01. 0620_m15_ms_62 Q: 5

tests on solution **E**

(a) yellow / green / any combination of yellow/green [1]

(b) white precipitate (1) [1]

(c) **(i)** green (1) precipitate (1) [2]

(ii) indicator paper turns blue (1)

pungent / sharp smell(1) [2]

(d) brown precipitate (1) [1]

(g) hydrogen (1) [1]

(h) any **two** from:
transition metal (1)

different valencies / colours (1)

acidic solution (1) [2]

---

02. 0620_m16_ms_62 Q: 3

(a)	blue / green (solid / crystals);	**1**
(b)(i)	(pale) blue; precipitate; royal / deep blue; dissolves / solution;	**4**
(b)(ii)	(pale) blue precipitate;	**1**
(b)(iii)	white precipitate;	**1**
(b)(iv)	no reaction / change / precipitate;	**1**
(c)	ammonium; iodide;	**2**

03. 0620_m17_ms_62 Q: 1

(a)	electrode(s)	1
(b)	diagram of test-tube over either electrode	1
	containing liquid	1
(c)	test: glowing splint result: relights	1
(d)(i)	carbon dioxide	1
(d)(ii)	oxygen reacted with carbon	1
(e)	solution became more acidic / more concentrated	1
	water was broken down / electrolysed	1

04. 0620_m17_ms_62 Q: 3

(a)(i)	white	1
	precipitate	1
(a)(ii)	(white precipitate) dissolves	1
(b)(i)	white precipitate	1
(b)(ii)	(white precipitate) dissolves	1
(c)	cream	1
	precipitate	1
(d)	sodium	1
	iodide	1

05. 0620_m17_ms_62 Q: 4

(a)	any 4 from: **M1** measure initial temperature of (solid) ammonium chloride / barium hydroxide **M2** add barium hydroxide / ammonium chloride / other solid **AND** mix / stir **M3** use a thermometer **M4** measure the temperature of the mixture / final temperature **M5** temperature decreases / test-tube feels cold	4
(b)	**M1** add (aqueous) sodium hydroxide (and warm)	1
	M2 gas produced turns (red) litmus blue	1

06. 0620_m18_ms_62 Q: 3

	tests on solution **M**	
(a)	yellow / brown	1
(b)	white	1
	precipitate	1
(c)	no reaction / change / precipitate	1
(d)(i)	brown	1
	precipitate	1
(d)(ii)	no change / precipitate remains / insoluble	1

	tests on solid **N**	
(e)	carbon dioxide	**1**
(f)	copper / transition element	**1**
	carbonate	**1**

07. 0620_m19_ms_62 Q: 1

1(a)	Electrolysis	**1**
1(b)	Open (air hole / collar)	**1**
1(c)	Fizzing / bubbles / green gas	**1**
	Chlorine / Cl_2	**1**
1(d)	Iron reacts (with chlorine) / iron is reactive / not inert	**1**
1(e)(i)	Bubbles / effervescence / fizzing	**1**
	Hydrogen (is below zinc in the reactivity series)	**1**
1(e)(ii)	Litmus	**1**
	Bleached / turns white	**1**
1(f)	Wear gloves / goggles	**1**

08. 0620_m19_ms_62 Q: 2

2(a)	Table of results for Experiment 1 Initial and final volumes completed correctly 1.1, 16.1	**1**
	Difference 15.0	**1**
2(b)	Table of results for Experiment 2 Initial, final volumes and difference completed correctly 1.9, 31.9, 30.0	**1**
	All readings to 1 dp in **(a)** and **(b)**	**1**
2(c)(i)	Solution A	**1**
	Smaller volume / less (of potassium manganate used) / solution A	**1**
2(c)(ii)	2 □ (times) as concentrated	**1**
2(d)(i)	2 □ (times) value from table for Experiment 2, 60 cm^3	**1**
	Double volume (of C) used	**1**
2(d)(ii)	Volume of potassium manganate solution added > 50 cm^3	**1**
	Use more than one burette / refill burette	**1**
2(e)	Advantage easy to use / quick	**1**
	Disadvantage not as accurate owtte	**1**
2(f)	(Solution C) contains iron(II) (ions) / Fe^{2+}	**1**
	Reference to oxidation / (iron(II)) → iron(III) / Fe^{3+}	**1**

09. 0620_m19_ms_62 Q: 3

Tests on solution D		
3(a)	1–3	**1**
3(b)	Bubbles / fizz / effervescence	**1**
	Lighted splint / flame	**1**
	'Pops'	**1**
3(c)	No reaction / no change / no precipitate	**1**
3(d)	White precipitate	**1**
Tests on solid E		
3(e)	Carbon dioxide	**1**
3(f)	Calcium	**1**
	Carbonate	**1**

10. 0620_m20_ms_62 Q: 3

Question	Answer	Marks
	Tests on solution J	**1**
(a)	1	**1**
(b)	carbon dioxide	**1**
(c)(i)	hydrochloric acid / HCl hydrogen (ions) / H^+ chloride (ions) / Cl^-	**2**
	Tests on solid K	**1**
(d)	no change	**1**

Question	Answer	Marks
(e)	(red) litmus	**1**
	(litmus) turns blue	**1**

Question	Answer	Marks
	Tests on solution J	1
(a)	1	1
(b)	carbon dioxide	1
(c)(i)	hydrochloric acid / HCl hydrogen (ions) / H^+ chloride (ions) / Cl^-	2
	Tests on solid K	1
(d)	no change	1

11. 0620_m21_ms_62 Q: 3

Question	Answer	Marks
(a)	ammonia / NH_3	1
(b)	lithium nitrate lithium (ions) / Li^+	1
	nitrate / NO_3^-	1
(c)	white precipitate	1
	dissolves / disappears / forms colourless solution	1
(d)	white precipitate	1
	remains / does not dissolve / no further change / white precipitate / nothing happens	1
(e)	no change	1
(f)	white precipitate	1

