



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES

0654/22

Paper 2 Core Theory

May/June 2016

MARK SCHEME

Maximum Mark: 120

Published

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- 1 (a) (i) carbon dioxide ;
reference to limewater ; [2]
- (ii) magnesium chloride ;
hydrogen ; [2]
- (b) (i) (B or C)
(reaction causes) temperature increase ; [1]
- (ii) no change in temperature (suggests) no reaction ;
because copper (too) unreactive (to displace hydrogen from dilute acid) ; [2]
- (c) nitrous oxide covalent ;
compound of two non-metals ;
magnesium nitride ionic/eletrovalent ;
compound of metal and non-metal ; [4]
- [Total: 11]**
- 2 (a) (i) leaves / stomata / mesophyll surface ; [1]
- (ii) transpiration ; [1]
- (b) (i) 15.30–16.30 ;
17.00 ; [2]
- (ii) similar pattern / correlated ;
water uptake lags behind water loss ;
appropriate ref to figures in the graph ; [max 2]
- (c) (i) photosynthesis / turgor / support / solvent ; [1]
- (ii) transported / transports ions in solution ; [1]
- [Total: 8]**
- 3 (a) straight line ;
from (0, 0) to (30, 60) ; [2]
- (b) (i) kinetic energy / (gravitational) potential energy ; [1]
- (ii) chemical energy ; [1]
- (c) (i) R ;
Q ; [2]
- (ii) equal and opposite ; [1]

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(d) friction between fuel and pipe ;
 electrons transferred ;
 from pipe to fuel ; [max 2]

[Total: 9]

4 (a) (i) oxygen 21 (%) ;
 nitrogen 78 (%) ; [2]

(ii) reference to the combustion products of propane/hydrocarbons
 which rise into balloon mixing with air inside ;
 higher amounts of CO₂/CO/H₂O ;
 so lower amounts of oxygen ; [max 2]

(b) (i) fractional distillation ;
 compound ;
 mixture ; [3]

(ii) compound containing only hydrogen and carbon ;
 having only single bonds/containing as much hydrogen as possible/no
 double bonds ; [2]

(c) reference to helium being unreactive/greater reactivity of hydrogen/reference to
 safety/reducing fire risk ; [1]

[Total: 10]

5 (a) total = 39 500 ;
 ÷ 5 = 7900 ; [2]

(b) area of the country ;
 area of the forest ;
 any replanting (elsewhere) ; [max 2]

(c) (i) use land for agriculture/building/mining ;
 for fuel ;
 use wood for construction etc. ; [max 2]

(ii) extinction ;
 loss of animal habitat ;
 disruption of food chains/webs ;
 loss of soil ;
 flooding ;
 increased CO₂ (in atmosphere) ; [max 2]

[Total: 8]

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- 6 (a) (i) visible placed to left of UV ; [1]
(ii) right hand side/gamma end ; [1]
- (b) (i) radiation that causes atoms/molecules to ionise/lose electrons ; [1]
(ii) cancer/mutations ; etc. [1]
(iii) gamma more penetrating ;
gamma has no charge, alpha has (positive) charge ;
gamma is a wave, alpha is a particle ;
gamma less ionising ; [max 2]
- (c) (i) B ; [1]
(ii) E ; [1]
- (d) error labelled ;
not total internal reflection/wave leaves fibre/
angles of incidence and reflection not equal ; [2]
- (e) (i) principal focus correctly labelled ; [1]
(ii) focal length correctly shown ; [1]
- [Total: 12]**
- 7 (a) maintaining constant ;
internal environment ; [2]
- (b) (i) K = (named type of) receptor ;
L = sweat gland ; [2]
(ii) fat(ty) ; [1]
(iii) arterioles ;
vasoconstriction ;
capillaries ; [3]
- [Total: 8]**
- 8 (a) (speed =) distance/time or 70/1.2 ;
= 58.3(3) (km/hr) ; [2]
- (b) (i) radiation ; [1]

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(ii) particles move faster / have more KE ;
collide with type walls more often / hit tyre wall harder / with greater force ; [2]

(c) the temperature at which ;
a solid turns into a liquid ; [2]

(d) use a magnet – steel as magnetic ; [1]

(e) (i) 20 (allow 10) (Hz) ;
to 20 000 (allow 25 000) (Hz) ; [2]

(ii) high frequency ; [1]

[Total: 11]

9 (a) (i) a lead atom / nucleus contains 82 protons ;
the total number of particles in the atom / nucleus is 207 /
the total number of protons + neutrons in the lead atom is 207 ; [2]

(ii) isotopes ; [1]

(b) (i) label line goes to the negative electrode and nowhere else ; [1]

(ii) melt the lead bromide ; [1]

(iii) bromine is produced ;
orange / brown ; [2]

(c) (i) 8 to 14 ;
lithium hydroxide solution is alkaline [2]

(ii) hydrogen ; [1]

(iii) lithium hydroxide + carbon dioxide → lithium carbonate + water ; [1]

[Total: 11]

10 (a) two or more alternative forms of a gene ;
only expressed when dominant allele is not present /
not expressed when dominant allele is present /
needs two present to show /
not expressed when heterozygous ; [2]

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(b) P = Nn ;
 Q = NN ;
 or Nn ;
 R = nn ;

[4]

(c) (i) (the physical or other) features / characteristics of an organism (due to both its genotype and environment ;

[1]

(ii) has genotype Nn / contains two different alleles ;

[1]

[Total: 8]

11 (a) (i) molecule ;

[1]

(ii) S₈ ;

[1]

(b) (i) reference to gain of oxygen (by sulfur atoms) ;

[1]

(ii) red / orange ;
 solution is acidic / sulfur dioxide is acidic / non-metal oxides are acidic ;

[2]

(iii) reference to formation of sulfur dioxide ;
 sulfur dioxide reacts forming acid rain ;
 acid rain causes chemical damage to buildings ;
 biological damage to plant / animal life ;
 sulfur dioxide poses health risks for humans ;

[max 3]

[Total: 8]

12 (a) (i) all components present and the correct number ;
 in series circuit ;
 all symbols correct ;

[3]

(ii) voltmeter (correct symbol) connected in parallel across lamp ;

[1]

(b) (i) not a straight line ;

[1]

(ii) 0.7 (A) ;

[1]

(c) R_T = R₁ + R₂ or 4 + 12 ;
 R_T = 16 (Ω) ;

[2]

[Total: 8]

13 (a) add Benedict's solution ;
 heat ;
 red (precipitate) ;

[3]

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(b) (i) nucleus ;
cell wall ;
chloroplast ; [3]

(ii) cell wall ; [1]

(iii) prevents constipation ; [1]

[Total: 8]