

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2015 series

0654 CO-ORDINATED SCIENCES

0654/22

Paper 2 (Core Theory), maximum raw mark 120

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Page 2	Mark Scheme	Syllabus	Paper
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- 1 (a) decomposition / decay / respiration ; [1]
- (b) (i) carbon dioxide ;
water ; [2]
- (ii) nitrate ;
magnesium ;
other named essential mineral ion ; [max 2]
- (iii) keep the compost bin warm ;
mix / aerate the compost ;
break up compost into smaller pieces ; [max 2]
- (c) (i) CO₂ / methane ; [1]
- (ii) traps solar energy / causes global warming ; [1]
- [Total: 9]**
- 2 (a) (i) hydrogen ; [1]
- (ii) lighted splint ;
'pops' ; [2]
- (iii) calcium
magnesium
zinc
copper ;;
(four correct = 2 marks, one or two correct = 1 mark) [2]
- (iv) potassium and or sodium very / too reactive;
reference to safety of student ; [2]
- (b) alloy is stronger than pure gold ; [1]
- [Total: 8]**
- 3 (a) (i) constant speed (of 25 m/s) ; [1]
- (ii) X at time 250 s ; [1]
- (b) (i) air resistance ; [1]
- (ii) 30 000 (N) ; [1]

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(c) (i) chemical ; [1]

(ii) thermal / sound ; [1]

(d) rails expand during hot weather ;
will buckle if no gap left ; [2]

(e) (i) volume = $0.5^3 = 0.125 \text{ (m}^3\text{)}$; [1]

(ii) (mass =) density \times volume ;
= $7800 \times 0.125 = 975 \text{ (kg)}$; [2]

[Total: 11]

4 (a) petroleum / crude oil ; [1]

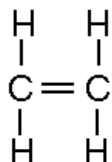
(b) (i) fractional distillation ; [1]

(ii) heating / cooking / other correct ; [1]

(iii) gasoline / petrol ; [1]

(c) (i) C_2H_6 ;
ethane; [2]

(ii)



C =C double bond ;
all else correct ; [2]

(d) (i) cracking ; [1]

(ii) (react / mix / shake with) bromine (solution) ;
bromine not decolourised by alkane ;
bromine decolourised by alkene ; [3]

[Total: 12]

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- 5 (a) (i) 8.5(%) (accept 8–9) ;
5(%) (accept 4.5–5.5) ; [2]
- (ii) glycogen converted to sugar / glucose ;
for (increased) respiration ;
provides energy (for training / muscle contraction) ; [max 2]
- (iii) (description):
increases ;
(from 5) to 8.5 / back to original level ;
- (explanation):
glucose converted to glycogen ;
energy storage ; [max 3]
- (iv) less food eaten / more activity on day 2 (after training) ; [1]
- (b) (i) carbon ;
hydrogen ;
oxygen ; [3]
- (ii) glucose ; [1]
- (c) (i) decrease – (no mark)
adrenaline causes glycogen breakdown / increased blood glucose ; [1]
- (ii) increased heart rate ;
AVP ; [max 1]
- [Total: 14]**
- 6 (a) upright ;
laterally inverted (or description) ;
same size as object ; [max2]
- (b) (i) no refraction / total internal reflection / angle (of incidence) greater than critical
angle ; [1]
- (ii) ray reflects at **P** and on opposite side of prism ;
emergent ray parallel to incident ray ; [2]
- (c) particles constantly in motion ;
collide with walls of tyre ;
force of collisions exerts a pressure ; [max 2]

