

Muungano KCSE Post Trial Exam

233/3

CHEMISTRY

PAPER 3 (Practical)

September 2015

2¼ Hours

Q1. You are provided with:

Solution **H**, acidified sodium hydrogen sulphite solution

Solution **P**, potassium iodates solution

Solution **S**, starch indicator

A stop watch/clock

You are required to find the effect of the concentration of potassium iodate **P**, on the rate of the reaction with acidified sodium hydrogen sulphite, **H**.

NB: The end-point for the reaction of potassium iodate with acidified sodium hydrogen sulphite is detected by the formation of a blue-coloured complex using starch indicator.

Procedure 1

Place solution **P** in a burette and measure out the volumes of **P** as shown in Table 1 into six dry test-tubes. Using a 10cm³ measuring cylinder, add distilled water to the test-tubes as shown in below.

Table 1

Test-tube	Volume of C ₂ and water
(i)	10cm ³ of P + 0 cm ³ distilled water
(ii)	8cm ³ of P + 2 cm ³ distilled water
(iii)	6cm ³ of P + 4 cm ³ distilled water
(iv)	4cm ³ of P + 6 cm ³ distilled water
(v)	3cm ³ of P + 7 cm ³ distilled water
(vi)	2cm ³ of P + 8 cm ³ distilled water

b) Using a clean 10cm³ measuring cylinder, place 10cm³ of solution **H** into a 100cm³ beaker; add 3 drops of solution **S** and shake well. To this mixture add quickly the contents of test-tube (i) and start the stop watch immediately.

Shake the mixture and note the time taken (*in seconds*) for the blue colour to appear. Record the time in **table II**

Repeat this procedure using the other solutions prepared in (a) above and complete the table below.

Table II

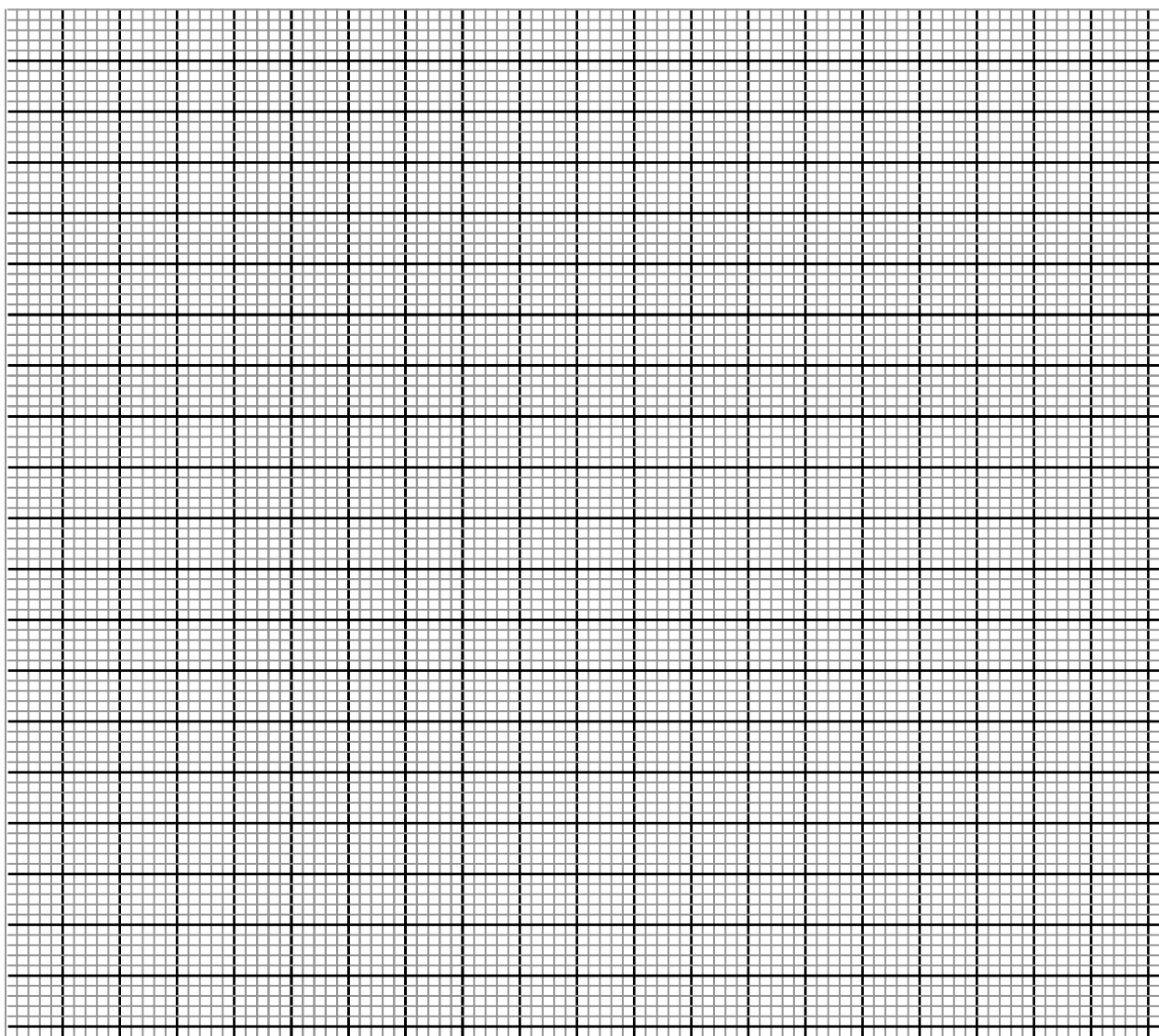
Volume of H (cm ³)	Volume of S (drops)	Volume of P (cm ³)	Volume of distilled water (cm ³)	Time taken for blue colour to appear (seconds)
10	3	10	0	
10	3	8	2	
10	3	6	4	
10	3	4	6	

