HILLCREST H
PHYSICAL
GRAD
PAPER 2-

JUNE 2014
TIME: 3 HRS

Instructions

1. Answer ALL the questions.

2. This question paper consists of TWO se

3. SECTION A (20)
   SECTION B (130)

   Answer SECTIONS A and B in the ANS

4. Non-programmable calculators may be

5. Appropriate mathematical instruments

6. Number the answers correctly accordin
   question paper.

SECTION A

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to
has only ONE correct answer. Write only the let
(1.1 – 1.10) in the ANSWER BOOK.

1.1 Identify the Bronsted-Lowry bases in the re

$$H_2SO_4 + H_2O \leftrightarrow HSO$$

A. H_2O and HSO_4^-

B. HSO_4^- and H_3O^+

C. H_2O and H_3O^+

D. H_2SO_4 and H_3O^+

1.2 Use the table of redox potentials to determ
be able to reduce $Cd^{2+}_{(aq)}$ but not reduce M

1.4 Which ONE of the following statements reg
INCORRECT?

A. The anode is where oxidation takes place.

B. The cathode is positively charged.

C. There is no salt bridge.

D. The reaction is non-spontaneous.

1.5 Consider the reaction represented by the fo

$$Ba + 2HNO_3 \rightarrow$$

Which option describes the change in oxid

A. From -2 to +2

B. From +2 to -2

C. From 0 to +2

D. From 0 to -2

1.8 Which one of the 50ml solutions listed bel
hydronium (oxonium) ions?

A. 0.2mol.dm^{-3} hydrochloric acid

B. 0.3mol.dm^{-3} ethanoic acid

C. 0.4mol.dm^{-3} ammonium chloride

D. 0.5mol.dm^{-3} ammonium hydroxide

1.9 What is the **intermolecular** force present i

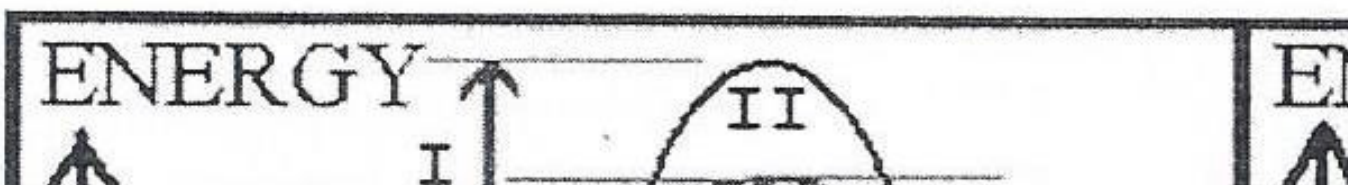
A. Covalent

B. Hydrogen bonds

C. Dipole induced dipole

D. Dipole-dipole

2.10 In the diagram below the change in enthalp



SECTION B

INSTRUCTIONS AND INFORMATION

1. Leave ONE line between two sub question
and QUESTION 2.2.

2. Show the formulae and substitutions in AL

3. Round off your numerical answers to **TWO**

Question 2

2.1 741g of octane (one litre of petrol) burns in
reaction are carbon dioxide and water vap

