MARK SCHEME for the October/November 2011 question paper for the guidance of teachers

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 must be read in conjunction with the question papers and the report on the examination.

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1 (a) (i) C [1]
   (ii) A [1]
   (iii) E [1]
   (iv) D [1]
   (v) C [1]

(b) (i) limestone / chalk / marble [1]
   ignore: lime / formulae
   (ii) 3rd box down ticked (heavier than air) [1]
   (iii) H₂O on right [1]
      2(HCl) [1]
      second mark dependent on correct formula for water [1]

[Total: 9]
2 (a) copper → any common use e.g. electrical wiring / pipes jewellery
   **ignore**: for alloys / for brass / for wires (unqualified)

   platinum → any common use e.g. inert electrode / jewellery
   **allow**: for catalyst (as long as not incorrect catalyst)
   aluminium → any common use e.g. food containers / car (bodies) / aircraft (bodies) / kitchen utensils / pots and pans
   **allow**: for roofing / for high voltage electrical cables
   **ignore**: for wires / for knives

(b) (i) poisonous / harms nervous system or brain
   **ignore**: harmful (without qualification)

   (ii) protons → 82
   neutrons → 125

(c) (i) Any three of:
   sodium goes into a ball /
   gets smaller / disappears
   **allow**: dissolves **ignore**: reacts
   moves (over surface)
   bubbles / effervescence /
   **ignore**: hydrogen given off
   floats on the water (as it reacts) /
   fizzes / hissing / crackling
   **ignore**: sound
   litmus turns blue /
   **ignore**: changes colour

   (ii) sodium hydroxide
   hydrogen

   (iii) electron
   ion
   gains
   negative

[Total: 15]
3 (a) Any two of:
- temperature
- mass / amount of manganese(IV) oxide / volume of manganese(IV) oxide
- size of manganese dioxide particles
  allow: pressure
  ignore: concentration

(b) (i) the greater the concentration the greater the speed / rate increases with concentration
  ignore: concentration increases speed / more oxygen the greater the concentration

  (ii) less hydrogen peroxide present (in B) / more hydrogen peroxide (in A)
  allow: hydrogen peroxide less concentrated (in B)

  (iii) time taken → 27 (s)
  allow: 26 (s)
  volume → 37 (cm³)

(c) magnesium → copper → manganese → lead
  ignore: oxide / oxidation numbers

[Total: 7]

4 (a) methane

(b) arrangement → random / irregularly arranged / no fixed position
  proximity → close together / touching
  motion → random/ sliding over each other / movement not entirely free
  allow: move slightly

(c) (i) arrow at tube at bottom left
  ignore: direction of arrow

  (ii) group of (different) molecules / group of (different) hydrocarbons
  implication of different molecules
  with similar / (particular) range of boiling points / molecules with similar molecular masses or small range of molecular masses

  (iii) X → naphtha
       Y → diesel (oil)

  (iv) structure of ethane showing all atoms and all bonds

  (v) 2nd box down ticked (saturated hydrocarbon)

[Total: 11]
5 (a) molecule → two or more atoms  [1]
    atom → the smallest part  [1]
    ion → an atom that has become  [1]

(b) (i) pH 13  [1]
    (ii) 40  [1]
    (iii) neutralisation  [1]
    (iv) pH decreases / pH goes from higher to lower pH / suitable reference to pH values e.g. from pH 12 to pH 8  [1]
        final pH below 7 / stated value below 7  [1]
        ignore: gets more acidic  [1]

(c) Any six of:  [6]
    bubbles (from the electrodes)
    solution goes yellow(ish) / solution goes green(ish)
    hydrogen at cathode
    chlorine at anode
    (hydrogen and chlorine gases produced at wrong electrodes = 1)
    electrodes are graphite / electrodes are carbon
    electrodes conducts electricity / electrons move in electrodes
    hydrogen (ions) go to cathode
    chloride (ions) go to the anode
    smell of chlorine
    electrolyte conducts electricity
    ignore: hydroxide ions

[Total: 14]
6 (a) as a reducing agent / in the blast furnace / for extracting iron or zinc or other suitable metal / to extract metals / in making lime

(b) (i) layers can slide over each other
both ideas of layers and sliding needed
strong bonding in all directions / covalent bonding in all directions / strong bonding in macromolecules in giant structure
both ideas of type of bonding and giant structure needed

(ii) for cutting / drill bits / for drills

(c) (i) ammonium sulfate
ignore: water / hydrogen

(ii) nitrogen

(d) one pair of electrons in each overlap area

(e) 1st box ticked
last box ticked

[Total: 9]
7 (a) (i) Any two of:
- have same general formula / have same pattern of formula / members differ by CH₂ group
- have same functional group
- have similar chemical properties / prepared by similar methods

**allow:** same chemical properties

**not:** similar properties

- show gradual change in physical properties / show trend in boiling points

(ii) \[
\begin{array}{c}
\text{H} \\
\\
\text{H} \\
\text{H} \\
\text{H} \\
\text{H} \\
\text{C} - \text{C} - \text{O} - \text{H}
\end{array}
\]

**allow:** OH in place of O – H

(b) (i) exothermic and temperature increases / goes from 18 to 37

**both:** exothermic and temperature increase needed for the mark

**allow:** exothermic because heat is given off

(ii) grey / black / grey-black

**not:** brown / purple

(c) filter (off zinc);

**note:** second mark dependent on filtration for first mark

(let alcohol) evaporate / evaporate (off the alcohol)

**allow:** warm gently (to remove some alcohol)

**allow:** use drying agent

**ignore:** heat unqualified / crystallise

**reject:** residue left to dry

(d) (i) Zn₂I₂

**allow:** 5ZnI₂

(ii) 2\textsuperscript{nd} answer ringed (giant ionic)

**allow:** underlined or ticked

(e) 1 mark for each product

- zinc nitrate
- ammonium nitrate **not:** ammonia nitrate
- water

(f) add (aqueous) sodium hydroxide (and warm)

- test gas evolved with red litmus paper / universal indicator paper
- litmus paper / universal indicator paper turns blue

**note:** the 2\textsuperscript{nd} and 3\textsuperscript{rd} marks are dependent on the first mark being correct

[Total: 15]