12. 0620_p20_ms_60 Q: 3

(a) platinum / graphite / carbon [1]

(b) damp blue litmus paper / Universal indicator paper / pH paper; [1]
bleaches / turns white; [1]

(c) hydrogen [1]

13. 0620_p20_ms_60 Q: 4

(a) (i) white precipitate [1]

(ii) precipitate dissolves in excess; [1]

(iii) white precipitate; [1]
no change / precipitate remains; [1]

(b) contains water / hydrated [1]

(c) ammonia
not: ammonium [1]

(d) Any two from:
nitrate;
hydrated salt / contains water;
it is not a sulfate; [2]

(e) sodium hydroxide is hazardous / irritant / caustic; [1]
allow: toxic
boiling causes mixture to spit / blow-out; [1]

---

14. 0620_p20_ms_60 Q: 5

(a) Universal indicator / pH paper; [1]
pH of 4–6 / yellow / orange; [1]
note: any suitable test with appropriate result

(b) Any four from:
chromatography;
description of applying food colouring to paper;
use of solvent;
results / number of spots;
compare results to known sample / reference to R_f value; [4]
marks can be obtained from a labelled diagram

---

15. 0620_s12_ms_61 Q: 5

(c) fizz/bubbles/effervescence (1) limewater (1)
milky/cloudy/white ppt (1) **cond**: on limewater [3]

(e) ammonia (1) [1]

(f) non-transition metal (1)
ammonium (salt or carbonate) (2) **not**: ammonia max [2]

[Total: 6]

---

16. 0620_s12_ms_62 Q: 3

(a) bulb/lamp lights/water level falls/green-yellow gas (1) [1]

(b) arrows labelling electrodes as anode/cathode or + – or the electrodes or Pt (1)
allow: labels either way round **not**: the wires labelled [1]

(c) **(i)** hydrogen (1) [1]

(ii) lighted splint (1) if Cl_2 in **(c)(i)** allow ecf for damp litmus/indicator paper
no ecf for anything other than Cl_2

pops (1) if Cl_2 in **(c)(i)** allow ecf for bleached/white/decolourised [2]
note: These are conditional marks so the result is conditional on the test, i.e. glowing splint pops = 0/2

(d) chlorine (1) soluble/dissolves/reacts (1) [2]

[Total: 7]

---

17. 0620_s12_ms_62 Q: 6

(d) appearance colourless (1) **ignore**: clear
smell vinegar/pungent/sour/sharp (1) **ignore**: sweet/strong [2]

(e) pH 2–6 (1) [1]

(f) carbon dioxide (1) [1]

(g) copper/Cu^{2+} (1) carbonate/CO_3^{2-} (1) [2]

[Total: 6]

---

18. 0620_s12_ms_63 Q: 2

bromine (water) (1) not: bromide
colourless (1)
aqueous silver nitrate (1)
yellow precipitate (1)
named indicator/solution of copper salt (1)
correct colour change/pH/blue precipitate (1) [6]

[Total: 6]

---

19. 0620_s12_ms_63 Q: 5

(c) bubbles/fizz/effervescence (1) [1]
limewater (1) milky (1) [2]

(d) **(i)** blue (1) precipitate (1) [2]

(ii) blue precipitate (1) [1]
dark/deep blue (1) solution/dissolves (1) [2]

(e) barium/calcium (1) chloride (1) **not**: chlorine ions [2]

[Total: 10]

---

20. 0620_s13_ms_61 Q: 1

(a) electrode(s) / anode / cathode(either) (1)
allow: electrodes labelled wrong way round **not:** carbon/platinum

bulb / lamp / light (1) [2]

(b) lighted splint (1) pops (1) glowing splint = 0 [2]

(c) graduated test-tube / measuring cylinder (1) **not:** gas syringe as will not work

filled with electrolyte / acid / water inverted over electrode / owtte (1) [2]

(d) **(i)** sodium hydroxide (1) [1]

(ii) universal indicator with pH>7 / litmus turns blue (1) [1]
note: mark not awarded if **(d)(i)** is incorrect

---

21. 0620_s13_ms_61 Q: 2

(a) to prevent air / oxygen / bacteria entering jar (1) [1]

(b) pestle and / or mortar (1) [1]

(c) diagram of funnel and filter paper (1) labelled (1) [2]

(d) yeast would not work at high temperatures / kills yeast / denatures enzymes / owtte (1) [1]
allow: kills enzyme

(e) **(i)** bubbles / froth (1) [1]
not: gas / CO_2 given off / turns cloudy

(ii) (collect gas) and measure volume / count bubbles (1)

over certain time interval (1) [2]
allow: one mark for timing until bubbles / reaction stopped

(f) fractional distillation (1) [1]

---

22. 0620_s13_ms_62 Q: 4

(a) colourless (1) **ignore:** clear, **not:** white [1]

(b) white (1) precipitate (1)

dissolves / clears (1) [3]

(c) white precipitate (1) insoluble / does not dissolve (1) [2]

(d) no change / colourless solution / no reaction (1) [1]

(e) white (1) precipitate (1) [2]

(g) carbon dioxide / CO_2 (1) [1]

(h) calcium / Ca^{2+} (1) **accept:** any Group 2 metals carbonate / CO_3^{2-} (1)
note: $CaCO_3$ = 2 [2]

---

23. 0620_s13_ms_63 Q: 4

tests on solid **H**

(a) blue / green (1) [1]

(b) blue (1) precipitate (1) [2]

(c) blue (1) precipitate (1) [2]

with excess deep blue (1) solution / clear / dissolves (1) [2]

