CAMBRIDGE
INTERNATIONAL EXAMINATIONS

JUNE 2003

INTERNATIONAL GCSE

MARKING SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 0654/01

CO-ORDINATED SCIENCES
Paper 1 (Multiple Choice)

Question Number	Key	Question Number	Key
1	D	21	D
2	D	22	A
3	B	23	B
4	C	24	C
5	B	25	A
6	B	26	A
7	B	27	D
8	D	28	A
9	B	29	C
10	A	30	D
11	D	31	D
12	D	32	A
13	B	33	D
14	C	34	D
15	C	35	B
16	A	36	A
17	C	37	A
18	B	38	B
19	B	39	A
20	A	40	D

TOTAL 40

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

JUNE 2003

INTERNATIONAL GCSE

MARKING SCHEME

MAXIMUM MARK: 100

SYLLABUS/COMPONENT: 0654/02

CO-ORDINATED SCIENCES (DOUBLE AWARD)
Paper 2 (Core)

1(a) (i) (rbc) has no nucleus;
(rbc) has biconcave shape;
(rbc) is round/more regular shape;
(rbc) contains haemoglobin;   max 2

(ii) (plant cell) has cell wall;
(plant cell) has chloroplasts;
(plant cell) has (sap/large) vacuole;   max 2

(b)   defend against infections/kill bacteria/kill viruses;   1

(c) (i) HIV;   1

(ii) sexual intercourse;
sharing needles/blood to blood;
mother to baby.   max 2

Total 8 marks

2 (a)   statement describing evaporation -
e.g. faster moving particles have enough energy to escape and leave the
liquid;
overcome forces of attraction;
more particles will have this energy on a warm day;   3

(b)   particles gain energy;
amount of vibration increases;
distance between particles increases;   3

(c)   particles being heated vibrate more;
vibration passed on to neighbouring particles.   2

Total 8 marks

3 (a)   **A**;
reference to only one type of atom;   2

(b) (i) potassium bromide;   1

(ii) to make it into an electrolyte/so that it conducts an electric current;
salt **X** must be broken down;
ions must be free to move;   max 2

(iii) metals always form at the same electrode/at the cathode;
potassium ions are positive;   max 1

(iv) giant metallic   simple molecular   giant ionic   3

Total 9 marks

4 (a) reptiles have scaly skin/amphibians have smooth skin;
reptiles may live entirely on land/amphibians reproduce in water;
reptiles have shelled eggs/amphibian eggs have no shell;
amphibians have tadpole stage/reptiles do not;   max 2

(b) (i) gg;   1

(ii) GG;   1

(iii) phenotypes of parents   **green**   **green**;
genotypes of parents   Gg   Gg
gametes produced   **G and g**   **G and g**;
genotypes of offspring   **GG   Gg**   **Gg   gg**;   3

(iv) 3:1.   1

Total 8 marks

5 (a) goes faster for given force/better acceleration/less fuel used;
less wear and tear, etc.;   2

(b) (i) 20 000 N;   1

(ii) 20 000N;   1

(c) (i) 20m/s;   1

(ii) 40s;   1

(iii) 100s;   1

(iv) 20/40;
$0.5m/s^2$;   2

Total 9 marks

6 (a) made from (once) living organisms;
formed over a very long timescale/OWTTE;   2

(b) (i) **Y**
   X
   Z   1

(ii) the larger the molecules the higher the boiling point;   1

(iii) (fractional) distillation;   1

(iv) **A**;   1

(c) saturated - only single bonds(between carbons)/contains maximum
amount of hydrogen per molecule;
unsaturated - has double/multiple bonds(between carbons)/does not
contain maximum amount of hydrogen per molecule.   2

Total 8 marks

7 (a) so light could enter/light needed;
for photosynthesis; 2

(b) photosynthesis happens (only) during daytime/when light present;
produces oxygen;
oxygen falls in darkness because respiration happening; max 2

(c) curve with peak in centre;
similar lower levels at either end; 2

(d) (i) (organism which) produces food/produces organic substances
(from inorganic); 1

