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CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2013 series

0653 COMBINED SCIENCE

0653/21 Paper 2 (Core Theory), maximum raw mark 80

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1 **(a)** **(i)** nucleus;

(ii) **B** ;
sum of protons and neutrons is 16 ; [

(iii) numbers of protons and electrons are the same ;
protons positive electrons negative ;
charges (of protons and electrons) cancel ; [max 2]

(b) **(i)** covalent ; [1]

(ii) helium is inert / unreactive / no need to bond (to become stable) ;
reference to complete outer shell ; [max 1]

(c) pop (test) indicates hydrogen (given off) ;
zinc displaces hydrogen / zinc reacts with hydrochloric acid to produce hydrogen ;
zinc more reactive than hydrogen ; [max 2]

[Total: 9]

2 **(a)** **(i)** gravity ; [1]

(ii) gravitational / potential / gravitational potential ;
kinetic ; [2]

(b) **(i)** **E** ; [1]

(ii) **B** ; [1]

(c) turbine ;
generator ; [2]

[Total: 7]

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3 (a)

	producer	consumer	carnivore	herbivore
heron		×	×	
water snail		×		×
yellow water lily	×			

1 mark per correct row ;;; [3]

(b) (i) eutrophication ;
increased growth of algae ;
reduction of (dissolved) oxygen ;
reference to toxins / named toxin ; [max 2]

(ii) reference to greenhouse gas ;
traps heat ;
global warming / climate change ;
reference to consequence of global warming (e.g. sea level rise, more extremes of weather, change in habitats of living organisms) ; [max 2]

[Total: 7]

4 (a) (i) chain of two carbon atoms joined by single bond ;
only six hydrogen atoms correctly bonded to carbon ; [2]

(ii) methane ; [1]

(b) (i) <u>fractional</u> distillation / fractionation ; [1]

(ii) carbon dioxide ;
water (ignore vapour) ; [2]

(c) (i) too reactive / compounds much more stable ; [1]

(ii) electrons are transferred ;
sodium atoms lose (one) electron / outer shell electron / become 2.8 / become positively charged ;
chlorine atoms gain (one) electron / complete outer shell / become 2.8.8 / become negatively charged ; [max 2]

[Total: 9]

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5 **(a)** calcium ;

(b) water ;

(c) they contain protein ; [1]

(d) orange / brown ;
it does not contain starch / substances from animals do not contain starch / the only carbohydrate is sugar / lactose ; [2]

(e) protein, fat and carbohydrate ; [1]

(f) has more calcium ;
for, teeth / bones ;
OR
has more protein ;
for, growth / repair / other specific function of protein ; [max 2]

[Total: 8]

6 **(a)** **(i)** worker **Y** (no mark)
same force but bigger distance;
work is force × distance and distance is bigger ; [max1]

(ii) joules ; [1]

(iii) 5000 (g) ; [1]

(iv) density = mass/volume ;
= 5000/5500 = 0.91 (g / cm^3) ; [2]

(b) **(i)** use of graph / working ;
288 (m) ; [2]

(ii) 240 (s) ; [1]

(iii) boy **C** ;
line on graph goes down etc. (so speed was changing) ; [2]

[Total: 10]

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7 **(a)** 4 ;

(b) carbon dioxide ;
produces an acid(ic solution) / lowers pH ; [2]

(c) **(i)** decrease ;
of 7 (°C) ; [2]
(–7 gains 2 marks)

(ii) endothermic ; [1]

(d) lowers reaction rate ;
increases reaction rate ; [2]

[Total: 8]

8 **(a)** **A**: trachea ;
B: broncholi / bronchiole ; [2]

(b) **(i)**

gas	**percentage in inspired air**	**percentage in expired air**
nitrogen	78	**78**
oxygen	21	17
carbon dioxide	0.04	4
noble gases	1	**1**

both for 1 mark;
[1]

(ii) argon / neon / xenon / krypton / radon ; [1]

(iii) respiration ;
uses oxygen and produces carbon dioxide ;
oxygen diffuses into blood and carbon dioxide diffuses from the blood ; [max 2]

(iv) limewater / hydrogencarbonate indicator ;
method bubbles / mixes both types of air through the indicator ;
reference to comparison of time taken for indicator to change colour ; [3]

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(c) **(i)** reference to energy / work ;
more energy used / more work done per unit time ;

(ii) increased ;
use of comparative figures (e.g. 0.5 dm^3 when no power output, 2.8 dm^3 at 225 W) ;
reference to change of gradient at 50 W ; [max 2]

(iii) faster / more breaths per minute ; [1]

[Total: 14]

9 **(a)** current ;
current ; [2]

(b) most / greater the two symbols correct ;
all five symbols correct ;
ammeter in series and voltmeter in parallel ;
everything else correct ; [4]

(c) metals expand when hot / contract when cold ;
cables could snap / become too tight and damage pylons ;
if put up tight in summer ; [max 2]

[Total: 8]