

CAMBRIDGE INTERNATIONAL EXAMINATIONS**Cambridge International General Certificate of Secondary Education****MARK SCHEME for the March 2016 series****0620 CHEMISTRY****0620/32**

Paper 3 (Core Theory), maximum raw mark 80

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0620	32

Abbreviations used in the Mark Scheme

- ; separates marking points
- / separates alternatives within a marking point
- () the word or phrase in brackets is not required but sets the context
- **A** accept (a less than ideal answer which should be marked correct)
- **I** ignore (mark as if this material were not present)
- **R** reject
- ecf credit a correct statement that follows a previous wrong response
- ora or reverse argument
- owtte or words to that effect (accept other ways of expressing the same idea)

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0620	32

Question	Answer	Marks
1(a)(i)	N / nitrogen;	1
1(a)(ii)	C / carbon / carbon dioxide;	1
1(a)(iii)	Al / aluminium;	1
1(a)(iv)	Cr / Fe / Al / Ti / chromium / iron / aluminium / titanium;	1
1(a)(v)	Cu / copper	1
1(b)(i)	substance containing only one type of atom;	1
1(b)(ii)	number of protons: 20 and 20; number of neutrons: 23 and 28; number of electrons: 20 and 20;	3
1(b)(iii)	18;	1

Question	Answer	Marks
2(a)	anode: bromine / Br ₂ ; cathode: potassium / K;	2
2(b)(i)	they are inert / they do not react;	1
2(b)(ii)	any suitable use, e.g. lubricant / pencil leads / brake linings / steelmaking / <u>walls</u> of blast furnace;	1
2(c)	bromine / Br ₂ ;	1
2(d)	cream precipitate / cream solid;	1
2(e)	irritates eyes / irritates nose / irritates lungs;	1

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0620	32

Question	Answer	Marks
3(a)	observations with sodium: fizzes or effervesces / sodium goes into a ball / sodium melts / moves over surface of water; products: sodium hydroxide / hydrogen; observations with iron: red or black or brown solid / iron glows; products: iron oxide / hydrogen;	4
3(b)	gas syringe / upturned measuring cylinder filled with water / upturned burette filled with water; workable apparatus, e.g. airtight; use of stopclock / idea of timing;	3
3(c)	powder → 25 large pieces → 3 small pieces → 10;	1
3(d)(i)	rate increases with increasing temperature; idea that graph is not linear / rate does not increase proportionally / upward curve;	2
3(d)(ii)	16 (cm ³ hydrogen / min);	1
3(e)	increasing concentration increases rate;	1

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0620	32

Question	Answer	Marks
4(a)	up to four from: - sodium chloride is ionic; - sodium chloride has a giant structure / lattice; - sodium chloride is not volatile / has a high boiling point; - sodium chloride does not conduct (electricity) <u>when solid</u> / conducts <u>when molten</u> / conducts <u>when aqueous</u>; up to four from: - nitrogen is molecular; - nitrogen has covalent bonds; - nitrogen is volatile / has a low boiling point; - nitrogen does not conduct (electricity);	5
4(b)(i)	speeds up (rate of) reaction;	1
4(b)(ii)	3(H ₂); 2(NH ₃);	2
4(b)(iii)	3 bonding pairs of electrons (between N and H) <u>and</u> no extra electrons on H; 2 non-bonding electrons on N atom;	2
4(b)(iv)	copper oxide / CuO; oxygen removed (from copper oxide) / oxidation number of copper decreases / copper ions gain electrons;	2

Question	Answer	Marks
5(a)(i)	copper; has high heat conductivity <u>and</u> high melting point;	2
5(a)(ii)	cobalt <u>and</u> copper; high melting point / high strength / high density;	2

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0620	32

Question	Answer	Marks
5(a)(iii)	magnesium; low density;	2
5(b)	copper → cobalt → tin → magnesium; one pair reversed = [1]	2
5(c)	any four from: • add <u>excess</u> cobalt carbonate to sulfuric acid • filter (off excess cobalt carbonate) • evaporate filtrate to point of crystallisation / evaporate some of the water and allow to cool • filter (off crystals) • dry crystals with filter paper	4
5(d)(i)	⇌;	1
5(d)(ii)	add water to anhydrous cobalt sulfate / add water to CoSO_4 ; colour changes (from blue) to red / pink;	2

Question	Answer	Marks
6(a)	add universal indicator to the lemon juice / solution; match colour with colour chart;	2
6(b)(i)	ring around one or more COOH groups;	1
6(b)(ii)	ethanoic (acid) / any other correctly named carboxylic acid;	1
6(c)(i)	carbon dioxide; water;	2
6(c)(ii)	filtration;	1

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0620	32

Question	Answer	Marks
6(d)	endothermic <u>and</u> energy of products higher than energy of reactants;	1
6(e)(i)	2(C ₂ H ₅ OH) 2(CO ₂)	2
6(e)(ii)	any two from: • yeast/zymase • temperature between 5 °C and 40 °C/room temperature • anaerobic/ no oxygen/ no air • pH ~7	2
6(e)(iii)	180; one row correct = [1], e.g. $12 \times 1 = 12$ or $6 \times 16 = 96$	2

Question	Answer	Marks
7(a)	any three from: • silvery/shiny/lustrous • conducts heat/ conducts electricity • malleable • ductile • sonorous • high melting point/ high boiling point • strong/ hard • high density	3
7(b)	ReCl ₃ ;	1
7(c)	change of state (directly) from solid to gas/ gas to solid;	1
7(d)(i)	pH 2;	1

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – March 2016	0620	32

Question	Answer	Marks
7(d)(ii)	water;	1
7(d)(iii)	potassium carbonate;	1
7(e)	glowing splint; relights/idea of bursting into flame;	2