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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2011 question paper

for the guidance of teachers

0654 CO-ORDINATED SCIENCES

0654/21 Paper 2 (Core Theory), maximum raw mark 100

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1 **(a)** steel / an alloy is a mixture (of metals and other elements) / contains more than one element ;
(mild steel) contains carbon (mixed with iron) ; [m

(b) **(i)** in **B**, air / oxygen and water are present (together) / air and water needed for rusting ;
no water in **A** ;
no air / oxygen in **C** ; [3]

(ii) oxidation ; [1]

(iii) not enough air / oxygen present / only water present ; [1]

(c) **(i)** **W** and **Y** ;
contain only hydrogen and carbon ; [2]

(ii) does not mix with water / air / oxygen ;
sticks to chain / steel ; [max 1]

(d) polymer molecule much larger / longer / heavier ;
idea that polymer is made from simple molecules / monomers linked into chain ; [max 1]

[Total: 10]

2 **(a)** **(i)** number of waves per second ; [1]

(ii) (distance =) speed × time ;
= 300 000 000 × 0.000 027 = 8100 (m) ;
so distance = 4050 (m) ; [3]

(b) (KE =) ½ mv^2 ;
= ½ × 140 000 × 100 × 100 = 7×10^8 (J) ; [2]

(c) **(i)** **C** = weight, **D** = drag / friction / air resistance ; [1]

(ii) constant speed / no acceleration (means balanced forces) ; [1]

(d) (deceleration =) change in velocity / time ;
= 85/40 or 2.125 (m / s^2) ; [2]

[Total: 10]

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3 **(a)** (receptor) nose / cells in nose ;
(effector) salivary glands ;

(b) **(i)** catalyst ;
protein ;
speeds up / controls / catalyses, metabolic reactions ; [max 2]

(ii) to break down / digest starch to ;
sugar / maltose ;
that can be absorbed / that can move from gut into the blood ; [max 2]

(c) **(i)** grinding / crushing ;
increase surface area of food ;
idea of easier access for enzymes ; [max 2]

(ii) bacteria (on food residues) ;
produce acids ;
(acids) dissolve / react with, enamel ;
make holes through which bacteria can reach, dentine / pulp cavity / living cells ; [max 3]

(iii) contains calcium ;
needed to form enamel ; [2]

[Total: 13]

4 **(a)** **(i)** electrons ; [1]

(ii) negative ; [1]

(iii) length ;
temperature ;
cross sectional area / width / diameter ;
material / resistivity / conductivity ; [max 2]

(b) **(i)** red, green and blue ;; [2]

(ii) other colours produced by a combination of these ; [1]

(c) **(i)** heat / thermal ; [1]

(ii) increase temperature / produce convection current ; [1]

(iii) efficiency = useful energy output / energy input = 100 / 30 ;
= 33(%) ; [2]

[Total: 11]

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5 **(a)** ceramics ;
chlorine ;
glass ;
paper ;

(b) **(i)** compound has formula / fixed proportions of elements ;
compound has different elements bonded together ;
compound has different properties from constituents ;
(significant) energy change when compound formed ;
(or corresponding statements for mixture) [max 2]

(ii) fractional distillation ; [1]

(c) increase temperature ;
increase pressure ;
use catalyst ; [max 2]

(d) acid ;
neutralisation ; [2]

[Total: 11]

6 **(a)** **(i)** 23 ;
chromosomes ; [2]

(ii) label to cell membrane ;
label to cytoplasm ; [2]

(iii) pointed head, reduces friction / streamlined ;
tail for swimming ; [2]

(b) testis/testicle ; [1]

(c) **(i)** oxygen use by one sperm / single sperm quantities too small to measure ; [1]

(ii) respiration ;
oxygen combined with sugar to release energy ;
more energy used when swimming ; [2 max]

[Total: 10]

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7 **(a)** diagram showing second switch in parallel with first ;

(b)

switch X	*switch Y*	*lamp off or on*
up	up	**on**
up	down	**off**
down	**up**	off
down	down	on

;; [2]

(c) **(i)** heated water rises / cold water sinks ;
by convection ;
hot water less dense / cold water more dense ; [max 2]

(ii) 5000 (J) ; [1]

(d) (large current produces) strong electromagnet ;
(strong enough to) attract iron (on pivot) ;
contacts break ; [3]

(e) **(i)** coal / oil / gas / peat ; [1]

(ii) no CO_2 emissions / no addition to global warming / no use of fossil fuels / renewable ; [1]

(iii) turbines unsightly / turbines noisy / can't work if too windy / not enough wind / wildlife destroyed ; [1]

[Total: 12]

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8 **(a)** respiration ;
carbon dioxide ;
stomata ;
photosynthesis ;

(b) nitrates absorbed by plant roots ;
used for making proteins ;
proteins used for making new cells ; [max 2]

(c) **(i)** to kill / destroy, insects ;
which eat / damage, crop / grass for grazing ;
increase yields ; [max 2]

(ii) kill dung beetles ;
so dung not buried / nitrates in dung do not get into soil ; [2]

[Total: 10]

9 **(a)** **(i)** 13 ; [1]

(ii) potassium feldspar ;
lilac shows potassium ; [2]

(iii) calcium / potassium ; [1]

(b) **(i)** no wind for sandblasting ;
no water for freeze / thaw ;
no water for chemical weathering ;
no plants / animals for biological weathering ; [max 2]

(ii) salts / minerals are released into the soil ;
which plants need for healthy growth / maintenance ; [2]

(c) **(i)** (thermal) decomposition ;
(heating) causes a substance to break down into simpler ones / a large substance is broken down into smaller ones / calcium oxide (and carbon dioxide) is (are) simpler substances than calcium carbonate ; [2]

(ii) (calcium oxide has lower mass)
mass due to carbon dioxide has been lost / part of the calcium carbonate has been lost / calcium oxide is only a part of calcium carbonate ; [1]

(iii) green to blue / purple ;
reaction produces an alkali / alkaline solution / calcium hydroxide ; [2]

[Total: 13]