

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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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
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- 1 (a) (i) magnesium / Mg
allow: methane / CH₄
- (ii) hydrogen / H₂
- (iii) carbon monoxide / CO [1]
- (iv) copper / Cu [1]
- (v) calcium oxide / CaO;
allow: carbon dioxide / CO₂ [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]
- 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]

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- 3 (a) the more (carbon) atoms, the higher the boiling point
- (b) Any **two** from:
- 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) C₃H₆ [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

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- (e) (i) 2 (CO);
2 (C) dependent on 2CO being correct;
- (ii) poisonous / toxic;

[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) C₂H₄ [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]

Page 5	Mark Scheme	Syllabus
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- 7 (a) square / rectangular sheet of paper in chromatography tank;
note: the sheet should not touch the sides of the beaker
- solvent at bottom of tank with paper dipping into it;
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) mixture of metals / mixture 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 (SO₂); [1]
 3 (O₂); [1]

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

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

(b) filtration / filtered

[1]

(c) (i) cathode;

[1]

(ii) last / 4th box ticked (zinc at negative electrode and O₂ at positive electrode);

[1]

[Total: 7]