(d) forms a carbonate on heating / carbon dioxide present (1)

organic / ethanoate (1) [2]

---

24. 0620_s14_ms_61 Q: 5

(d) white (1)

precipitate (1) [2]

(e) no reaction / no change / no precipitate (1) [1]
allow: colourless solution

(f) not a chloride / halide (1) [1]

(g) oxygen / O_2 (1) [1]
not O

(h) transition metal / manganese (1)

hydrated salt (1)
ignore: sulfate

allow: catalyst (1) max [2]

---

25. 0620_s14_ms_62 Q: 5

(b) pH paper turns blue / pH > 7 / reference to smell of the gas (1) [1]

(c) **(i)** paper turns blue / pH > 7 (1)

reference to smell of gas (1)
ignore: fizzing

(ii) white (1)

precipitate (1)

(f) zinc (1)
allow: Zn^{2+}
ignore: incorrect formulae

carbonate (1)
allow: CO_3^{2-}
ignore: incorrect formulae

---

26. 0620_s14_ms_63 Q: 4

(a) temperature boxes correctly completed (2),
25, 36, 38, 37, 36, 35, 34 [2]
guidance: 7 correct (2); 6 correct (1); 5 or fewer correct (0)

(b) temperature boxes completed correctly
25, 19, 18, 17, 16, 16, 17 [2]
guidance: 7 correct (2); 6 correct (1); 5 or fewer correct (0)

(d) all points correctly plotted(3)
guidance: 7 correct (2); 6 correct (1); 5 or fewer correct (0)

smooth line graphs (2)

labels (1) [6]

(e) **(i)** value from graph (1) 37.5 s

shown clearly (1) [2]

(ii) value from graph (1) 6 s

shown clearly (1) [2]

(f) endothermic (1) [1]

(g) M is a carbonate / carbon dioxide given off (1) [1]

(h) lower temperature changes (1)

greater volume / more water (1) [2]

(i) room temperature or 25 °C (1)

reaction finished (1) [2]

(j) more readings / points / more accurate / better graph (1) [1]

---

27. 0620_s14_ms_63 Q: 5

(c) **(i)** white (1)

precipitate(1)

insoluble(1) [3]

(ii) no / thin precipitate (1) [1]

(iii) yellow precipitate (1) [1]

(d) copper (1)

oxide (1) [2]

---

28. 0620_s15_ms_61 Q: 5

(c)	white; precipitate; dissolves / clears;	3	
(d)	white precipitate;	1	
(e)	no reaction / no change / no precipitate / colourless solution;	1	
(f)	white; precipitate;	2	
(g)	hydrated / water;	1	
(h)	not a halide / not a named halide;	1	
(i)(i)	ammonia / NH_3;	1	
(i)(ii)	ammonium / NH_4^+;	1	

29. 0620_s15_ms_62 Q: 3

	aqueous potassium hydroxide named indicator e.g. red litmus; correct colour e.g. turns blue; **OR** pH paper / indicator / meter / probe; >7; **OR** chemical test e.g. copper sulfate solution; correct result e.g. blue precipitate; *octane* lighted splint; liquid catches fire; **OR** add to water; immiscible; *pure water* boiling point / melting point; 100 °C / 0 °C;	**6**	note: any correct tests allowable for these liquids **I** pH scale, but **A** measure pH, **A** the observation in both cases **A** burn it **I** chemical tests for water **I** indicators / pH tests **I** tests that would also work for KOH(aq)

30. 0620_s15_ms_62 Q: 5

(b)	pungent smell; paper turns blue / purple / green;	**2**	**A** sharp **I** pH
(c)	(pale) yellow; precipitate;	**2**	**R** bright yellow
(e)	pH 8–14;	**1**	**A** above 7 / 7–14
(f)	carbon dioxide;	**1**	
(g)	barium / lead / calcium / silver; carbonate;	**2**	

31. 0620_s15_ms_63 Q: 5

(c)	red brown; precipitate; no change;	**3**	
(d)	red brown precipitate;	**1**	
(e)	no change / no precipitate / no reaction / nothing;	**1**	
(f)	white; precipitate;	**2**	
(g)	hydrated / water;	**1**	
(h)	not a halide / not a named halide;	**1**	
(i)(i)	ammonia / NH_3;	**1**	
(i)(ii)	ammonium / NH_4^+;	**1**	

32. 0620_s16_ms_61 Q: 3

(a)	sodium; bromide;	**2** 1 1
(b)	green;	**1**
(c)(i)	green; precipitate; with excess, green solution / clear / dissolves;	**3** 1 1 1
(c)(ii)	grey-green; precipitate;	**2** 1 1
(c)(iii)	white precipitate;	**1**
(d)	fume cupboard / protective clothing, e.g. gloves or goggles;	**1**

33. 0620_s16_ms_62 Q: 3

(a)	white (solid / crystals / powder);	1
(b)(i)	no change;	1
(b)(ii)	turns from purple / pink; to colourless / white;	2 1 1
(c)	yellow / orange (flame);	1
(d)	ammonia / NH_3;	1
(e)	ammonium / NH_4^+;	1

34. 0620_s16_ms_63 Q: 3

(a)(i)	white; precipitate; dissolves;	3 1 1 1
(a)(ii)	white precipitate; dissolves;	2 1 1
(a)(iii)	no reaction / change / precipitate;	1
(a)(iv)	any 3 from: effervescence / fizz / bubbles; red litmus / pH paper; blue / pH > 7; pungent smell;	3
(b)	lithium; carbonate;	2 1 1