$$2C_8H_{18(\ell)} + 25O_{2(g)} \longrightarrow$$

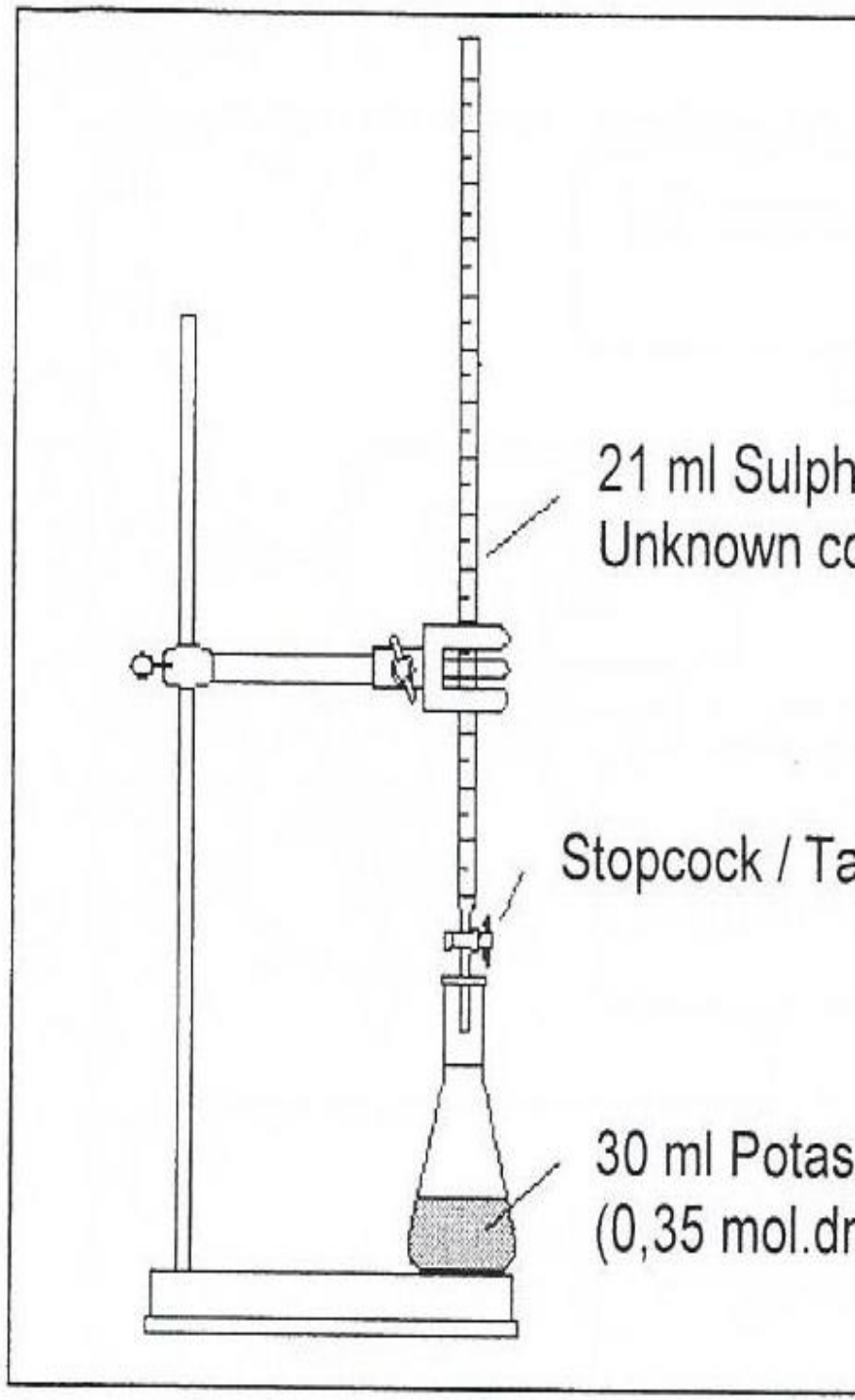
2.1.1 Calculate the number of moles of:

