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Introduction

The paper seemed to be generally accessible to candidates. All parts of all sections were attempted. There was no evidence of candidates being unable to complete the paper due to lack of time.

Question 17 (a)

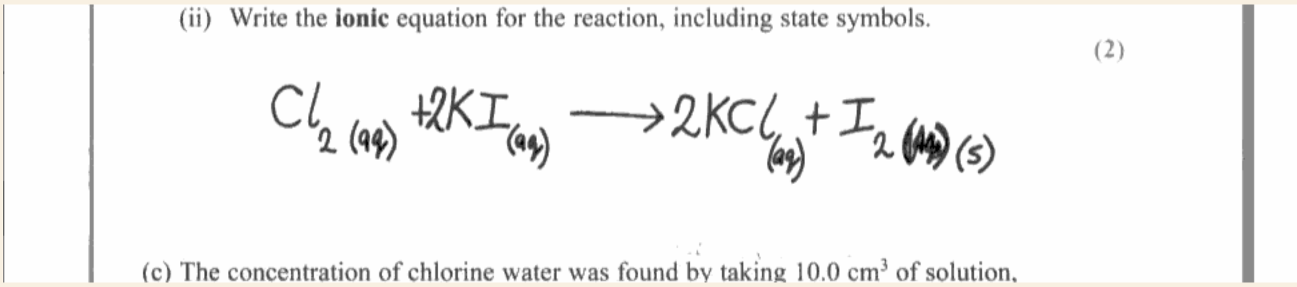
Though colourless was accepted on this occasion, a solution of chlorine in water is green. This is clearly seen if a test tube is viewed down its length and compared with a similar test tube of water. Weak candidates gave mixture of correct and wrong colours.

Question 17 (b) (i)

A mixture of colours, provided they are red/brown, was acceptable for this question, as this is the accurate description of any reasonably strong aqueous solution of iodine. Yellow, the colour of weaker aqueous solutions of iodine, was also acceptable.

Question 17 (b) (ii)

The mode mark on this question was zero. Candidates need more practice at writing ionic equations like these. A fully correct overall equation gained one mark, as did failure to eliminate the spectator potassium ions.


(ii) Write the **ionic** equation for the reaction, including state symbols.

(2)

$Cl_{2(aq)} + 2KI_{(aq)} \longrightarrow 2KCl_{(aq)} + I_{2(s)}$

(c) The concentration of chlorine water was found by taking 10.0 cm³ of solution,

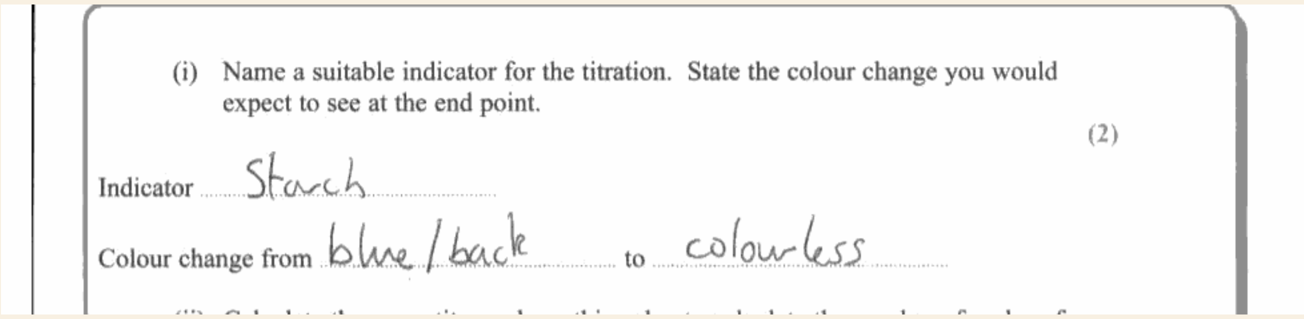
ResultsPlus

Examiner Comments

An acceptable overall equation which gains one mark.

Question 17 (c) (i)

About one third of candidates gave an acid-base indicator like phenolphthalein which gained no credit. About one quarter gave the colour change for starch the wrong way round or an incorrect colour combination.



(i) Name a suitable indicator for the titration. State the colour change you would expect to see at the end point.

(2)

Indicator Starch

Colour change from blue / back to colourless

ResultsPlus
Examiner Comments

The fully correct answer.

Question 17 (c) (ii-vi)

