CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0620 CHEMISTRY

0620/21 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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

CAMBRIDGE
International Examinations

1 **(a)** **(i)** magnesium / Mg [1]
allow: methane / CH_4

(ii) hydrogen / H_2 [1]

(iii) carbon monoxide / CO [1]

(iv) copper / Cu [1]

(v) calcium oxide / CaO; [1]
allow: carbon dioxide / CO_2

(b) 1 mark for each correct word:
seven;
trend;
density / colour;
sodium. [4]

[Total: 9]

2 **(a)** any **three** points (1 mark each) e.g. [3]
- electrons random / electrons not in shells ORA e.g. electrons in shells
- electrons are negatively charged ORA
- positive charge spread out / diffuse charge ORA e.g. protons have + charge
- no nucleus ORA e.g. nucleus present
- no protons / no neutrons / no nucleons / no nuclear particles ORA

(b) **(i)** different number of neutrons / different mass number / different nucleon number [1]

(ii) any suitable use e.g. [1]
- energy production / nuclear power / power stations
- measuring thickness of paper
- finding cracks in pipelines / pipes
- smoke alarms

(c) melting point any value between 120–200 (°C) [1]
atomic radius any value between 0.220 and 0.240 (nm) [1]

(d) **(i)** lithium hydroxide; [1]
hydrogen [1]

(ii) pH 13 [1]

(e) 1 electron in outer shell; [1]
inner shells correct i.e. 2, 8, 8 [1]

[Total: 12]

3 **(a)** the more (carbon) atoms, the higher the boiling point [1]

(b) Any **two** from: [2]
- naphtha
- lubricating (oil) / lubricant
- bitumen

(c) **(i)** correct structure of ethane showing all atoms and bonds; [1]

(ii) 2 inner shell electrons for C; [1]
4 bonding pairs of electrons representing each C–H bond; [1]

(d) **(i)** C_3H_6 [1]

(ii) heat / high temperature; [1]
ALLOW: quoted temperature values between 300-800 °C
ALLOW: high pressure

[Total: 8]

4 **(a)** any **four** from: [4]
- atoms in gas irregularly arranged / randomly arranged / far apart / all over the place
- atoms in gas moving very fast / free to move / bouncing around
- atoms slow down during condensation / move less than before
- atoms become less randomly arranged / less irregularly arranged during condensation / atoms get closer together in condensation
- atoms in liquid are irregularly arranged / close together / touching
- atoms in liquids slide over each other / atoms in liquids move slowly
- atoms slow down (further) during freezing
- atoms become more regularly arranged during freezing
- atoms in solid only vibrate
- atoms in solid are regularly arranged / touching / close to each other

(b) 4 / four [1]

(c) Any physical property e.g. [1]
malleable / ductile / conduct heat / conduct electricity / conducts (unqualified) / silvery / shiny / sonorous
ALLOW: high melting point / high boiling point / solid at room temperature
IGNORE: reference to density / hardness

(d) silver < tin < iron < magnesium [2]
1 mark if 1 pair inverted / magnesium > iron > tin > silver

(e) **(i)** 2 (CO); [1]
2 (C) dependent on 2CO being correct; [1]

(ii) poisonous / toxic; [1]

[Total: 11]

5 **(a)** A shown correctly (on either left or right top pipes at base of furnace) [1]
W shown correctly on one of the two pipes at the top [1]

(b) hematite [1]

(c) **(i)** heat given off / energy given out [1]

(ii) limewater; [1]
turns milky / turns cloudy / white precipitate; [1]
note: second mark dependent on first being correct

(d) iron oxide is losing oxygen / CO is gaining oxygen [1]

[Total: 7]

6 **(a)** ring around the OH group only [1]

(b) **(i)** (on left) sugar / glucose / any other suitable sugar; [1]
(on right) carbon dioxide; [1]

(ii) enzymes; [1]

(c) C_2H_4 [1]

(d) increases up to a maximum / increases up to given figure between 35–40 °C / rises to a peak; [1]

(e) **(i)** (density) increases as the number of carbon atoms increases; [1]
allow: decreases as the number of C atoms gets lower

(ii) propanol; [1]

(iii) liquid because its melting point is below room temperature and boiling point is above room temperature / becomes liquid at –79 °C (and does not become a) gas until 138 °C / room temperature is between the boiling point and melting point (room temperatures for last answer can be between 5 and 40 °C) [1]

[Total: 10]

7 **(a)** square / rectangular sheet of paper in chromatography tank; [1]
note: the sheet should not touch the sides of the beaker

solvent at bottom of tank with paper dipping into it; [1]
note: solvent does not have to be labelled / paper can just touch the surface
But there should be no gap between the solvent and the paper
watchglass over the tank (this can just be shown as a line); [1]

(b) place spot of ink / dye on the paper; [1]
note: answer must imply a spot or drop (not just ink put on paper)

above the solvent level; [1]

let the solvent run up the paper / solvent moves the dyes up the paper / some idea that solvent is needed for the movement of the spots; [1]

(c) any suitable solvent e.g. ethanol / butanol / ester / alcohol [1]

(d) **(i)** W, X and Y; [1]

(ii) 4 / four; [1]

(e) **(i)** idea that ethene is the monomer / idea that monomers are the simple (or basic) units which add together; [1]

idea that poly(ethene) is the polymer / idea that the polymer is formed by adding ethene units / simple units combine to form polymer / idea that polymer is a very long (hydrocarbon) chain; [1]

note: (ethene) monomers join to make a polymer = 2 marks

(ii) <u>mixture</u> of metals / <u>mixture</u> of metal + non metal; [1]

(f) **(i)** increasing strength decreases (thermal) conductivity / the lower the conductivity the higher the strength; [1]

(ii) high strength aluminium; [1]

has high strength / it is strong / aircraft body need to be strong; [1]

it has low density / it is light(weight) / aircraft body needs to be light(weight) [1]

[Total: 16]

8 **(a)** **(i)** 2 (SO_2); [1]

3 (O_2); [1]

(ii) causes acid rain / it is acidic / it acidifies (something); [1]

erodes (limestone) buildings / erodes mortar / corrodes metalwork / corrodes bridges / erodes named carbonate rock [1]

(b) filtration / filtered [1]

(c) **(i)** cathode; [1]

(ii) last / 4th box ticked (zinc at negative electrode and O_2 at positive electrode); [1]

[Total: 7]