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

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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

(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 HCl + warm + NH$_3$/test only scores NH$_3$ mark   [3]

(iii) r.m.m. of (NH$_4$)$_3$PO$_4$ = 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)

7 (b) [Total.

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** <u>contains</u> a transition metal ion/transition metal/d-block metal (1)
not <u>it is</u> a transition metal.

(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 <u>not</u> 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]