

## **MARK SCHEME for the October/November 2012 series**

### **0620 CHEMISTRY**

**0620/22**

Paper 2 (Core Theory), maximum raw mark 80

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.

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
	IGCSE – October/November 2012	0620	22

- 1 (a) (i) D / phosphorus / P; [1]  
(ii) E / helium / He; [1]  
(iii) C / chlorine /  $Cl_2$  /  $Cl$ ; [1]  
(iv) A / copper / Cu; [1]  
(v) A / copper / Cu; [1]
- (b) C; D; [2]
- (c) giant; covalent; [2]
- (d) substance containing only 1 type of atom / substance which cannot be broken down into a simpler one; [1]  
**allow:** substance which can't be separated by chemical means  
**ignore:** substance with one atom / substance with similar types of atom

[Total: 10]

- 2 (a) (damp) red litmus (paper); [1]  
turns blue; [1]  
**note:** second mark dependent on correct reagent  
**allow:** universal indicator (1 mark); turns blue / purple (1 mark)  
**allow:** 1 mark for litmus paper turns blue / pH paper turns blue  
**allow:** white fumes (1 mark); with hydrochloric acid vapour (1 mark)  
**ignore:** other chemicals added as long as it is clear that ammonia is the gas being tested
- (b) pH 9; [1]
- (c) (i)  $NH_4Cl$  on right; [1]  
(ii) structure completely correct;; [2]  
**allow:** 1 mark for 1 pair of electrons bonded between H and  $Cl$   
**ignore:** inner shell electrons

Page 3	Mark Scheme	Syllabus	Paper
	IGCSE – October/November 2012	0620	22

(d) (i) any 4 of: [4]  
 use of burette  
 add indicator to flask  
 add acid to alkali (or vice versa)  
 until indicator changes colour  
 record volume (of acid or alkali added) **ignore:** amount of acid or alkali added  
 repeat without indicator  
 using same volume of acid and ammonia as in previous experiment

(ii) heat to crystallisation (point) / evaporate some of the water / leave to crystallise [1]  
**allow:** heat then cool  
**ignore:** heat (unqualified) / heat to dryness / heat to get rid of all the water

[Total: 11]

3 (a) (i) get darker / deeper colour; [1]

(ii) gas; [1]  
**allow:** answer written in table

(iii) any value between  $-180$  to  $-20^{\circ}\text{C}$  (actual =  $-101^{\circ}\text{C}$ ); [1]  
**allow:** answer written in table

(b) (i) chlorine  $\rightarrow$  bromine  $\rightarrow$  iodine  $\rightarrow$  astatine;; [2]  
**allow:** 1 mark if one pair incorrect way round / order completely reversed

(ii) no **and** chlorine is more reactive (than bromine) / bromine is less reactive; [1]  
**ignore:** chlorine is very reactive / bromine is not very reactive  
**ignore:** chloride is more reactive

(c)  $\text{H}_2\text{O}$  (on right); [1]  
 2 on left (this is dependent on  $\text{H}_2\text{O}$  being the product); [1]

(d) (i) to kill bacteria / to kill microbes / to disinfect it [1]  
**allow:** to kill germs / to get rid of bacteria  
**ignore:** to clean water

(ii) any two of: [2]  
 minerals or (dead) remains insoluble in water  
 these particles are large / water particles (molecules) are very small  
 (larger particles) get stuck (between the sand particles) / (larger particles) remain in the sand / trapped by sand  
 water (molecules) drain through / water comes out the bottom  
**ignore:** water is filtered

[Total: 11]