(ii) eating/feeding (on plants);
energy is in carbohydrates/other named organic molecule. 2

Total 9 marks

8 (a) (i) iron/cobalt/nickel; 1

(ii) interfere with electromagnets/tape etc.; 1

(iii) electrical;
to kinetic/sound;
allow kinetic to sound for two marks 2

(iv) area around magnetic where the influence of the magnet can
be detected; 1

(b) (i) wavelength correctly shown; 1

(ii) wave drawn with half amplitude;
but same wavelength; 2

(iii) quieter (no mark)
amplitude of wave controls loudness. 1

Total 9 marks

9 (a) (i) chemotherapy; 1

(ii) analgesic; 1

(b) 4; 1

(c) (i) 117; 1

(ii) caesium; 1

(iii) platinum may have coloured compounds/catalytic activity/more than one
valency/be less reactive;
also allow answer in terms of melting points, boiling points and density 1

(d)   many drugs are developed from chemicals found in plants/OWTTE;
high diversity of plants in rainforest;
chance of finding new drugs may be lost or reduced/OWTTE.   max 2

Total 8 marks

10 (a) add biuret solution/potassium hydroxide and copper sulphate solution;
purple;   2

(b)   *digested*
protease (breaks proteins down);
to amino acids;
absorbed
in small intestine/ileum;
into villi/blood;   max 3
(mark (i) and (ii) together)

(c) (i) liver;   1

   (ii) transported in blood;
to kidneys;
excreted;
in urine.   max 2

Total 8 marks

11 (a) electrons are charged;
electrons are negative;   2

(b)   correct symbol;
in parallel;   2

(c)   length/cross section/temperature/metal it is made from;   2

(d)   200 Ω.   1

Total 7 marks

12 (a) (i) carbon hydrogen oxygen (2 marks for all three, 1 mark for two);   2

   (ii) idea of symbols joined in a chain;   1

   (iii) very large/chain molecule;
made of repeating units/smaller molecules/monomers which have joined
together;   2

(b)   container with labelled limewater;
delivery tube entering limewater;   2

(c)   liquid liquid;
solid liquid.   2

Total 9 mark

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INTERNATIONAL GCSE

MARKING SCHEME

MAXIMUM MARK: 110

SYLLABUS/COMPONENT: 0654/03

CO-ORDINATED SCIENCES (DOUBLE AWARD)
Paper 3 (Extended)

1 (a) (i) label M to anther;
           label D to stigma;   2

   (ii)   petals;
           anthers, inside petals/enclosed;
           stigma, inside petals/enclosed/not feathery;   max 2

   (iii)   pollination is the transfer of pollen;
           from an anther to a stigma;
           fertilisation is the fusion of (male and female) gametes/nuclei/cells; **not** pollen
           inside an ovule;   max 3

(b) (i)   structure of fruit described (e.g. fleshy, sweet, has hooks);
           how this helps dispersal by animals (e.g. egested in faeces in different place,
           removed from fur in different place);   2

     (ii) allows colonisation of new areas;
           reduces competition (between new plants/between parent plant and offspring);
           reduces threat from localised disaster;
           reduces chance of breeding with close relation and hence increases variation.
                                                                           max 2

                                                                 Total 11 marks

2 (a) (i)   130 dm^3;   1

   (ii) $P_1V_1 = P_2V_2$ *or* 100 000 x 130 = P_2 x 30;
            433 333 Pa/Nm^{-2};   2

   (iii)   ref. to possible temperature change;
            gas became hotter when pushed into the cylinder;
            higher temperature (in the same volume) increases pressure;   max 2

(b) (i)   (gas) pressure increases when temperature increases;
            (this) pushes the piston/metal plate out;
            (which) closes the connection (and starts the alarm);   3

     (ii) $P_1/T_1 = P_2/T_2$ *or* 120 000/300 = 180 000/T_2;
            450 K.   2

                                                                 Total 10 marks

3 (a) (i)   temperature rises;
            when acid is added (to the alkali);
            heat is evolved;   max 2

   (ii)   7;
            this is when the alkali has (just) been neutralised or max temp. shows
            reaction has finished;   2

