CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0439 CHEMISTRY (US)

0439/21 Paper 2 (Core Theory), maximum raw mark 80

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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;
allow: carbon dioxide / CO_2 [1]

(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]
- <u>electrons</u> random / <u>electrons</u> not in shells ORA e.g. <u>electrons</u> 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) <u>liquid</u> 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]