Page 4	Mark Scheme	Syllabus	Paper
	IGCSE – October/November 2012	0620	22

- 4 (a) groups of hydrocarbons / molecules; [1]  
with similar (range of) boiling points / sizes / masses; [1]  
**allow:** 1 mark for idea of separating molecules for particular fuels  
**ignore:** petroleum broken down / smaller molecules formed / mixture of fuels
- (b) (i) gasoline; diesel; [2]  
(ii) refinery gas: heating / cooking; [1]  
**allow:** fuel  
bitumen: roads / roofing; [1]
- (c) high temperature; [1]  
**allow:** heat / stated temperature of 200 °C or more  
catalyst; [1]  
**ignore:** name of catalyst  
**ignore:** pressure
- (d) (i) substance containing hydrogen and carbon only; [1]  
(ii) C<sub>4</sub>H<sub>8</sub> / 2C<sub>2</sub>H<sub>4</sub>; [1]
- (e) (i) 
$$\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{C} = \text{C} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$$
 [1]
- (ii) monomers; addition; polymers; [3]

**[Total: 14]**

Page 5	Mark Scheme	Syllabus	Paper
	IGCSE – October/November 2012	0620	22

- 5 (a) any two of; [2]  
Al has low density / iron has high density  
**allow:** lightweight or light for density)  
Al does not form coloured compounds / iron formed coloured compounds  
Al has only one oxidation state / iron has several oxidation states  
Al does not act as a catalyst / iron can act as a catalyst  
Al is softer / iron is harder (comparative needed)  
Al has lower density / iron has higher density (comparative needed)  
Al is a better conductor / iron is not as good a conductor (comparative needed)  
Al is weaker / iron is stronger (comparative needed)  
**ignore:** melting and boiling points
- (b) any suitable use e.g. aircraft or car (bodies) / food containers / pots and pans / electrical wiring / drinks cans; [1]
- (c) precipitate formed; [1]  
which is white in colour; [1]  
dissolves (in excess sodium hydroxide); [1]  
**allow:** precipitate disappears
- [Total: 6]**
- 6 (a) (i) limestone / chalk; [1]  
(ii) the other product is a gas / carbon dioxide escapes; [1]  
**allow:** carbon dioxide is a gas / waste gases are gone / CO<sub>2</sub> formed  
**allow:** reaction goes completely to the right
- (b) (i)  $C + O_2 \rightarrow CO_2$ ; [2]  
**allow:** 1 mark for O<sub>2</sub> as reactant /  $C + 2O \rightarrow CO_2$
- (ii) limited; air; monoxide; poisonous; [4]  
**allow:** oxygen in place of air  
**note:** if dioxide put in third position allow 1 mark for harmless in 4<sup>th</sup> position
- (c) calcium chloride; [1]  
water; [1]
- (d) (i) idea of measure the (decrease in) mass / weight; [1]  
idea of measuring time (intervals); [1]
- (ii) increases / faster; [1]  
decreases / slower; [1]  
increases / faster; [1]  
**note:** the answers above must be comparative  
**allow:** 1 mark for fast; slow; fast  
**ignore:** reference to time taken

**[Total: 15]**

Page 6	Mark Scheme	Syllabus	Paper
	IGCSE – October/November 2012	0620	22

- 7 (a) (i) any 4 of: [4]  
 (at 20 °C / at the start) particles are close together / touching / arranged regularly  
 (at 20 °C / at the start) particles are vibrating / not moving  
 as temperature rises / then particles vibrate more / gain energy  
 at 114 °C / then particles begin to move  
 forces between particles weaken / molecules start to break away (from each other)  
 at 114 °C / then particles become more randomly arranged / slide over each other  
 when liquid / above 114 °C / then particles slide over each other/ move  
 when liquid / above 114 °C then particles are randomly arranged  
**ignore:** particles further apart / particles (move) faster
- (ii) 254; [1]
- (b) (i) ionic; [1]
- (ii) KI; [1]
- (c) (1 each) [4]  
 insoluble / does not dissolve; doesn't conduct;  
 soluble / dissolves; doesn't conduct;  
**ignore:** low / high / not very well
- (d) + electrode: iodine / I<sub>2</sub> / I; [1]  
 – electrode: potassium / K; [1]  
**allow:** 1 mark if correct electrode products reversed  
**ignore:** iodide

[Total: 13]