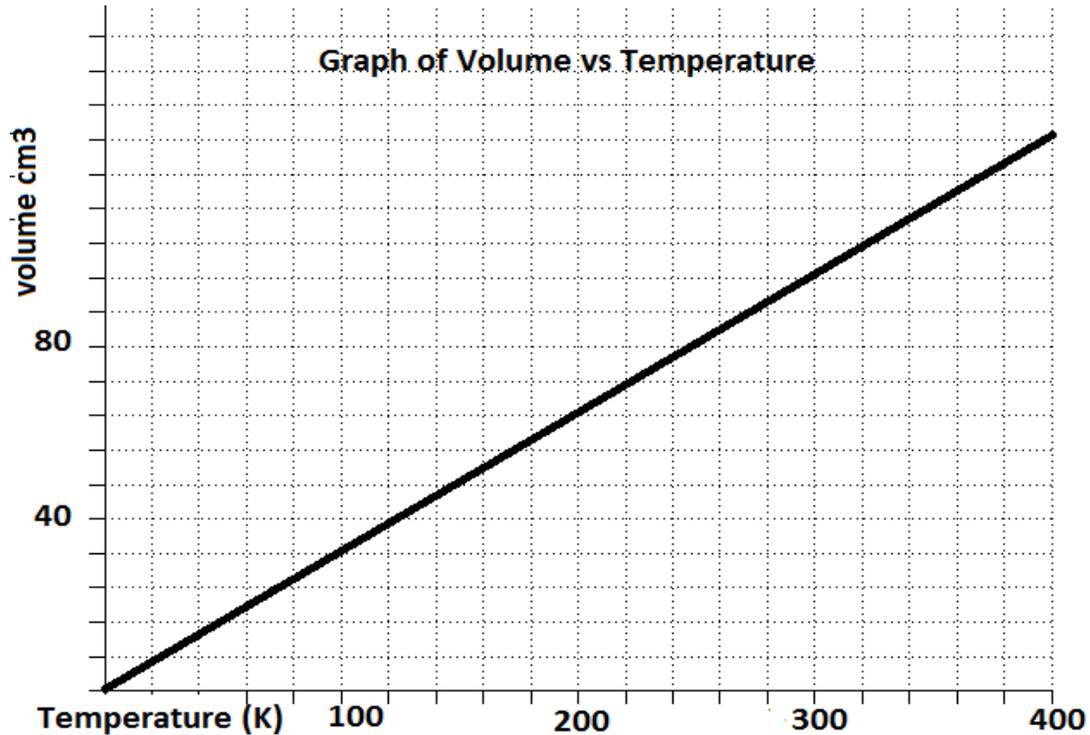
3.3.2 NAME the reducing agent. (1)

[15]

QUESTION 4

4.1 A learner conducted an experiment to verify the relationship between volume and temperature of a certain gas. They used a glass tube sealed on one end and mercury was on top of the gas inside the tube and is free to slide up and down and prevented any of the gas from escaping. The temperature of the gas inside the tube was increased.

They recorded the results, which they used to plot the graph below.



4.1.1 Name the gas law they are investigating and state the law in words. (3)

4.1.2 In the graph, which is:

a) the independent variable? (1)

b) the dependant variable? (1)

4.1.3 Name two control variables for the above experiment. (2)

4.1.4 From the graph determine the volume of the gas at -153°C . (1)

4.2 9g of gas at STP (0°C and 101,3 kPa) occupies a volume of $5,60\text{ dm}^3$.

Calculate:

4.2.1 the number of moles (5)

4.2.2 the molar mass (2)

4.2.3 based on your answer in 4.2.2, which gas was used? (1)

[16]

FORCE/KRAG

$F_{\text{net}} = ma$	$w = mg$
$F = \frac{GM_1M_2}{r^2}$	$f_{s(\text{max})} = \mu_s N$
$f_k = \mu_k N$	

CHEMISTRY

NAAM/NAME	SIMBOOL/SYMBOL	WAARDE/VALUE
Avogadro's constant Avogadro se konstante	N_A	$6,02 \times 10^{23} \text{ mol}^{-1}$
Molar gas constant <i>Molêre gaskonstante</i>	R	$8.31 \text{ J} \cdot \text{K}^{-1} \cdot \text{mol}^{-1}$
Standard pressure <i>Standaarddruk</i>	p^θ	$1,013 \times 10^5 \text{ Pa}$
Molar gas volume at STP <i>Molêre gasvolume teen STD</i>	V_m	$22,4 \text{ dm}^3 \cdot \text{mol}^{-1}$
Standard temperature <i>Standaardtemperatuur</i>	T^θ	273 K

TABLE 2: FORMULAE/TABEL 2: FORMULES

$\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$	$pV = nRT$
$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$n = \frac{V}{V_M}$	$c = \frac{n}{V}$ OF/ OR $c = \frac{m}{MV}$