35. 0620_s17_ms_61 Q: 3

(a)	solid spits out of the tube / the tube might crack	1
(b)	carbon dioxide	1
(c)	copper / Cu^{2+}	1
	carbonate / CO_3^{2-}	1
(d)	white	1
(e)(i)	no reaction / change	1
(e)(ii)	yellow	1
	precipitate	1
(f)	lilac	1

(g)	any 2 from: □ blue / roaring / hot flame □ use of a splint / wire to introduce the solid into the flame □ use of (concentrated) hydrochloric acid	2

36. 0620_s17_ms_61 Q: 4

(a)	(red) litmus turns blue	1
(b)	heat / boil the mixture	1
	condense the vapour	1
(c)	filter / decant	1
	wash residue (with water)	1
	dry	1

37. 0620_s17_ms_62 Q: 1

(a)	measuring cylinder	1
	conical flask	1
(b)	bubbles / fizz / effervescence	1
(c)	time (taken)	1
	s / seconds / secs	1
(d)(i)	80 and 40 (cm^3)	1
	Experiment 1 at twice / double the volume of Experiment 2	1
(d)(ii)	two times as much / mass / amount / length magnesium used (in Experiment 1)	1
(d)(iii)	curve drawn is steeper than Experiment1	1
	curve drawn finishes at the same level as Experiment 1	1

38. 0620_s17_ms_62 Q: 3

(a)	initial temperature and final temperature recorded correctly: 19, 23	1
	temperature difference correctly calculated: 4	1
(b)	endothermic	1
(c)	sulfur dioxide	1
(d)	sodium / Na^+	1
	sulfite / SO_3^{2-}	1
(e)	red	1
(f)	white	1
	precipitate	1

39. 0620_s17_ms_63 Q: 3

(a)	chlorine	1
(b)(i)	iron(III)	1
	hydroxide	1
(b)(ii)	green	1
	precipitate	1
(c)	oxygen	1
(d)	catalyst	1
	transition element compound / manganese oxide	1

40. 0620_s18_ms_61 Q: 3

(a)	hydrogen / H_2	1
(b)	sulfuric	1
	acid	1
(c)	limewater	1
	milky / cloudy / white ppt.	1
(d)(i)	white	1
	precipitate	1
(d)(ii)	dissolves / clears / goes colourless	1
(e)(i)	white precipitate	1
(e)(ii)	dissolves / clears / goes colourless	1

41. 0620_s18_ms_62 Q: 1

(a)	(gas) syringe	1
(b)(i)	volume of gas / volume of carbon dioxide	1
(b)(ii)	reaction finished / no more gas given off	1
	calcium carbonate used up	1
(c)	sketch less steep at beginning	1
	to same level / volume / final amount of gas	1
(d)	limewater / calcium hydroxide solution	1
	milky / cloudy / white ppt.	1

42. 0620_s18_ms_62 Q: 3

(a)	(pale) green (solid / crystals)	1
(b)	no change / no reaction / no precipitate / no observation	1
(c)	white precipitate	1
(d)	green	1
	precipitate	1
(e)	green precipitate	1
(f)	calcium	1

43. 0620_s18_ms_63 Q: 3

(a)(i)	yellow	1
(a)(ii)	pH 11–14	1
(b)	white precipitate	1
	clears / dissolves	1
	white precipitate	1
(c)	pH / litmus paper	1
	turns pH >7 / turns blue	1
(d)	grey-green	1
	precipitate	1

(e)	organic / fuel / flammable	1

44. 0620_s19_ms_61 Q: 1

(a)	(conical) flask (1) gas jar (1)	2
(b)	no bung in second flask (1) gas jar should not be inverted (1)	2
(c)	to dry the gas / remove water	1
(d)	litmus (1) turns white/bleaches (1)	2
(e)	chlorine / gas is poisonous / toxic	1

45. 0620_s19_ms_61 Q: 3

	Tests on solution F	
(a)	0–3	1
(b)	bubbles / fizz / effervescence (1) lighted splint / flame (1) pops (1)	3
(c)	white precipitate	1
(d)	no reaction/change	1
	Tests on solid G	
(e)	calcium (1) carbonate (1)	2

46. 0620_s19_ms_62 Q: 2

(a)	table of results	2
	time boxes completed 20, 34, 68, 98 in seconds	1
(b)	appropriate scale for *y*-axis	1
	all points plotted correctly	1
	best fit smooth line graph between plotted points	1
(c)	extrapolation shown clearly	1
	value from graph	1
	unit … s	1
(d)(i)	(length) is a control variable	1
(d)(ii)	times / results would be lower / smaller / less (because less magnesium is used)	1
(e)	apparatus: **M1** gas syringe / measuring cylinder over water	1
	measurement 1: **M2** volume of gas	1
	measurement 2: **M3** time	1

(f)(i)	exothermic / redox / displacement	1
(f)(ii)	hydrogen / H_2	1

47. 0620_s19_ms_62 Q: 3

	Tests on solid L	
(a)	white (solid / crystals)	1
(b)	condensation / drops on side of tube	1
	cobalt(II) chloride paper turns from blue	1
	to pink	1
(c)	any **two** from: □ (red) litmus paper □ turns blue □ pungent smell	2
(d)	white precipitate	1
(e)	iron(III) / Fe^{3+}	1
	chloride / Cl^-	1

48. 0620_s19_ms_63 Q: 3

	Tests on solid N	
(a)	white (solid)	1
(b)	condensation / drops on side of tube	1
	cobalt(II) chloride paper turns (from blue) to pink	1
(c)(i)	white precipitate	1
(c)(ii)	precipitate dissolves / clears / soluble	1
(d)	white precipitate	1
	Tests on solid O	
(e)	potassium	1
	chloride	1

49. 0620_s20_ms_61 Q: 3

Question	Answer	Marks
	Tests on solid G	
(a)	any **three** from: • bubble / fizz / effervescence • blue solution formed • (gas made turns) limewater • milky	3
(b)	• carbon dioxide / CO_2	1