   (iii)   22.5 cm^3;   1

(b) (i) $HCl + KOH \rightarrow KCl + H_2O$;

   (ii) hydrogen/H^+;
hydroxide/OH^-;   2

(c) (i) (relative formula mass =) 39 + 16 + 1 *or* 56;
(56 x 0.1 =) 5.6 g;   2

   (ii) working;
1.4 g.   2

Total 13 marks

4 (a) (i)

Gas	Percentage in Inspired Air	Percentage in Expired Air
carbon dioxide	0.03	**3 to 4**
oxygen	**20 to 21**	18
nitrogen	78	**78 to 79**

                                3

   (ii) water vapour/argon/other;   *not hydrogen* 1

(b) (i) to give time for breathing rate to settle down/time for carbon dioxide to equilibrate in the room/words to that effect;   1

   (ii) echidna breathing rate does not increase as much overall (as carbon dioxide concentration increases)/vice versa;
echidna breathing rate increases less at (very) high carbon dioxide concentrations/curve flattens off for echidna/vice versa;   2

(c) (i) ref. to <u>diffusion</u>;
between blood and alveoli;
more CO_2 in air/alveoli, slows down diffusion/makes gradient less steep/causes CO_2 to diffuse into blood;   max 2

   (ii) more carbon dioxide in blood is an indication of more respiration;
(faster breathing) supplies more oxygen to tissues;
(faster breathing) removes carbon dioxide rapidly;
high carbon dioxide concentration in blood is dangerous;   max 2

(d) atrium;
right;
ventricle;
artery.   4

Total 15 marks

5 (a) (i)   fossil fuels running out;
fossil fuel burning, releases carbon dioxide/adds to global warming/releases
sulphur dioxide/causes acid rain;   2

(ii)   radiation may leak/high costs of decommisioning/high start-up costs/if there is a
disaster it is likely to be a major one/radioactive waste is difficult to deal with;   1

(iii)   needs to be in area of high winds/spoils landscape/noisy for local residents;   1

(b) (i)   minimises <u>energy</u> losses;
at higher voltages;   2

(ii)   substitution into equation;
ratio is 1:16.   2

Total 8 marks

6 (a)   (damp) red litmus;
turns blue;

or

contact with hydrogen chloride gas;
white smoke produced;   2

(b) (i)   reaction is reversible/gases not in reactor long enough/some nitrogen and
hydrogen do not (have time to) react/some gases miss the catalyst/*one*
reactant may be in excess;   1

(ii)   decrease/become zero;
catalyst is needed to speed up the reaction/reaction would be slower;   2

(c) (i)   nitrogen is unreactive/inert;   1

(ii)   oxygen (*allow 'air'*);
water;
rhodium/platinum/vanadium (catalyst);   max 2

(d)   (dilute) sulphuric acid;
mix reagents until neutral;
ref. to method of deciding neutrality;
heat mixture to evaporate some of the water;
allow water to evaporate leaving the crystals.   max 4

Total 12 marks

7 (a)   plants need, nitrogen/nitrate/ammonium, to make proteins/amino acids;
         soil may be short of nitrogen/nitrate/ammonium;
         adding fertiliser <u>increases</u> growth/yield;   max 2

  (b) (i)   by diffusion/active transport;
             into root;
             (root) hairs;   max 2

     (ii)   xylem;   1

  (c) (i)   increase at the point where fertilisers enter the river;
             fall downstream as fertiliser is used up/diluted/dispersed;   2

     (ii)   bacteria increase as they feed on (dead) algae;
             bacteria respire;
             bacteria use oxygen;
             oxygen curve falls as bacteria curve rises/vice versa;
             fish need oxygen for respiration;
             fish die/move away, when oxygen level falls.   Max 4

                                                                                    Total 11 marks

8 (a) (i)

Result	Switch A	Switch B	Switch C	Switch D
cold, slow	on	off	on	off
hot, slow	**on**	**off**	**on**	**on**
cold, quickly	**off**	**on**	**on**	**off**
hot, quickly	**off**	**on**	**on**	**on**