a. C_8H_{18}

b. O_2

Question 3

3.1. During a titration 21ml of sulphuric acid of u
of a 0.35mol.dm^{-3} solution of potassium hy

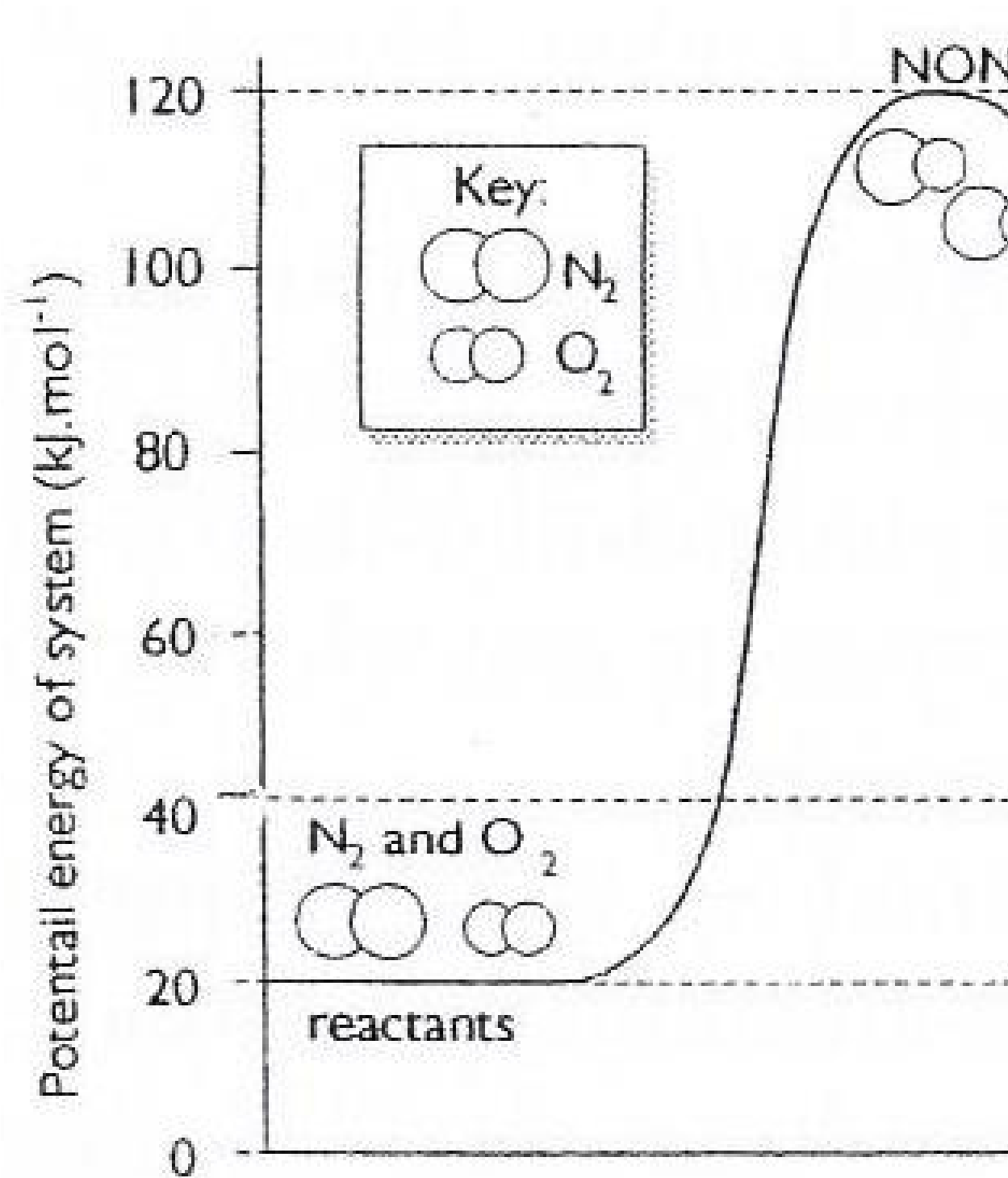


Question 4

4.1 The following **synthesis** reaction takes pla

$$N_2 + O_2$$

The energy profile for the reaction betwee



Question 5

The cell notation of a standard galvanic (voltaic) c
shown below.