Question	Answer	Marks
(c)	blue	1
	precipitate	1
	dark(er) / royal blue and dissolves / solution	1
(d)	not a halide	1
	tests on solid H	
(e)	hydrated	1
	sodium / Na^+ sulfate / SO_4^{2-} sodium sulfate = 2 Na_2SO_4 = 2	1

50. 0620_s20_ms_62 Q: 3

Question	Answer	Marks
	Tests on solution L	
(a)	stays purple **or** no change	1
(b)	green ppt	1
	(dissolves / soluble) producing a green solution	1
(c)	grey-green precipitate	1
	remains in excess / does not dissolve	1
(d)	white precipitate	1

Question	Answer	Marks
	Tests on solid M	
(e)	sodium / Na^+	1
	carbonate / CO_3^{2-}	1

51. 0620_s20_ms_63 Q: 3

Question	Answer	Marks
	Tests on solid N	
(a)	ammonia	1
(b)	zinc / Zn^{2+}	1
	nitrate / NO_3^-	1
	Tests on solid P	
(c)	white	1
(d)	lilac	1
(e)(i)	(pale) yellow precipitate	1

Question	Answer	Marks
(e)(ii)	no change	1
(e)(iii)	becomes brown / orange / yellow	1

52. 0620_s21_ms_61 Q: 3

Tests on solid E		
(a)	hydrated / contains water (of crystallisation)	1
(b)	not a halide	1
(c)	ammonium / NH_4^+	1
	aluminium / Al^{3+}	1
	sulfate / SO_4^{2-}	1
Tests on solid F		
(d)	yellow	1
(e)(i)	blue	1
(e)(ii)	blue ppt	1

53. 0620_s21_ms_62 Q: 3

Question	Answer	Marks
	Tests on solid G	
(a)	oxygen / O_2	1
(b)	calcium / Ca^{2+}	1
	iodide / I^-	1
	Tests on solid H	
(c)	any 2 from: • white fumes given off • condensation at mouth of tube • solid (changes from blue and) becomes white	2
(d)	blue-green	1

Question	Answer	Marks
(e)	(light) blue precipitate	1
	dissolves / forms a solution / soluble (in excess)	1
	which is a darker / deep blue	1
(f)	white precipitate	1

54. 0620_s21_ms_63 Q: 3

Question	Answer	Marks
	Tests on solid I	
(a)	green precipitate	1
	dissolves in excess (forming a green solution)	1
(b)	grey-green precipitate	1
	remains / does not dissolve	1
(c)	white ppt	1
(d)	no change	1
	Tests on solid J	
(e)	carbon dioxide / CO_2	1

Question	Answer	Marks
(f)	potassium / K^+	1
	carbonate / CO_3^{2-}	1

55. 0620_w12_ms_61 Q: 5

(a) (i) white (1) precipitate (1) dissolves (1) [3]

(ii) white precipitate (1) dissolves (1) [2]

(b) no reaction/change (1) [1]

(c) white (1) precipitate (1) [2]

(g) chlorine (1) **not:** chloride [1]

(h) oxygen (1) [1]

(i) transition metal present (1) catalyst (1) **allow:** copper oxide for one mark [2]

manganese (1) oxide (1) max 2

56. 0620_w12_ms_62 Q: 5

(a) green (1) [1]

(b) green (1)
precipitate (1) [2]

(c) green precipitate (1) [1]

(d) no reaction/no precipitate/no change/no observation/nothing (1) [1]

(e) white (1)
precipitate (1) [2]

(i) ammonia (1) [1]

(j) transition metal/cobalt (1) ignore copper
nitrate (1) [2

---

57. 0620_w12_ms_63 Q: 4

tests on filtrate

(a) **(i)** white (1) precipitate (1) with excess does not dissolve/clear (1) [3]

(ii) no precipitate/very slight precipitate/no reaction [1]

(iii) white (1) precipitate (1) [2]

(c) carbon dioxide/CO_2 (1) [1]

(d) lead/silver (1) carbonate (1) [2]

---

58. 0620_w13_ms_61 Q: 4

tests on liquid L

(a) colourless (liquid) [1]
allow: (pale) yellow

(c) no reaction / change (1) [1]

(d) yellow (1) precipitate (1) [2]

(e) iodine dissolves / owtte (1) [1]

(f) organic (1) solvent (1) liquids do not mix (1) max [2]

---

59. 0620_w13_ms_62 Q: 5

(a) colourless **and** smells acidic / vinegar / pungent / choking / sour (1) [1]
not: strong
red / orange / yellow (1) pH 1–6 (1) [2]

(b) fizzes / effervescence (1)
lighted splint (1) pops (1) [3]
not: glowing splint pops

(c) effervescence / fizz / bubbles (1) [1]
not: carbon dioxide unless limewater test described as an observation

(f) organic / hydrocarbon (1) fuel / flammable (1) reducing agent (1) max [2]
allow: 2 marks for alcohol / ethanol

---

60. 0620_w13_ms_63 Q: 4

(a) table of results for experiment 1

initial and final volumes and differences completed correctly (1)
15.7, 0.0 and 15.7
to 1 decimal place (1) [2]
allow: 2 decimal places

(b) table of results for experiment 2
initial and final volumes completed correctly (1)
47.3 and 15.9
differences completed correctly (1)
31.4 [2]

(c) iron / Fe (1) (II) / 2+ (1) oxidised / reacts with air / to iron(III) (1) [3]

(d) **(i)** colourless to pink / purple (1) [1]
not: clear **allow:** reverse

(ii) not an acid and alkali reaction / potassium manganate is coloured / owtte / indicator not needed / a colour change already occurs / potassium manganate acts as an indicator (1) [1]