                                                                                                    3

     (ii)   greater resistance but same voltage (in circuit)/smaller voltage drop across
             motor;
             less current passes through motor/motor receives less energy;   2

     (iii)   240 V;   1

     (iv)   1 V is 1 J per coulomb/energy = voltage x charge plus explanation;   1

   (b)   energy = shc x temperature change x mass; *must be stated fully*
          = 4200 x 50 x 2;
          420 000 J/420 kJ.   3

                                                                                    Total 10 marks

9 (a) (i)   in the earth/in porous rocks/with petroleum/from biogas/
            action of microorganisms on organic matter/compost/cattle/paddy fields/other;

   (ii)   four shared pairs shown;
            all otherwise correct (no other outer electrons);   2

   (iii)   three carbons and eight hydrogens;
            all single bonds shown;   2

   (iv)   carbon dioxide + water;   2

  (b) (i)   **2** CH_4 + **3** 0_2 $\rightarrow$ $2CO$ + **4** H_2O;   1

   (ii)   +2;
            need for charge balance;   2

   (iii)   CO is toxic/harmful to health;
            cannot be seen or smelled/person would not know it was present;
            action taken (e.g. leave the room, turn off the heater, open windows).   max 2

                                                          Total 12 marks

10 (a) (i) KE = $^1/_2$ mv^2 *or* obvious use of this relationship in calculation;
            calculation of KE at the two speeds *and* one shown to be four times the other; 2

   (ii)   *small* increase in speed means *large* increase in kinetic energy;
            degree of injury is related to <u>kinetic energy</u> (at impact);   2

  (b) (i)   force = mass x acceleration/acceleration = 4000 $\div$ 1000;
            4m/s^2;   2

   (ii)   32 = 0.5 x 4 x t^2;
            t = 4 seconds.   2

                                                          Total 8 marks

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MARKING SCHEME
MAXIMUM MARK: 45
SYLLABUS/COMPONENT: 0654/05 CO-ORDINATED SCIENCES (DOUBLE AWARD) Practical

1 (a) (i)   feels warm;   1

   (ii)   condensation/water/clear liquid;   1

   (iii)   goes cloudy/milky/white;
carbon dioxide is produced;   2

   (iv)   oxygen/air;   1

   (v)   slower process/no burning/done by enzymes/lower
temperature;   1

   (vi)   oxygen used/CO_2 produced/energy released/water release.   1

  (b) (i)   A – pale blue   B – purple/mauve/lilac;   2

   (ii)   B;   (1, 1)

  (c) (i)   colour change to red/green/yellow;   1

   (ii)   (reducing) sugar;   1

   (iii)   yes;   1

   (iv)   starch catalysed/changed/broken down to sugar;   1

   (v)   add iodine solution;
goes blue/black.   2

Total 15 marks

2 (a) (iii)   a reading for h_o
5 readings taken (-1 if not in g)
force calculated correctly
extension calculated (deduct 1 if not in mm)   4

(b)   axes labelled correctly
sensible scale
plotting correctly carried out
best line drawn goes through or would go through origin   4

(c)   extension read correctly or calculated   1

(d)   proportional (allow one if says extension increases by fixed
amount for fixed force)   2

(e)   line correctly drawn and labelled   1

(f)   read extension
use graph
calculate in g or kg using correct number,
i.e. /10 to kg or x 100 to g   3

Total 15 marks

3 (a)   each metal correct as –ve   1

             three values of p.d. to be within 0.2V of SV   3

(c)   magnesium with a suitable explanation   2

(d)   correct order Mg, Zn, Cu   1

(e)   bubbling, colour fades, black/brown deposit, magnesium disappears
             or other suitable   3

             magnesium is displacing copper ion (some reference to electron
             movement or ion changes is essential to score both marks)   2

(f)   test with each metal
             note polarity
             compare this polarity with the other three   3

Total 15 marks

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MARKING SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 0653/06, 0654/06

COMBINED AND CO-ORDINATED SCIENCE
Alternative to Practical

1 (a)   correct headings (1) data entered accurately (1)
     time 0 entered (1)