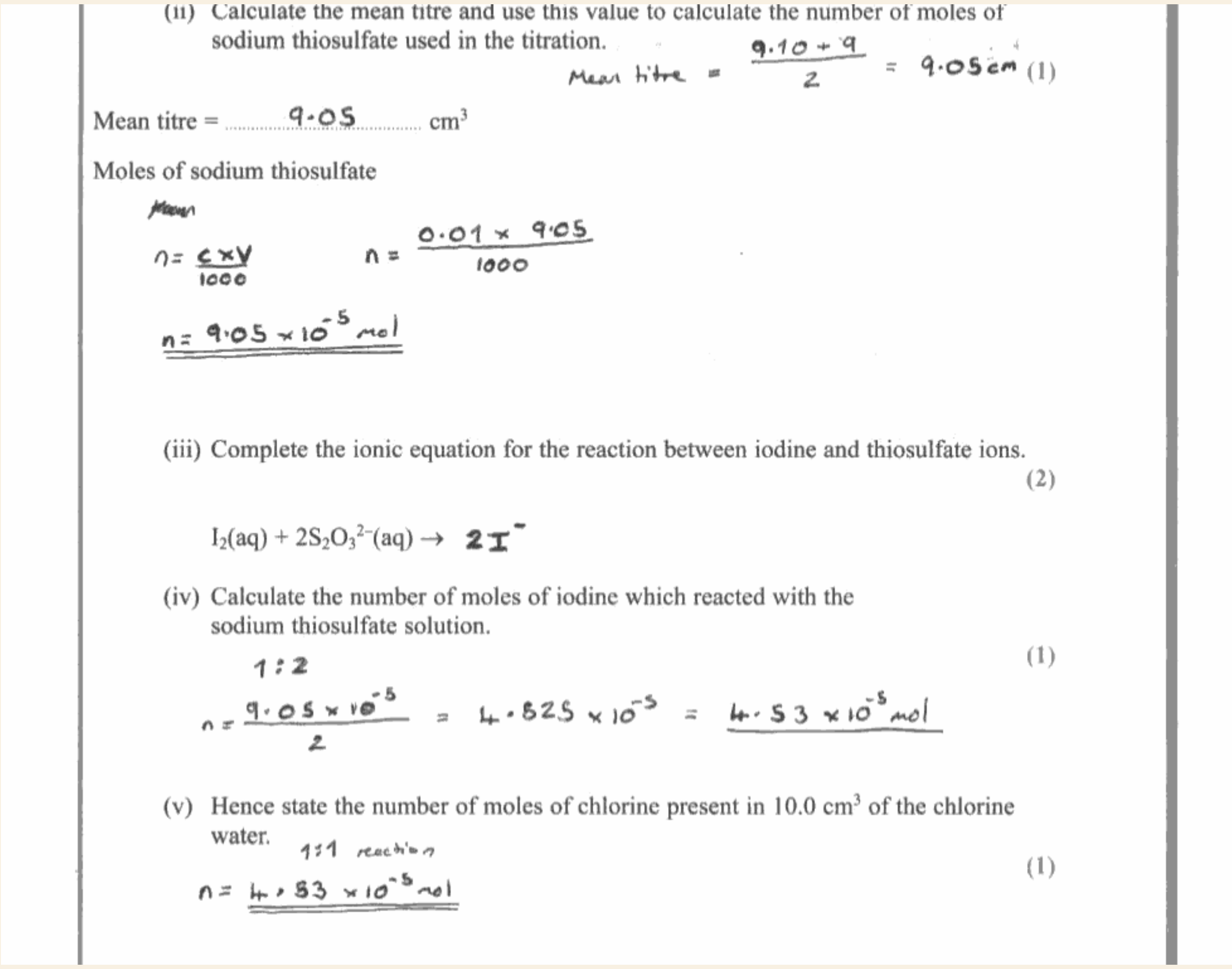
The calculations were generally well done. Some omitted to divide by 1000 in the first part.

About one third of candidates gave an acid-base indicator like phenolphthalein which gained no credit. About one quarter gave the colour change for starch the wrong way round or an incorrect colour combination. The products of an iodine-thiosulfate titration were not well known. Some gave iodide without the stoichiometric number. Most did not know the other product was tetrathionate.

Some candidates multiplied by two, instead of dividing by two in part (iv).

Some candidates began a new calculation in (v).

A small fraction of candidates did not know how to find a concentration of a solution given a volume containing a known number of moles in (vi).



(ii) Calculate the mean titre and use this value to calculate the number of moles of sodium thiosulfate used in the titration. (1)

Mean titre = $\frac{9.10 + 9}{2}$ = 9.05cm

Mean titre = 9.05 cm^3

Moles of sodium thiosulfate

Mean

$n = \frac{c \times V}{1000}$ $n = \frac{0.01 \times 9.05}{1000}$

$n = 9.05 \times 10^{-5}$ mol

(iii) Complete the ionic equation for the reaction between iodine and thiosulfate ions. (2)

$I_2(aq) + 2S_2O_3^{2-}(aq) \rightarrow 2I^-$

(iv) Calculate the number of moles of iodine which reacted with the sodium thiosulfate solution. (1)

1 : 2

$n = \frac{9.05 \times 10^{-5}}{2} = 4.525 \times 10^{-5} = 4.53 \times 10^{-5}$ mol

(v) Hence state the number of moles of chlorine present in 10.0 cm^3 of the chlorine water. (1)

1:1 reaction

$n = 4.53 \times 10^{-5}$ mol

(vi) Calculate the concentration of the chlorine water, in mol dm^{-3}.

(1)

$n = cV$

$c = \frac{n}{V}$

$c = \frac{4.53 \times 10^{-5}}{0.01 \text{ dm}^3}$ $c = 4.53 \times 10^{-3} \text{ mol dm}^{-3}$

ResultsPlus

Examiner Comments

This is a typical answer, missing only the tetrathionate ion.

ResultsPlus

Examiner Tip

Notice how 4.525 has been correctly rounded to 4.53. Incorrect rounding like 4.52, would have been penalised, as would one significant figure.

Question 17 (d) (i)

The vast majority of candidates correctly gave 'lilac'.

(d) Potassium burns in chlorine to form potassium chloride.

(i) Give the colour of the flame when potassium burns in chlorine.

(1)

purple

ResultsPlus
Examiner Tip

Though not strictly correct, this was acceptable.

Question 17 (d) (ii)

This equation was generally well known.

(ii) Write the equation for the reaction between potassium and chlorine. State symbols are **not** required.

(1)

$K + Cl_2 \rightarrow KCl_2$

ResultsPlus
Examiner Comments

Some tried to balance for chlorine by changing the formula of potassium chloride, or forgetting that chlorine is a diatomic molecule.