(e) **(i)** experiment 2 (1) [1]

(ii) experiment 2 2× volume experiment 1 [1]

(iii) solution E more concentrated / stronger (1) or converse
2 × as concentrated (2) [2]

(f) half value from table result for Experiment 2 / 15.7 cm^3 (1)
half volume of E used (1) [2]

(g) advantage
easy to use / quick / convenient (1)

disadvantage
not accurate / owtte (1) [2]

61. 0620_w13_ms_63 Q: 5

(c) no reaction / no change / no precipitate (1) [1]

(d) white (1) precipitate (1) [2]

(e) neutral (1) transition metal (ion) present (1) [2]

(f) reversible / equilibrium / neutralisation / (1)
solution returned to original colour / solution turns back to yellow (1) [2]

(g) oxygen (1) [1]

---

62. 0620_w14_ms_61 Q: 5

(c) no reaction / no change / no precipitate (1) [1]

(d) white (1)
precipitate (1) [2]

(e) transition metal present (1)
allow: iron
water / hydrated (1) [2]

(f) hydrated (1) iron (1) (II) (1) (sulfate) [3]

---

63. 0620_w14_ms_61 Q: 6

(a) **(i)** gas syringe / inverted measuring cylinder in trough of water (1)
labelled (1) [2]

(ii) limewater (1)
milky (1) [2]

(b) measured volume of water (1)
in named weighed container (1)
evaporate to dryness (1)
reweigh / measure mass of solid (1)
conclusion: e.g. double the mass of residue if 500 cm^3 water used to check mass in 1000 cm^3 (1) max [4]

---

64. 0620_w14_ms_62 Q: 2

a solution of chlorine in water
named indicator (1)
bleaches / turns white (1) [2]
do not allow: halide test

sulfuric acid
named indicator (1)
result (1)
or
add barium nitrate (1)
white precipitate (1)
or
carbonate (1)
fizzes (1) [2]
allow: other valid alternatives

hexene
bromine (water) (1)
decolourises (1) [2]
allow: lighted splint (1)
ignites (1)

limewater
pass carbon dioxide (1)
milky / cloudy (1) [2]
allow: named indicator (1)
correct result (1)

---

65. 0620_w14_ms_62 Q: 5

tests on solution **A**

(a) yellow / brown / orange (1) [1]
allow: combination of above colours
do not allow: red, but **allow:** red-brown

(b) (orange / red) brown (1)
allow: rusty
precipitate (1) [2]

(c) (orange / red) brown precipitate (1) [1]

(d) white precipitate (1) [1]

(i) aluminium (1)
sulfate (1) [2]
list principle applies here

---

66. 0620_w14_ms_63 Q: 5

tests on solution **N**

(e) appearance colourless (1) [1]
pH 11–14 (1) [1]

(f) colourless / no change (1)
white (1)
precipitate (1) [3]

(g) litmus paper turns blue (1)
pungent smell (1) [2]

(h) **(i)** hydrogen / H_2 (1) [1]

(ii) ammonia (1) [1]

(i) hydrochloric acid (2) [2]
acid or chloride only, 1 mark.

---

67. 0620_w15_ms_61 Q: 3

(a)	electrolysis;	1	
(b)	bulb lights / bubbles;	1	
(c)	platinum;	1	**R:** copper
(d)	glowing splint; relights;	1 1	**R:** relights a lighted splint **A:** lighted splint glows brighter
(e)	hydrogen (ions) positive / opposites attract	1	
(f)	chlorine produced; poisonous / toxic;	1 1	

68. 0620_w15_ms_61 Q: 4

(d)	all time readings correctly recorded: 48, 68, 96, 132 4 correct = 3 3 correct = 2 2 correct = 1 0 or 1 correct = 0 in seconds;	3 1	
(e)	all points correctly plotted: 48, 68, 96, 132 4 correct = 2 3 correct = 1 2 or fewer correct = 0 smooth line graph;	2 1	
(f)(i)	value from the graph, 0.7; shown clearly on the graph;	1 1	

(f)(ii)	value from the graph, e.g. 34 s; extrapolation shown clearly;	**1** **1**	
(g)	idea of fair test / comparability;	**1**	
(h)	21 (°C); 49 (°C);	**1** **1**	
(i)(i)	exothermic / redox / displacement;	**1**	**I:** neutralisation
(i)(ii)	hydrogen;	**1**	
(i)(iii)	values halved;	**2**	'smaller temperature change' = 1 mark
(j)	*apparatus* gas syringe / thermometer; *measurements* volume of gas / temperature of reaction; over time;	 **1** **1** **1**	

69. 0620_w15_ms_61 Q: 5

(a)	yellow / green;	**1**	**R:** reference to ppt.
(b)	white precipitate;	**1**	
(c)	green; precipitate;	**1** **1**	
(d)	green precipitate;	**1**	
(e)	brown; precipitate;	**1** **1**	
(i)	silver / lead; nitrate;	**1** **1**	

70. 0620_w15_ms_62 Q: 4

	 tests on ethene bromine (water); turns colourless; *ammonia* red litmus / pH paper; turns blue / pH > 7; *oxygen* glowing splint; relights;	 **1** **1** **1** **1** **1** **1**	**A:** Allow any test which gives only a **unique detectable result** for that substance, e.g. lighted splint / ethene burns. **R:** relights a lighted splint **A:** lighted splint glows brighter

71. 0620_w15_ms_62 Q: 5

(c)	copper; chloride;	**1** **1**	**I:** any reference to copper's oxidation state
(d)	colourless;	**1**	**R:** white / pale yellow
(e)(i)	white; precipitate ; insoluble / no change / no reaction ;	**1** **1** **1**	**R:** colourless
(e)(ii)	no precipitate / slight white precipitate; no change / no reaction;	**1** **1**	
(e)(iii)	yellow; precipitate;	**1** **1**	

