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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CAMBRIDGE
International Examinations

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)** CO_2 / 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]

(c) **(i)** chemical ; [1]

(ii) thermal / sound ; [1]

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

(e) **(i)** volume = $0.5^3 = 0.125\,(m^3)$; [1]

(ii) (mass =) density × volume ;
= 7800 × 0.125 = 975 (kg) ; [2]

[Total: 11]

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

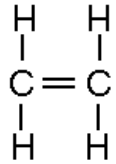
(b) **(i)** fractional distillation ; [1]

(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]

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]

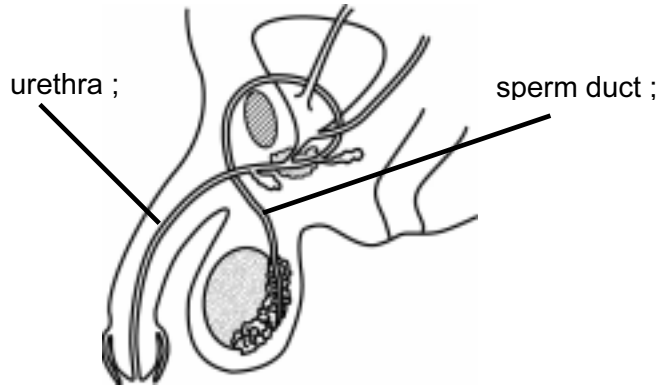
(ii) ray reflects at **P** and on opposite side of prism ;
emergent ray parallel to incident ray ; [2]

(c) particles <u>constantly</u> in motion ;
collide with walls of tyre ;
force of collisions exerts a pressure ; [max 2]

(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 ºC; [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]

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 Ω) ; [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 × time ;
$= 34\,000 \times \frac{0.002}{2} = 34$ 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 → 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]

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]

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]