Mark scheme 5070/3 – Practical Test November 2001

Question 1 (22 marks)

(a) Temperature Readings (12 marks)

For each of the first six temperature differences:
2 marks for a value within 0.5 ^{o}C of the Supervisor's value.
1 mark for a value within 1.0 ^{o}C of the Supervisor's value.
Up to two marks lost for subtraction errors.

(b) Graph (3 marks)

1 mark for the correct plotting of all the points (tolerance one small square).
Two marks for two intersecting curves or straight lines which fit the results as plotted.
The first curve must pass through the origin.

(c) and (d) Temperature and Volume readings (2 marks)

One mark for the correct temperature from the graph (tolerance 0.2 ^{0}C).
One mark for the corresponding volume (tolerance 1 cm^3) from the graph

(e) Concentration of sodium hydroxide (2 marks)

Assuming a value of 27 cm^3

conc of NaOH $= \frac{27 \times 2.0}{50}$ (1)

$=$ 1.1 (correct to 0.1) (1)

(f) Temperature change with base **R** (2 marks)

2 marks for a value within 0.5^{o} C of the Supervisor's value.
1 mark for a value within 1.0 ^{o} C of the Supervisor's value.

(g) pH of solutions (1 mark)

Assuming that the temperature rise in (f) is less than the value given in (d)
one mark for ticking pH **Q** = 14 and pH **R** = 11.

This is marked consequentially on the candidate's results.

Question 2 (18 marks)
T is nickel sulphate

Test	**Acceptable alternatives**	**Unacceptable alternatives**

Test 1 *T* + *NaOH* **2 marks** green ppt + *excess NaOH* no change	 shades of green both green and ppt required. allow solid, suspension, powder green ppt, ppt remains etc	 blue substance, particles, deposit, residue, sediment, gelatinous, insoluble etc partially soluble, partially insoluble
Test 2 *T* + NH_3 **4 marks** blue ppt + *excess* NH_3 ppt dissolves blue solution	 violet forms a blue solution (2) solution turns blue (1)	 green
Test 3 *T* + $Ba(NO_3)_2$ **3 marks** white ppt + HNO_3 insoluble	 white ppt, no change, does not dissolve, etc. milky/cloudy = (0) but milky/cloudy remains = (1)	 See Test 1 partially soluble, partially insoluble

Test 4 *T* + *NaClO* **6 marks** green ppt ppt turns black effervesces <u>gas</u> bleaches litmus chlorine	 Black solution (1) bubbles, fizzes, gas <u>vigorously</u> evolved gas must be implied to score chlorine mark test must be at least partially correct	 Green solution gas evolved
Test 5 + H_2O_2 **5 mark** ppt dissolves green solution effervesces <u>gas</u> relights a <u>glowing</u> splint oxygen	 Partially soluble forms a green solution (2) turns green (1) bubbles, fizzes, gas <u>vigorously</u> evolved gas must be implied to score oxygen mark test must be at least partially correct	 gas evolved

Conclusion (1 mark)

The anion is Sulphate or SO_4^{2-}

To score SO_4^{2-} a candidate needs a ppt that must not dissolve in Test 5.

[Any 18 marks to score]