UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

0654 CO-ORDINATED SCIENCES

0654/22 Paper 22 (Core Theory), maximum raw mark 100

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1 **(a)** kinetic ; [1]

(b) uranium, plutonium ; [1]

(c) **(i)** cannot be replaced / used up more quickly than they are formed ; [1]

(ii) solar / sunlight / tides / hydroelectric power / waves / wind / geothermal ; [1]

(iii) no atmospheric pollution / no polluting gases ;
no carbon dioxide emissions / greenhouse gases / global warming ;
no sulfur dioxide emissions / acid rain ;
less fossil fuels being burned ;
less solid waste produced ;
more energy released per kg ; [max 1]

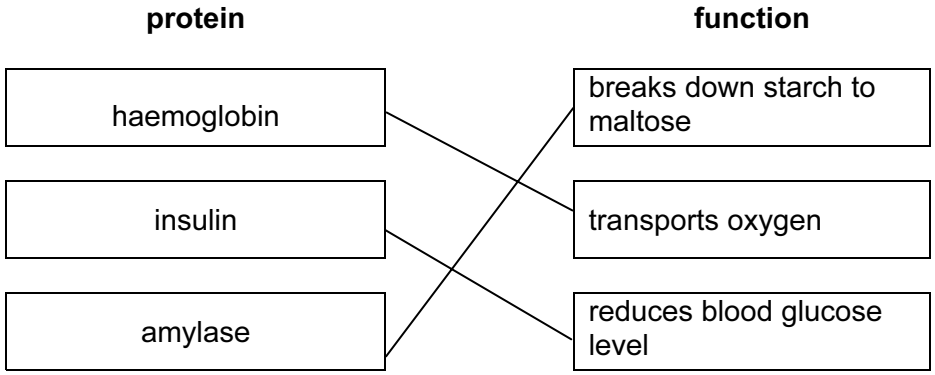
(d) to reduce heat / energy / power losses ;
high voltage means low current ;
lower I^2R means less energy lost ; [max 2]

(e) **(i)** split / divide / break ; [1]

(ii) negatively charged particle / electron ; [1]

[Total: 9]

2 **(a)**



;; [2]

(b) carbon, hydrogen, oxygen, nitrogen (one mark for any two correct) ;; [2]

(c) sample **A** (only) ;
purple with biuret test / positive result with biuret test ; [2]

(d) liver ; [1]

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(e) nitrogen fixed / converted to a compound ;
by, lightning / bacteria / Haber process ;
ref. to nitrate / ammonium / ammonia ;
(ignore nitrite)
(nitrate / ammonium) taken up through plant roots (must mention roots) ;
(ignore osmosis)
used to make, amino acids / proteins (in plant) ; [max 3]

[Total: 10]

3 (a) (i) hydrogen / H_2 ; [1]

(ii) **A** – sodium chloride / common salt / NaC*l* ;
B – chlorine / Cl_2 ;
D – sodium hydroxide / NaOH ; [2]

(iii) conducts (electricity) / good conductor ;
does not react with the electrolyte / unreactive ; [2]

(iv) (damp) litmus / indicator paper ;
is bleached ; [2]
or
pass through bromide / iodide solution ;
displaces other halogen/colour change stated ;

(b) (i) (sucrose is the carbohydrate)
because it contains only C, H and O / sucralose contains chlorine / another element in addition to C, H, O ;
reference to energy released from sucrose; [1]

(ii) 42 ; [1]

(iii) can use less which offsets extra cost ;
(for equivalent sweetening) fewer kilojoules (consumed) ;
stated health benefit – control of body weight / diabetes / tooth decay ; [max 2]

[Total: 11]

4 (a) (i) **A** and **C** ;
overall resultant force / unbalanced forces ; [2]

(ii) arrows in direction of resultant force ; [1]

(iii) gravity (weight) ; [1]

(iv) the Earth ; [1]