$$X(s) \mid X^{3+}(1\ mol{\cdot}dm^{-3}) \parallel$$

5.1 Name the component of the cell represente
cell notation.

5.2 State the **TWO** standard conditions that ar

5.3 Identify the oxidising agent in the above ce

5.4 The initial reading on a voltmeter connecte
1,53V. Identify metal X by calculating the s
X.

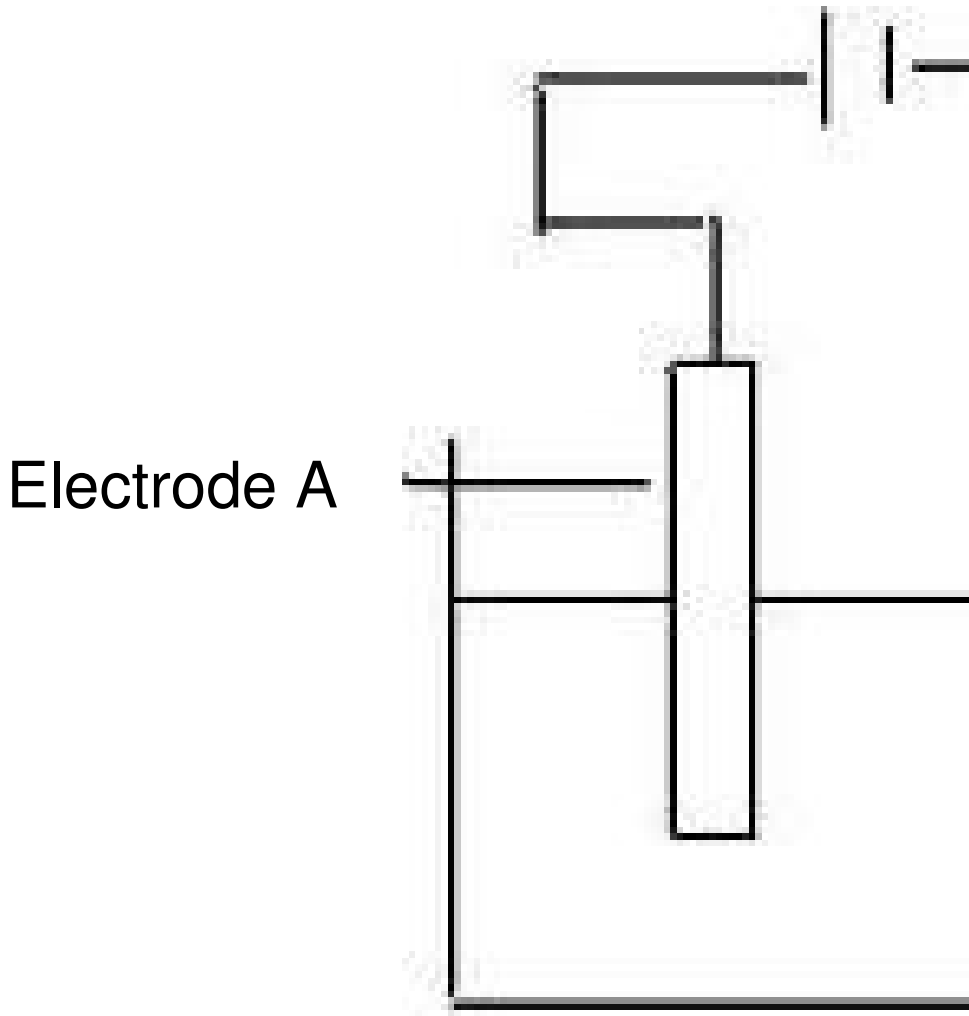
5.5 Write down the balanced equation for the r

