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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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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)

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Question	Answer	Marks
1(a)(i)	N / nitrogen;	1
1(a)(ii)	C / carbon / carbon dioxide;	1
1(a)(iii)	A*l* / aluminium;	1
1(a)(iv)	Cr / Fe / A*l* / 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 / walls 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

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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**

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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) when solid / conducts when molten / conducts when aqueous; 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) and 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 and high melting point;	**2**
5(a)(ii)	cobalt and copper; high melting point / high strength / high density;	**2**

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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 excess 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**

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Question	Answer	Marks
6(d)	endothermic and energy of products higher than energy of reactants;	1
6(e)(i)	$2(C_2H_5OH)$ $2(CO_2)$	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 × 1 = 12 **or** 6 × 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

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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**

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