(b) (density) = mass / volume ;
= 720 / 80 = 9 (g / cm^3) ; [2]

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(c) component to show conduction (lamp ammeter);
component to provide PD (battery / cell / power pack) ;
correct circuit (including symbols) ; [3]

[Total: 10]

5 (a) (i) the greater the light intensity, the faster the rate of photosynthesis ;
but at high light intensities no effect on rate ; [2]

(ii) energy ;
to make carbon dioxide combine with water ; [2]

(b) (i) **P** (upper) epidermis ;
Q air space ;
R stoma ; [3]

(ii) leaf **B** (no mark)
most photosynthesis takes place in palisade cells (compared with other cells)
larger / greater area of / greater volume of, palisade cells allows more photosynthesis ; [1]

(iii) reduces water loss ;
this leaf is exposed to (more) heat from Sun ; not light which would increase evaporation rate ; [max 2]

(iv) diffusion ;
down concentration gradient ;
through, stomata / **R** ;
through, air spaces / **Q** ; [max 3]

(c) environment ;
leaves are from the same tree ;
so have the same genes ; [max 2]

[Total: 15]

6 (a) 7 ;
5 ; [2]

(b) (i) test-tube / reaction mixture becomes warm / temperature rises;
because reaction gives off heat ; [2]

(ii) decrease (acid) temperature ;
decrease acid concentration / strength ;
lower magnesium surface area / less magnesium ; [max 2]

(iii) →magnesium chloride + hydrogen ;; [2]

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(c) **(i)** (mark words separately)
metallic
reference to typical properties e.g. good conductor / malleable / ductile / sonorous / lustrous / high melting point / high boiling point / forms positive ions ;
element
contains only one type of atom / found in Periodic Table / other correct ; [2]

(ii) beryllium / calcium / strontium / barium ; [1]

(iii) 26 – 12 = 14 neutrons ; [1]

[Total: 12]

7 **(a)** **(i)** **A** to **B** ; [1]

(ii) 50 ; [1]

(iii) (momentum =) mass × velocity ;
= 600 × 50 = 30000 (kg m / s) ; [2]

(iv) (acceleration =) gradient (or use numbers) ;
= 50 / 8 = 6.25 (m/s^2) ; [2]

(b) **(i)** (turning effect =) force × distance ;
= 0.3 × 300 = 90 (Nm) ; [2]

(ii) increase force ;
increase distance / longer spanner ; [2]

(c) red and green – both needed for mark ; [1]

[Total: 11]

8 **(a)** (stimulus) sound ;
(receptor) ear ;
(effector) muscle ; [3]

(b) **(i)** 2 ÷ 330 ;
0.006 (s) ; [2]

(ii) ring around results for heat 5 ; [1]

(iii) lane 8 (no mark)
takes longer for sound (of gun) to reach lane 8 ; [1]

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(c) **(i)** breaking down / releasing energy from, glucose / carbohydrate / other ;
without oxygen ; [2]

(ii) lactic acid ; [1]

(iii) combined with oxygen ;
in liver ;
ref. to breathing faster ;
ref. to oxygen debt ; [max 2]

[Total: 12]

9 **(a)** cools ; [1]

(b) no (elemental) oxygen gas present ;
oxygen is part of a compound / the water (vapour) ;
compounds have different properties from the elements in them ;
water puts the flame out ; [max 2]

(c) **(i)** (strong) heat / must be fired (in kiln) ; [1]

(ii) carbon dioxide is an acidic oxide / causes (rain)water to be acidic / lowers the pH of rain ;
acids react with limestone ;
limestone contains (calcium) carbonate (which reacts with acids) ; [3]

(d) **(i)** forms limescale on the element / dishes / inside surfaces ;
reduces efficiency of the (heating) element / may cause element to overheat / malfunction ;
use more detergent ; [max 1]

(ii) calcium / magnesium ; [1]

(iii) helps to clean objects / improves washing efficiency / kills bacteria ; [1]

[Total: 10]

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