5.6 How will the initial voltmeter reading be affe
$X_{(s)}|X^{3+}_{(aq)}$ half-cell is increased? Write dow
THE SAME.

5.7 Write down the value of the reading on the
equilibrium.

6.2.4 How would the addition of HCl to the Ag / A

6.3 Look at the diagram below and answer the



6.3.1 What type of cell is shown in the diagram a

6.3.2 What material would the electrodes be ma

6.3.3 Which is the anode? Write only **A** or **B.**

6.3.4 Write the reduction half reaction for this ce

7.3 Both CO_2 and H_2O are molecules consistin
provide the required information for each m

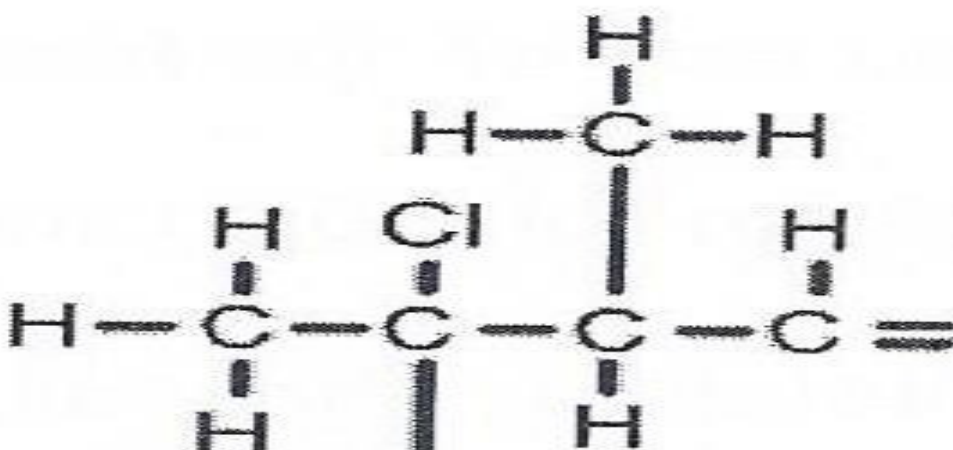
	C
Lone pairs of electrons present (**YES** / **NO**?)	7.3
POLAR or **NON POLAR** molecule	7.3
Type of intermolecular forces	7.3