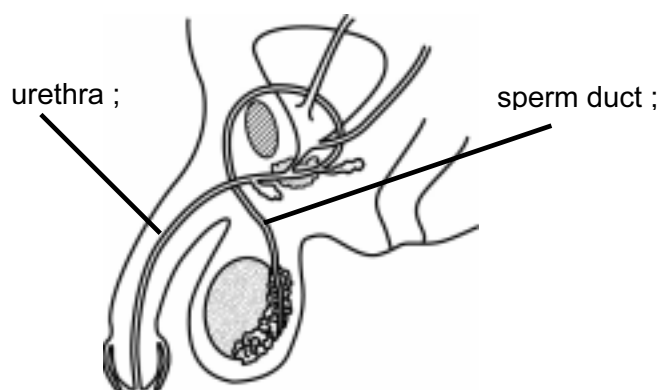
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- (d) heat transferred from body to sweat/absorbed by sweat from body/heat energy in body reduced by sweating ;
kinetic energy of water molecules increases / water molecules move faster ;
faster moving/more energetic (water) molecules escape/leave the surface/water molecules turn to gas/vapour ;
break bonds/break forces of attraction between molecules ;
(KE)/energy of (remaining) water molecules (in sweat) decreases ;

[max 2]

[Total: 9]

7 (a) (i)



[2]

- (ii) X = prostate gland ;
Y = testis ;

[2]

- (b) sperm production ;
production/secretion, of hormones/testosterone ;

[2]

- (c) (i) 0°C;

[1]

- (ii) sperm less likely to be able to reach the egg/less chance of fertilisation/owtte ;

[1]

- (iii) scrotum is outside the main body cavity ;
so lower temperature;
helps maintain sperm mobility ;

[max 2]

[Total: 10]

Page 6	Mark Scheme	Syllabus	Paper
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- 8 (a) radiation ; [1]
- (b) (i) labels to head (front) lights and rear lights ;
four lamps connected in parallel with battery ;
switch controlling headlights ;
switch controlling rear lights ; [4]
- (ii) $(R =) \frac{V}{I}$;
 $= \frac{12}{4.8} (= 2.5\Omega)$; [2]
- (iii) 28 (Ω) ; [1]
- (c) (i) 20 (Hz) ;
20 000 (Hz) ; [2]
- (ii) number of waves generated per second (unit time)/ number of waves
passing a fixed point per second ; [1]
- (iii) distance = speed \times time ;
 $= 34\,000 \times \frac{0.002}{2} = 34\text{ cm}$; [2]
- [Total: 13]**
- 9 (a) (i) 7; [1]
- (ii) contains protons and neutrons ;
7 protons and 7 neutrons ; [2]
- (iii) nitride has (3) more electrons than protons ; [1]
- (b) (i) nitrogen + hydrogen \rightarrow ammonia ; [1]
- (ii) use of damp, red litmus / universal indicator paper ;
colour change to blue / purple ;
OR
use hydrogen chloride gas ;
white smoke / ammonium chloride ; [max 2]
- (iii) increases reaction rate ;
without being consumed / permanently changed ; [2]
- (c) sulfuric (acid) ; [1]
- [Total: 10]**

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- 10 (a) (i)** relationship between energy input and useful energy output ; [1]
- (ii)** nuclei split ; [1]
- (b) (i)** γ -radiation ; [1]
- (ii)** γ -radiation ; [1]
- (iii)** radiation burns ;
radiation sickness ;
cancer ;
mutation ;
damages cells ; [max 2]
- (iv)** work behind shields / wear protective clothing / gloves / tongs ; [max 1]
- [Total: 7]**
- 11 (a)** folded / large surface area ;
thin / permeable ;
moist ; [max 2]
- (b) (i)** carbon dioxide ; [1]
- (ii)** diffusion ; [1]
- (c)** epidermal cell ;
guard cell ;
palisade cell ;
phloem ; [max 3]
- [Total: 7]**

Page 8	Mark Scheme	Syllabus	Paper
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- 12 (a) (i) (*element:*)
cannot be simplified / contains atoms with same proton number / contains only one type of atom / in Periodic Table ;
- (*compound:*)
made of different types of atom bonded together / can be simplified / broken down into elements ; [2]
- (ii) (*green to*) blue / purple ;
solution becomes alkaline / potassium hydroxide produced ; [2]
- (iii) reaction is exothermic / thermal energy / heat given off ; [1]
- (iv) less bubble / slower moving / no flame / less heat given off ; [max 1]
- (b) (i) covalent ;
reference to bonding of non-metallic elements ; [2]
- (ii) kills (harmful) microorganisms / sterilises ; [1]
- (iii) filtration / chlorination ; (*accept distillation*) [1]
- [Total: 10]**