

**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 than air (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 + NH₃/test only scores NH₃ mark [3]
- (iii) r.m.m. of (NH₄)₃PO₄ = 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) 1.89g (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/NO₂ evolved [1]
- (d) 0.01 moles (1) incorrect answer to (d) may be used e.c.f in (e) [1]
- (e) 480cm³ NO₂ (1), 120cm³ O₂ (1) mark independently
e.c.f examples:
- answer in dm³ but shown as cm³.
 - 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]

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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 cm³ (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]

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- 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 *Al* not mentioned only heat scores
if neither NaOH nor *Al* mentioned heat does not score
gas evolved or ammonia + test (1)
 $\text{Fe}(\text{NO}_3)_3$ (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]