72. 0620_w15_ms_63 Q: 4

(a)	green; precipitate;	1 1	use list principle for extra incorrect observations
(b)	correct table of results for Experiment 1: final volumes, initial volumes and difference: 10.8 0.0 10.8; all readings in **both** tables to 1 decimal place;	1 1	
(c)	correct table of results for Experiment 2: final volumes and initial volumes: 12.3 6.9; difference correct: 5.4;	1 1	**A:** ecf (usually 6.6)
(d)(i)	to remove **M** / residue / impurities / to clean it;	1	
(d)(ii)	to remove water / so **N** is not diluted;	1	**R:** **N** reacts with water
(e)	there is already a colour change / self-indicating / it goes pink / owtte; **M** and **N** change colour or show when the reaction is complete;	1 1	**A:** it is not acid-alkali / potassium permanganate or solutions **I:** potassium permanganate / solutions **M** and **N** are coloured
(f)(i)	Experiment 2 / solution **M** / the first titration;	1	
(f)(ii)	Experiment 2 uses 2 × volume of Experiment 3 ora;	1	**A:** (nearly) 2 × / (13.7 *v.* 6.6)
(f)(iii)	twice as concentrated / strong ora;	2	**A:** solution **N** more concentrated / stronger for 1 mark ora **R:** references to conc. of solution **L** (iron(II) sulfate)
(g)	half value from table result for Experiment 3 / 2.7; half volume (of **L**) used;	1 1	**R:** just 'half the volume' **A:** this shown by calculation
(h)	*advantage* easy to use / quick / convenient; *disadvantage* not accurate owtte;	1 1	**I:** reference to large volumes

73. 0620_w15_ms_63 Q: 5

(f)	hydrogen / H_2;	1	
(g)	hydrated / water; acid;	1 1	**A:** hydrous **I:** other conclusions unless contradictory
(h)	(grey /) white (solid);	1	**I:** crystals **R:** pale blue
(i)	temperature increase / rise; blue (solution);	1	additional incorrect observations, such as bubbles, contradicts a correct observation **I:** state and starting colour
(j)	blue; precipitate;	1 1	
(k)	blue precipitate; dissolves / soluble / solution; deep / dark / royal blue (solution);	1 1 1	

74. 0620_w16_ms_61 Q: 1

(a)	electrodes	1
(b)	bubbles / fizz / effervescence	1
(c)(i)	more hydrogen twice as much hydrogen / half as much oxygen	1 1
(c)(ii)	water	1
(d)	*lighted splint* no effect / brighter light for oxygen 'pops' for hydrogen **OR** *glowing splint* relights for oxygen no effect for hydrogen	 1 1 1 1

75. 0620_w16_ms_61 Q: 3

(a)	water present / hydrated	1
(b)	no change / colour	1
(c)(i)	white precipitate dissolves	1 1 1
(c)(ii)	white precipitate no change	1 1
(d)	not a halide	1
(e)	(aluminium) sulfate	1
(f)	white (crystals)	1

76. 0620_w16_ms_62 Q: 3

(a)(i)	pH 1–3	1
(a)(ii)	solid disappears / dissolves blue / green colour	1 1
(a)(iii)	solid dissolves limewater turns milky	1 1 1
(a)(iv)	white precipitate	1
(b)	iron(III) nitrate	1 1

77. 0620_w16_ms_63 Q: 3

(a)(i)	pH 1–3	1
(a)(ii)	effervescence / fizzing / bubbling / solid disappears / dissolves lighted splint 'pops'	1 1 1
(a)(iii)	effervescence / fizzing / bubbling / solid disappears / dissolves limewater milky	1 1 1
(a)(iv)	white precipitate	1
(b)	calcium / Ca^{2+} hydroxide / OH^-	1 1

78. 0620_w17_ms_61 Q: 3

(a)(i)	red-brown	1
	precipitate	1
(a)(ii)	insoluble / no change	1
(b)	red-brown precipitate	1
(c)	(red) litmus paper	1
	turns blue	1
(d)	ammonia	1
(e)	lithium	1
	carbonate	1

79. 0620_w17_ms_62 Q: 3

(a)	white (crystals)	1
(b)	bubbles / fizz	1
	limewater	1
	(turns) milky	1
(c)	carbon dioxide	1
(d)	yellow	1
(e)	non-transition metal / Group II metal / barium / calcium / magnesium	1
(e)	chloride	1

80. 0620_w17_ms_63 Q: 3

(a)(i)	green	1
	precipitate	1
(a)(ii)	green solution / precipitate dissolves	1
(a)(iii)	bubbles / fizzing / effervescence	1
	(red) litmus paper / Universal Indicator paper	1
	(red litmus paper) turns blue / (Universal Indicator paper) turns purple	1
(b)	ammonia / NH_3	1
(c)	(aqueous) ammonia / NH_3	1

81. 0620_w18_ms_61 Q: 3

(a)	Sulfur dioxide;	1
(b)	Potassium	1
	sulfite;	1
(c)(i)	White	1
	precipitate;	1
(c)(ii)	insoluble / remains / no change	1
(d)	No / (very) slight white precipitate;	1
(e)	No precipitate / reaction / change / remains colourless	1
(f)	(red)litmus / pH paper / universal indicator paper	1
	turns blue / pH>7 / alkaline	1

82. 0620_w18_ms_62 Q: 3

	Tests on solid N	
(a)	White(solid/crystals)	1
(b)	White	1
	precipitate	1
(c)	pH / (red)litmus paper	1
	>7 / blue	1
(d)	Ammonia	1