10	3	3	7	
10	3	2	8	

(6mks)

c) On the grid below **plot a graph** of volume of solution **P** (*vertical axis*) used versus time.

(6mks)



d) From your graph determine the time taken for the blue colour to appear using a mixture of 7cm^3 of **P** and 3cm^3 of distilled water. (1mk)

e) **How does** the concentration of potassium iodate **P**, affect its rate of reaction with acidified sodium hydrogen sulphite **H**? Explain your answer. (2mks)

Q2. You are provided with:

Solution **C**, 0.11M hydrochloric acid

Solution **B**, containing 19.2g/l of a basic compound $\text{Na}_2\text{B}_4\text{O}_7 \cdot n\text{H}_2\text{O}$. You are required to determine the value of n in compound **B**, $\text{Na}_2\text{B}_4\text{O}_7 \cdot n\text{H}_2\text{O}$

Procedure

Place solution **C** in the burette. Pipette 25.0cm^3 of **B** into a 250cm^3 conical flask and titrate using 2 drops of methyl orange indicator.

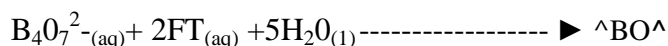
Record your results in the table below; repeat the titration carefully to achieve consistent results.

Table III

<i>Titration number</i>	<i>1</i>	<i>2</i>	<i>3</i>
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of C used (cm ³)			

b) Calculations:

Given that the ionic equation for the reaction is



(1 mole of the base reacts with two moles of the acid)

- Calculate** the concentration of **B** in moles per litre. (3mks)
- Calculate** the relative molecular mass of the basic compound **B**. (2mks)
- Calculate the value of n in the formula. $\text{Na}_2\text{B}_4\text{O}_7 \cdot n\text{H}_2\text{O}$ (B=108, H=1.0, Na=23.0 and O=16.0) (3mks)

Q3. You are provided with solid **X**. Carry out the following tests and record the observations and inferences in the spaces provided.

a) Place a little of solid **X** in a dry test-tube and heat gently.

Observation	Inference
(1mk)	(1mk)

b) Place the remainder of the solid **X** in a boiling tube. Add about 10 cm³ of distilled water and shake well to dissolve the solid. Divide the solution into four positions for tests (i) to (iv) below

i) To the first portion add a few drops of dilute sulphuric acid.

Observation	Inference
(1mk)	(1mk)

ii) To the second portion add dropwise aqueous sodium hydroxide until in excess.

Observation	Inference
(1mk)	(1mk)

iii) To the third portion add one to two drops of aqueous lead nitrate.

Observation	Inference
(1mk)	(1mk)

iv) To the fourth portion add a few drops of barium chloride solution.

Observation	Inference
(1mk)	(1mk)