

## **MARK SCHEME for the October/November 2013 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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- 1 (a) (i) ammonia [1]  
(ii) methane [1]  
(iii) ammonium chloride [1]  
(iv) water [1]  
(v) calcium carbonate [1]  
(vi) copper(II) sulfate [1]

(b) substance which contains two (or more) elements chemically combined (or bonded) / two different atoms bonded (or combined or joined) / different atoms bonded [1]  
**ALLOW:** a substance containing two (or more) elements which cannot be separated by physical means

- (c) CO<sub>2</sub> on right [1]  
2(O<sub>2</sub>) [1]  
**NOTE:** second mark dependent on first mark

[Total: 9]

- 2 (a) zinc → magnesium → calcium → sodium [2]  
**NOTE:** 1 mark if one pair incorrectly placed / metals in reverse order

(b) magnesium chloride [1]  
hydrogen [1]

(c) ion [1]

(d) 1 electron in outer shell [1]  
8 electrons in middle shell [1]

(e) (i) correct method of collection i.e. upturned measuring cylinder over water or (gas) syringe [1]  
workable apparatus and closed system [1]  
flask or test tube labelled AND measuring cylinder or syringe labelled [1]  
**ALLOW:** flask / test tube / syringe / measuring cylinder not joined up

(ii) Any three of: [3]  
increase concentration (of hydrochloric acid) / use concentrated acid  
increase temperature / heat up reaction  
use smaller lumps of zinc /  
add a catalyst

[Total: 13]

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- 3 (a) distillation [1]  
**ALLOW:** (fractional) distillation
- (b) (round-bottomed) flask [1]  
thermometer [1]  
condenser [1]  
**ALLOW:** condensing tube
- (c) 1 mark each:  
lower  
boils  
condenses [3]
- (d) (i) chloride /  $\text{Cl}^-$  [1]  
(ii)  $\text{K}^+$  / potassium [1]  
(iii)  $\text{Mg}^{2+}$  [1]  
 $\text{SO}_4^{2-}$  [1]
- [Total: 11]**
- 4 (a) 1 mark each: [4]  
poly(ethene) → it has a very long chain  
ethene → it decolourises bromine water  
methane → it is the main constituent of natural gas  
ethanoic acid → it contains a  $-\text{COOH}$  functional group
- (b) (i) substance containing carbon and hydrogen only [1]  
(ii) it has a double bond [1]
- (c) monomers [1]
- (d) (i) addition of oxygen / increase in oxidation number / loss of electrons [1]  
**ALLOW:** removal of hydrogen
- (ii) glucose (on left) [1]  
**ALLOW:** sugar  
carbon dioxide (on right) [1]
- [Total: 10]**

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5 (a) Any three of: [3]

alloy is a mixture / alloy is a combination of metal with another metal / of metals / of a metal with a non-metal

**IGNORE:** mixed with another substance /

alloying alters property of metal /

makes metal stronger /

makes metal more corrosion resistant /

makes metal harder /

**ALLOW:** reduces rusting ONLY if iron / steel mentioned

**IGNORE:** lasts longer / durable

**ALLOW:** answers from diagram

**ALLOW:** higher level answers e.g. layers in metals slide over each other easily / layers in alloy do not slide as easily

(b) (i) 1 mark each: [2]  
3rd box and 5th box ticked

(ii) 1 mark for method and 1 mark for why it works: [2]  
painting / tinning / galvanising / covering with plastic / chromium / greasing / (electro)plating (1)

**IGNORE:** covering / coating (unqualified)

prevents air (or oxygen) and water coming into contact with iron (1)

OR

galvanising / coating with zinc / putting block of named reactive metal on surface (1)

metal reacts instead of iron / metal more reactive than iron (1)

**ALLOW:** sacrificial protection

(c) (i) substance which speeds up reaction / increases rate of reaction [1]

(ii) (damp) red litmus paper [1]

**ALLOW:** universal indicator

turns blue [1]

**ALLOW:** (concentrated) hydrochloric acid (1) white fumes (1)

(iii) Any two of: [2]

replacement of nitrogen / nitrates / potassium / phosphorus (taken up by plants)

plants take up nitrogen / potassium / phosphorus / nitrates from soil / nitrogen (or potassium or phosphorus) needed by plants

(fertiliser) adds extra nitrogen / potassium / phosphorus / nitrates (to replace this)

increase plant growth / plants grow better / plants grow faster / better yield

**IGNORE:** for plant growth / for healthy plants

make more (plant) protein

[Total: 12]

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6 (a) Any three of: [3]

evaporates or evaporation (from garlic) / idea of change from liquid to gas /  
 movement of particles / atoms / molecules / diffusion / particles (in garlic smell) collide (with  
 air particles) /  
 spreading out or mixing up of particles / atoms / molecules /  
 random / disorderly (movement of particles / atoms / molecules) /  
**ALLOW:** particles move from high(er) to low(er) concentration

(b) (i)  $C_6H_{10}S_2$  [1]

(ii) (one) more sulfur atom in A / B has 1 sulfur atoms but A has 2 [1]  
 same number of C and H atoms / molecule otherwise the same / [1]

(c) (i) 18 [1]

(ii) atoms of same element with different number of neutrons / atoms with same number of  
 protons and different numbers of neutrons / atoms differing only in number of neutrons /  
 elements with same number of protons and different number of neutrons / elements with  
 same proton number but different nucleon (or mass) number [1]  
 number of protons + neutrons (in an atom) [1]

(iii) coal; oxidised; dioxide; water; [4]

(iv) pits surface/ idea of (chemical) weathering / (chemical) erosion [1]  
**ALLOW:** damages building / eats away the building / dissolves building / wears away the  
 building / surface disintegrates / surface crumbles  
**IGNORE:** destroys buildings / cracks the building / corrosion  
 acid (rain) reacts with carbonate / limestone / neutralisation [1]  
**REJECT:** burns carbonate / melts carbonate

[Total: 15]

7 (a) (i) (limestone added): A [1]  
 (waste gases exit): B [1]

(ii)  $CO_2$  [1]

(iii) 15 (g) [1]

(b) (i) harder / slower to decompose down Group / (ease) decreases down Group /  
 easier to decompose up Group / ease increases up Group / thermal stability increases  
 down Group / thermal stability decreases up Group [1]  
**ALLOW:** the more reactive the metal, the higher the decomposition temperature

(ii) **ALLOW:** values from 1000 to 2000 ( $^{\circ}C$ ) (actual =  $1360^{\circ}C$ ) [1]

(c) (i) neutralise acidic soils / neutralise acidic lakes / making mortar / making calcium  
 hydroxide / making limewater / whitewash [1]

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- (ii) basic [1]  
**IGNORE:** alkali / metal
- (iii) 56 [1]
- (d) (calcium) too reactive / (calcium) above carbon in reactivity series [1]  
**ALLOW:** very reactive / high reactivity / more reactive than carbon

**[Total: 10]**