UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2009 question paper for the guidance of teachers

5070 CHEMISTRY

5070/04 Paper 4 (Alternative to Practical), maximum raw mark 60

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1 **(a)** to dry/dehydrate/absorb water
no need to mention ammonia or product [1]

(b) **Y** (1) less dense or lighter <u>than air</u> (1), soluble in water (1)
X suggested but property(ies) is/are correct (1) or (2)
no e.c.f on **X** and appropriate properties. **Z** scores 0. [3]

(c) **(i)** phosphorus or P (1) (not phosphate) [1]

(ii) warm (1) aq. NaOH (1) ammonia or gas + test (1)
ammonia + test on its own 0 marks
use of HC*l* + warm + NH_3/test only scores NH_3 mark [3]

(iii) r.m.m. of $(NH_4)_3PO_4$ = 149 (1)
1 kg contains 281.9 (282) g N. (1) (not 280 or 281)
look for 149 somewhere in working
correct answer gets 2 (e.c.f from wrong M_r) [2]

[Total: 10]

2 **(a)** 1.89 g (1.90 penalised only if used in **(d)**) [1]

(b) white or yellow solid or powder (both colour and solid)
(not ppt) [1]

(c) toxic (or any word meaning toxic) gas/NO_2 evolved [1]

(d) 0.01 moles (1) incorrect answer to **(d)** may be used e.c.f in **(e)** [1]

(e) 480 cm^3 NO_2 (1), 120 cm^3 O_2 (1) mark independently
e.c.f examples:
- answer in dm^3 but shown as cm^3.
- 240 incorrect but 60 based on 1st volume.
- ¼ of any other first reasonable incorrect volume.

1 mark in all cases [2]

(f) nitric acid [1]

[Total: 7]

3 **(d)** **[Total: 1]**

4 **(c)** **[Total: 1]**

5 **(d)** **[Total: 1]**

6 (c) **[Total: 1]**

7 (b) **[Total: 1]**

8 (a) 1.7(0) g [1]

(b) carbon dioxide (1) lime water turns milky/cloudy/white ppt. (1)
(not misty or foggy) no other gas nor test counts [2]

(c) orange, red, pink to yellow (1) any combination of dark to light. [1]

(d)

25.9	48.6	32.4
0.0	23.3	6.9
25.9	25.3	25.5

mean value = 25.4 cm^3 (1)
1 mark for each row or column (3) (mark rows or columns) [4]

(e) 0.00254 [1]

(f) 0.00254 [1]

(g) 0.0254 [1]

(h) 0.05 [1]

(i) 0.0246 [1]

(j) 0.0123* [1]

(k) r.m.m. = 138(.2) (1), r.a.m. **M** = 39 (1)
any value between 24 and 50 is acceptable for potassium as answer to **(l)**.
(e.c.f throughout question) [2]

(l) potassium (1) reason based on ion charge/position in Group 1 in Periodic Table (1). [2]

* if answer in **(j)** is doubled rather than halved r.m.m becomes 35.
1st mark in **(k)** scores but no further mark is possible.
if answer to **(j)** is the same as **(i)**, **(k)** becomes 70 and r.a.m. becomes 5. Lithium is acceptable answer (2–22)
alternative reasons supporting potassium:

- A_r is 39
- It is an alkali metal or in Group 1 in the Periodic Table

[Total: 18]

9 **(a)** **C** contains a transition metal ion/transition metal/d-block metal (1)
not it is a transition metal. [1]

(b) and **(c)** (red brown precipitate) insoluble in excess (both) (1) [1]

(b) and **(c)** **C** contains Fe^{3+} ions (both) (1) [1]

(d) aq. NaOH (1) aluminium foil (1) and heat (1) (brown ring test)
if either NaOH or A*l* not mentioned only heat scores
if neither NaOH nor A*l* mentioned heat does not score
gas evolved or ammonia + test (1)
$Fe(NO_3)_3$ (1) e.c.f for Fe^{2+} concluded in **(b)** and **(c)** [5]

[Total: 8]

10 **(a)** **(i)** 0.25 g (1)

(ii) 35.2, 26.3. (1) 8.9 °C (1) [3]

(b) **(i)** 60 [1]

(ii) 0.0042 (1) allow 0.00416, 0.00417 but not 0.0041 [1]

* **(iii)** –1780 (1) kJ/mol answer must include –ve sign. [1]

(c) exothermic [1]

(d) heat loss/no insulation/incomplete combustion of the alcohol/evaporation of alcohol
any 2 [2]

(e) all points plotted correctly (1)
points connected by a smooth curve (1) [2]

(f) 0.59 g (1) (read candidates curve)
to +/- half small square but accept 0.585 etc [1]

* 0.00416 = – 1797 0.004166 = –1794.3
0.00417 = – 1793 0.0041 = –1823

[Total: 12]