Tests on solid O		
(e)	Group 1 cation present or named group 1 cation present	1
(f)	potassium	1
	chloride	1

83. 0620_w18_ms_63 Q: 1

(a)	mortar	1
	(Teat / dropping) pipette / dropper	1
(b)	**M1** Limewater	1
	M2 milky	1
(c)	**M1** Larger surface area	1
	M2 Increases rate of reaction	1
(d)	**M1** Add magnesium / zinc / iron	1
	M2 More reactive metal / displacement reaction	1

84. 0620_w18_ms_63 Q: 3

Tests on solid P		
(a)	White (solid / crystals / powder)	1
(b)	**M1** Bubbles / fizz	1
	M2 pH / (red) litmus paper / universal indicator	1
	M3 pH>7 / turns blue / alkaline	1
(c)	No reaction / (remains) colourless / no change	1
(d)	red	1

Tests on solid Q		
(e)	□ Transition metal / element	1
	□ Chloride / Cl^-	1

85. 0620_w19_ms_61 Q: 3

(a)(i)	white	1
	precipitate	1
(a)(ii)	clears / dissolves / colourless solution	1
(b)(i)	white precipitate	1
(b)(ii)	clears / dissolves / colourless solution	1
(c)	bubbles / effervescence	1
	litmus turns blue	1

(d)	lithium	1
	iodide	1

86. 0620_w19_ms_62 Q: 3

(a)	blue-green	1
(b)	blue precipitate	1
(c)(i)	blue precipitate	1
(c)(ii)	deep / royal blue	1
	solution / dissolves / soluble	1
(d)	litmus / pH paper	1
	turns blue / pH > 7	1
(e)	potassium	1
	bromide	1

87. 0620_w19_ms_63 Q: 3

(a)	blue / purple / green / violet	1
(b)(i)	green	1
	precipitate	1
(b)(ii)	green solution / precipitate dissolves	1
(c)	grey-green precipitate	1
(d)	any **two** from: □ effervescence □ (damp red / purple) litmus / pH paper □ turns blue / pH 8–10	2
(e)	fuel / organic	1

88. 0620_w20_ms_61 Q: 3

Question	Answer	Marks
	Tests on solid Y	
(a)	ammonia	1
(b)	aluminium / Al^{3+}	1
	nitrate / NO_3^-	1
(c)	(weakly) acidic	1
	Tests on solid Z	
(d)	green precipitate	1
	precipitate insoluble / remains / no further change	1
(e)	no change	1
(f)	no change / remains purple	1
(g)	white precipitate	1

89. 0620_w20_ms_62 Q: 3

Question	Answer	Marks
	Tests on solid Q	
(a)	fizzing / effervescence / bubbles	1
	(some of the) solid dissolves / disappears **OR** colourless solution	1
	limewater turns milky	1
(b)	carbon dioxide / CO_2	1
(c)(i)	white precipitate	1
	dissolves / forms a colourless solution	1
(c)(ii)	aluminium (ions) give the same result	1
(c)(iii)	add (excess) ammonia (solution)	1
(d)	**Tests on solid R**	
	sodium / Na^+	1
	iodide / I^-	1

90. 0620_w20_ms_63 Q: 1

Question	Answer	Marks
(a)	**A** delivery tube	1
	B trough	1
(b)	to hold / absorb / soak up the water	1
(c)	error: bung in (collecting) tube / the apparatus is sealed / water cannot get out of the boiling tube	1
	explanation: (pressure would increase and so the apparatus / tube would) explode / break	1
(d)	arrows under both zinc and mineral wool	1
(e)	test: lighted splint	1
	result: pops	1

91. 0620_w20_ms_63 Q: 3

Question	Answer	Marks
(a)	4	1
(b)	carbon dioxide / CO_2	1
(c)	hydrated	1
	acid / contains H^+ / hydrogen ions	1
(d)(i)	white precipitate	1
(d)(ii)	no change **OR** remains **OR** does not dissolve	1

Question	Answer	Marks
(e)	drops: no reaction **OR** no change **OR** remains colourless **OR** faint / slight (white) precipitate	1
	excess: no reaction **OR** no change **OR** remains colourless **OR** faint / slight (white) precipitate / precipitate remains / does not dissolve	1
(f)	white precipitate	1
(g)	no reaction **OR** no change **OR** remains colourless	1

92. 0620_w21_ms_61 Q: 3

Question	Answer	Marks
(a)	11–14	1
(b)	lithium / Li^+	1
	hydroxide / OH^-	1
(c)	(from) purple	1
	(to) colourless	1
(d)	sulfur dioxide / SO_2	1
(e)	(red) litmus turns blue	1
(f)	ammonia / NH_3	1

Question	Answer	Marks
(g)	no change / no reaction	1

93. 0620_w21_ms_62 Q: 3

Question	Answer	Marks
	Tests on solid O	
(a)	no change / colourless / no reaction / no observation	1
(b)(i)	(red litmus) becomes blue	1
(b)(ii)	ammonia / NH_3	1
(c)	cream precipitate	1
(d)	(solution becomes) orange / yellow	1
	Tests on a liquid P	
(e)	any two from: flammable / fuel unsaturated / alkene / any named alkene organic / contains carbon / hydrocarbon	2

94. 0620_w21_ms_63 Q: 3

Question	Answer	Marks
Tests on solid S		
(a)	test: (bubble the gas through) limewater	1
	result: turns milky	1
(b)	calcium / Ca^{2+}	1
	carbonate / CO_3^{2-}	1
Tests on solid T		
(c)	red-brown precipitate	1
	remains / insoluble in excess	1
(d)	red-brown precipitate	1
(e)	white precipitate	1
(f)	no change	1