

**MARK SCHEME for the May/June 2012 question paper**  
**for the guidance of teachers**

**0653 COMBINED SCIENCE**

**0653/22**

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) argentite and galena (or formulae) ; [1]  
(ii) scheelite (or formula) ; [1]
- (b) each particle correctly labelled ;; [2]
- (c) (i) heat given off / exothermic / temperature increases ;  
effervescence / fizzing / gas given off ;  
sodium (reacts and) dissolves ; [max 2]
- (ii) faster / more violent / greater temperature rise / reference to (lilac) flame ; [1]
- (iii) → potassium hydroxide + hydrogen ;; [2]
- [Total: 9]**

- 2 (a) suitable units ;  
suitable labelled axes ;  
all points plotted correctly ;  
3 correct lines drawn ; [4]
- (b) (i) water / sweat turns to gas / (water) vapour ;  
heat is needed / used to cause evaporation ;  
heat is obtained / taken / comes from (athlete's) body / so heat in (athlete's)  
body is reduced ;  
accept answers based on particle theory. [max 2]
- (ii) (higher) temperature ;  
(lower) humidity ;  
(greater) wind speed ;  
(greater) surface area ; [max 2]
- [Total: 8]**

- 3 (a) (chemical reactions that) break down nutrient (molecules) / glucose ;  
to release energy ; [2]

(b)

| gas                     | percentage in inspired air | percentage in expired air |
|-------------------------|----------------------------|---------------------------|
| <b>oxygen ;</b>         | 21                         | 17                        |
| <b>carbon dioxide ;</b> | 0.04                       | 4                         |
| <b>nitrogen ;</b>       | 78                         | 78                        |

[3]

|               |                                       |                 |              |
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(c) diffusion in the lungs ;  
in red blood cells ;  
combined with / attached to, haemoglobin ; [max 2]

(d) (i) increases pulse rate / makes heart beat faster ; [1]

(ii) anything related to fear or excitement ; [1]

(iii) liver ; [1]

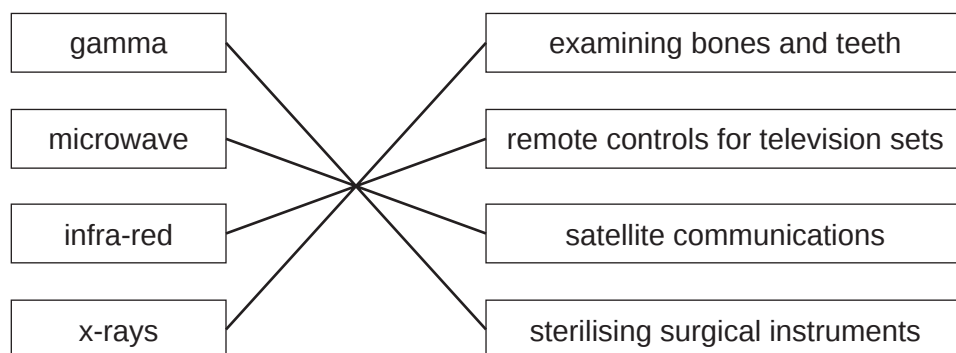
**[Total: 10]**

4 (a) transverse / longitudinal / difference frequency / wavelength / different speed ; [1]

(b)

**radiation**

**uses**



all correct 3 marks / three or two correct 2 marks / one correct 1 mark ;; [3]

(c) (i) (speed =) distance / time ;  
=  $500 / 1.5 = 333 \text{ (m/s)}$  ; [2]

(ii) between 10 and 20 (Hz) to between 20 000 and 25 000 (Hz) ; [1]

(iii) (density =) mass / volume ;  
=  $10\,000 / 1.1 = 9091 \text{ (kg/m}^3\text{)}$  ; [2]

**[Total: 9]**

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- 5 (a) use of chlorine / ozone / ultrafiltration / boiling ;  
removes / kills harmful microorganisms ;  
**OR**  
filtration ;  
removes insolubles ; [max 2]
- (b) in water (molecules) hydrogen (atoms) are bonded to oxygen (atoms) ;  
in the mixture only like atoms are bonded ;  
**OR**  
in water the H:O ratio is 2:1 ;  
in the mixture no fixed ratio ;  
**OR**  
(chemical) properties of compound are different from those of the elements it contains ;  
mixture retains properties of elements it contains ; [max 2]
- (c) (i) heat / boil / leave ;  
water evaporates / leaving crystals ; [2]
- (ii) (no)  
hexane is a liquid (at room temperature) ;  
so also passes through filter ; [2]
- (d) (i) it gains electrons ; [1]
- (ii) magnesium oxide reacted with the water ;  
and formed, an alkaline solution / product / magnesium hydroxide ; [2]
- [Total: 11]**
- 6 (a) (i) change shape ;  
change speed / start object moving / stop object moving / acceleration etc ;  
change direction (of motion) of object ; [max 2]
- (ii) newton ; [1]
- (b) **B** (no mark) ;  
car is decelerating, (force) **B** as is greater than (force) **F** ; [1]
- (c) chemical ;  
burned ;  
kinetic ;  
heat ;  
sound ; [5]

|               |                                       |                 |              |
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- (d) reaction between the fuel/gasoline and oxygen/air/complete combustion ;  
carbon reacts with oxygen to give carbon dioxide ;  
hydrogen reacts with oxygen to give water ;  
carbon dioxide and water are (combustion) products/products of burning ; [max 2]

**[Total: 11]**

- 7 (a) trees shade sand ;  
reduces the temperature ;  
reference to figures from the graph/quantitative comparison ; [max 2]

- (b) open sand is hotter and so produced more females ;  
forest cooler and so produced more males ; [2]

- (c) deforestation will result in hotter/more open sand ;  
so more female turtles produced ;  
which might make breeding difficult/might reduce number of young born ; [max 2]

- (d) increased carbon dioxide/effects of increased carbon dioxide ;  
less oxygen (in the atmosphere) ;  
(more soil) erosion / landslides ;  
(more) flooding ; [max 2]

**[Total: 8]**

- 8 (a) (i) (expt. 2)  
potassium hydroxide is an alkali ; [1]

- (ii) (expt 1)  
temperature decreased ; [1]

- (iii) no reaction occurred/no energy was transferred ;  
copper is less reactive than magnesium (so no reaction) ; [max 1]

- (b) (expt 5)  
the rate of reaction was greater ;  
so energy was transferred more quickly/temperature increases more quickly ;  
because powder has greater surface area ; [max 2]

**[Total: 5]**

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- 9 (a) catalyst ;  
biological / that works in living organisms ;  
protein ; [max 2]
- (b) greatest activity at pH 6.5 ;  
no activity at below pH 4 / above pH 9 ; [2]
- (c) (i) curve of similar shape with peak at pH 4 or below ; [1]
- (ii) sodium hydrogencarbonate neutralises / reacts with the acid / sodium hydrogencarbonate is a base ;  
so pH rises (above optimum for enzyme) / becomes too alkaline / pH too high ; [2]
- (d) so they can be absorbed ;  
into cells / into the blood / to be carried round the body ; [2]

**[Total: 9]**