Question 8

A. Propan-2-ol

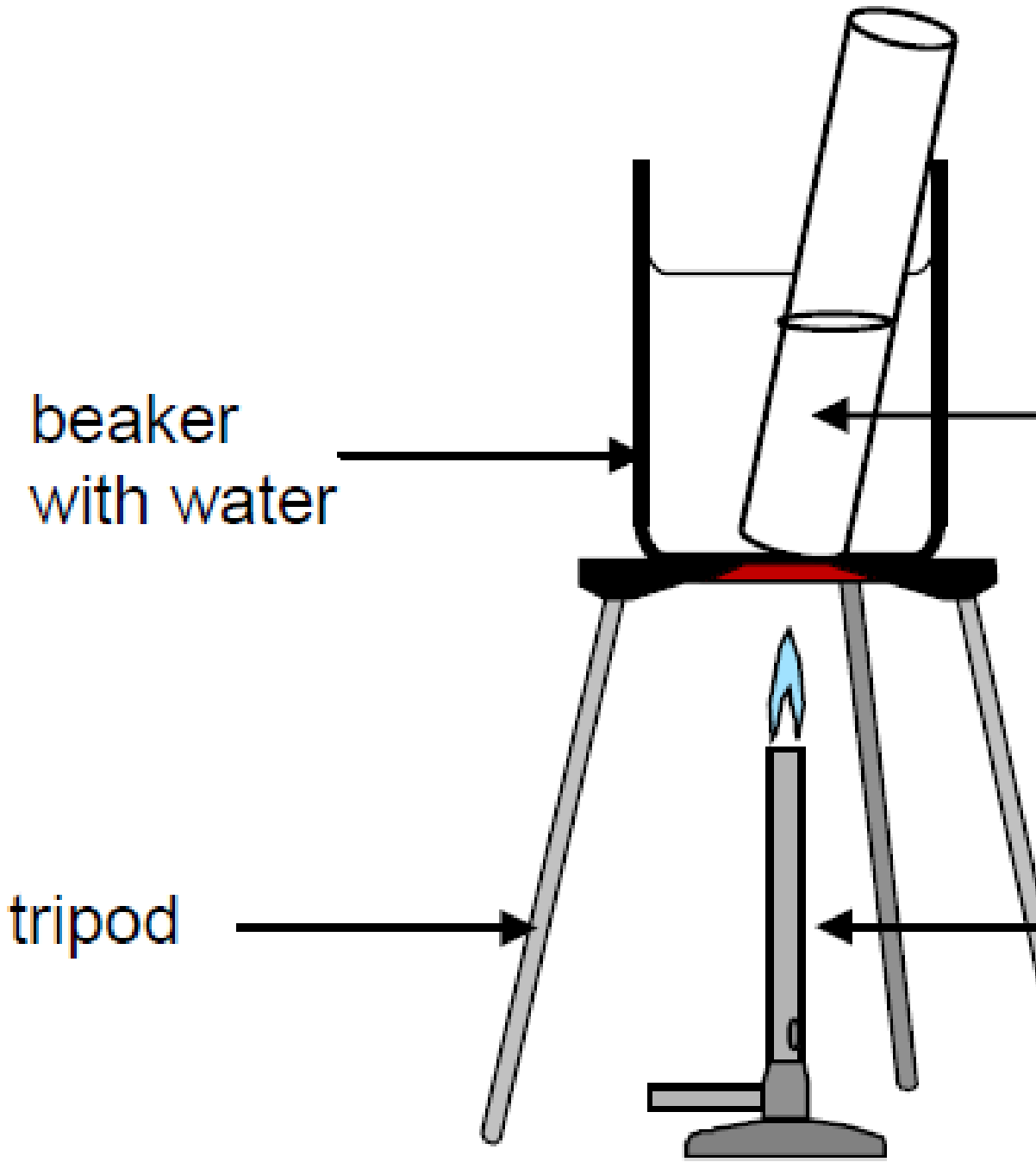
B. C_2H_4

C.



Question 9

9.1 Hexanoic acid is responsible for the unique
with alcohol X, ethyl hexanoate, which is u
Learners set up the apparatus shown belo



9.2 Viscosity is a measure of a fluid's resistanc
compare the viscosities of the first three al

The learners use the stopwatch to measur
the alcohols to flow from the pipette. They
viscosity of each alcohol, as given in the ta

	Alcohol
A	Methanol
B	Ethanol
C	Propan-1-ol

9.2.1 Formulate an investigative question for this

9.2.2 Which one of the alcohols **(A, B or C)** has
give a reason for your answer.

9.2.3. Refer to the intermolecular forces of the th
viscosities as shown in the table.

DATA FOR PHYSICAL
PAPER 2 (C

GEGEWENS VIR FISIESE
VRAESTEL

TABLE 1: PHYSICAL CONSTANTS/*TABEL*

NAME/*NAAM*	SYMBOL/*SIM*
Standard pressure *Standaarddruk*	p^{θ}
Molar gas volume at STP *Molêre gasvolume by STD*	V_m
Standard temperature *Standaardtemperatuur*	T^{θ}
Charge on electron *Lading op elektron*	e

