CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

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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CAMBRIDGE
International Examinations

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_2 on right [1]
$2(O_2)$ [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]

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 / Cl^- [1]

(ii) K^+ / potassium [1]

(iii) Mg^{2+} [1]
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 –COOH functional group

(b) **(i)** substance containing carbon and hydrogen <u>only</u> [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]

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]

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 <u>metal</u>, the higher the decomposition temperature

(ii) **ALLOW**: values from 1000 to 2000 (^oC) (actual = 1360 ^oC) [1]

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

(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]