TABLE 2: FORMULAE/*TABEL 2: FORMUL*

$n=\frac{m}{M}$	$c=\frac{n}{V}$ or/*of* $n=\frac{m}$	

TABLE 4A: STANDARD REDU
TABEL 4A: STANDAARD- RE

Half-reactions/*Halfrea*		
$F_2(g) + 2e^-$	=	$2F^-$
$Co^{3+} + e^-$	=	Co^2
$H_2O_2 + 2H^+ + 2e^-$	=	$2H_2$
$MnO_4^- + 8H^+ + 5e^-$	=	Mn^2
$C\ell_2(g) + 2e^-$	=	$2C\ell$
$Cr_2O_7^{2-} + 14H^+ + 6e^-$	=	$2Cr^$
$O_2(g) + 4H^+ + 4e^-$	=	$2H_2$
$MnO_2 + 4H^+ + 2e^-$	=	Mn^2
$Pt^{2+} + 2e^-$	=	Pt
$Br_2(\ell) + 2e^-$	=	$2Br^$
$NO_3^- + 4H^+ + 3e^-$	=	NO(
$Hg^{2+} + 2e^-$	=	Hg(
$Ag^+ + e^-$	=	Ag
$NO_3^- + 2H^+ + e^-$	=	NO_2
$Fe^{3+} + e^-$	=	Fe^{2+}
$O_2(g) + 2H^+ + 2e^-$	=	H_2O
$I_2 + 2e^-$	=	$2I^-$
$Cu^+ + e^-$	=	Cu
$SO_2 + 4H^+ + 4e^-$	=	S +
$2H_2O + O_2 + 4e^-$	=	4OH
$Cu^{2+} + 2e^-$	=	Cu
$SO_4^{2-} + 4H^+ + 2e^-$	=	SO_2
$Cu^{2+} + e^-$	=	Cu^+

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TABLE 4B: STANDARD REDU
TABEL 4B: STANDAARD- RE

Half-reactions/*Halfrea*		
$Li^+ + e^-$	$\rightleftharpoons$	Li
$K^+ + e^-$	$\rightleftharpoons$	K
$Cs^+ + e^-$	$\rightleftharpoons$	Cs
$Ba^{2+} + 2e^-$	$\rightleftharpoons$	Ba
$Sr^{2+} + 2e^-$	$\rightleftharpoons$	Sr
$Ca^{2+} + 2e^-$	$\rightleftharpoons$	Ca
$Na^+ + e^-$	$\rightleftharpoons$	Na
$Mg^{2+} + 2e^-$	$\rightleftharpoons$	Mg
$A\ell^{3+} + 3e^-$	$\rightleftharpoons$	Aℓ
$Mn^{2+} + 2e^-$	$\rightleftharpoons$	Mn
$Cr^{2+} + 2e^-$	$\rightleftharpoons$	Cr
$2H_2O + 2e^-$	$\rightleftharpoons$	H_2(g
$Zn^{2+} + 2e^-$	$\rightleftharpoons$	Zn
$Cr^{3+} + 3e^-$	$\rightleftharpoons$	Cr
$Fe^{2+} + 2e^-$	$\rightleftharpoons$	Fe
$Cr^{3+} + e^-$	$\rightleftharpoons$	Cr^{2+}
$Cd^{2+} + 2e^-$	$\rightleftharpoons$	Cd
$Co^{2+} + 2e^-$	$\rightleftharpoons$	Co
$Ni^{2+} + 2e^-$	$\rightleftharpoons$	Ni
$Sn^{2+} + 2e^-$	$\rightleftharpoons$	Sn
$Pb^{2+} + 2e^-$	$\rightleftharpoons$	Pb
$Fe^{3+} + 3e^-$	$\rightleftharpoons$	Fe
$2H^+ + 2e^-$	**$\rightleftharpoons$**	**H_2(g**
$S + 2H^+ + 2e^-$	$\rightleftharpoons$	H_2S
$Sn^{4+} + 2e^-$	$\rightleftharpoons$	Sn^{2+}

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	39	40	45	48	51	52	55	56	59	
0,8	37 Rb 86	1,0	38 Sr 88	1,2	39 Y 89	1,4	40 Zr 91	41 Nb 92	1,8	42 Mo 96	1,9	43 Tc	2,2	44 Ru 101	2,2	45 Rh 103	2,2	
0,7	55 Cs 133	0,9	56 Ba 137		57 La 139	1,6	72 Hf 179	73 Ta 181		74 W 184		75 Re 186		76 Os 190		77 Ir 192		
0,7	87 Fr	0,9	88 Ra 226		89 Ac													

58 Ce 140	59 Pr 141	60 Nd 144	61 Pm	62 Sm 150	
90 Th 232	91 Pa	92 U 238	93 Np	94 Pu	