                           [3]

 (b)   elder: average water loss = 6.6 - 1.6 (or 6.6 - 2.4)
     divided by 90 (80) = 0.056 cm/s. (0.525) (2)
     pyrocantha: average water loss = 18.8 - 0.8 (or 18.8 - 2.5)
     divided by 90 (80) = 0.19 (0.20) cm/s (2)
     part marks: any length divided by any time (1)
     correct time used in calculation (ecf from table) (1)
     correct distances used in calculation (2)

                           [4]

 (c)   different leaf area (shape) (1) gives smaller/larger
     area for transpiration/evaporation OWTTE (1)
     OR different numbers/density of stomata (1) OR waxy cuticle (on
     pyrocantha) gives lower rate of transpiration/evaporation (1)

                           [2]

 (d)   (change in) air movement/temperature/humidity/light intensity

                           [1]

                   Total 10 marks

2 (a)   magnesium copper (1)   2.0 (1) (MUST be 2.0)
     zinc   copper (1)   1.1 (1)

                           [4]

 (b)   most negative = magnesium
     most positive = copper

                           [2]

 (c)   magnesium, zinc, copper

                           [1]

 (d)   Find p.d. with each of the other metals (1)
     note which metal is positive/negative OR note p.d. (1)

     Metal X will be positive with a more reactive metal/vice-versa OR
     judge position in reactivity series by potential differences (1)
     OR react metals with acid (1) reference to conditions of
     reaction (1) rate of reaction judged by bubbling (1)
     OR react metal with solutions (1) of salts (1) of the other metals, it
     displaces metals that are less reactive (1)

                           [3]

                   Total 10 marks

3 (a)   160,122,85 +/- 1 mm,
          recorded in correct column (-1 for each error)

                                                                      [2]

  (b)   forces: 1.5, 2.0, 2.5 N (-1 only if 2 or more incorrect)
          extensions: 110, 148, 185 (ecf) (-1 for each error)

                                                                      [2]

  (c)   sensible scales used (1)
          plotting points including origin

                                                                      [3]

  (d)   proportional OR obeys Hooke's Law (1)
          Reject "as mass increases, extension increases" OWTTE

                                                                      [1]

  (e)   place mass on hanger instead of masses and find the extension (1)
          factor to convert extension or weight to mass in grams OWTTE (1)

                                                                      [2]

                                                          Total 10 marks

4 (a)   (i) heat/thermal energy produced (1) turns cloudy/milky (1)

                                                                      [2]

          (ii) lower temperature/enzyme catalysed/lowered activation energy
               slower process/energy transferred by ATP/can be anaerobic/uses
               glucose not starch (any 1)

                                                                      [1]

  (b)   (i) blue (1) lilac/purple/mauve (1)

                                                                      [2]

          (ii) add iodine (solution) (1) turns blue-black/black/blue (1)

                                                                      [2]

  (c)   (i) (reducing) sugar present

                                                                      [1]

          (ii) starch had been turned to sugar (1) by hydrolysis/breakdown of
               (long chain) molecules (1) (0 mark for "yes" without explanation)

                                                                      [2]

                                                          Total 10 marks

5 (a)   (i) crystal dissolved (in the water) or explanation of particles
             separating (1). Reject "melted"
             particles diffused or dispersed (to fill the liquid) (1)

[2]

    (ii) Warm/heat (1) stir (1) grind up crystal (1) (any 2)

[2]

  (b)   Alkaline/alkali/pH higher than 10

[1]

  (c)   (i) dilute = mixed with water/water added OWTTE. Reject "not
             concentrated"

[1]

    (ii) alkali reacted with acid (vice-versa) (1) pH = 7, neutralised (1)

[2]

    (iii) the alkali is in excess OWTTE;
             reject "the acid has not reached the alkali"

[1]

    (iv) calcium hydroxide + ethanoic acid + salt (or any name) + water

[1]

                                                    Total 10 marks

6 (a)   43.4 g, 93.6 g, 108.6 g
             (max 1 if the readings have been "inverted" but otherwise correct)

[3]

  (b)   (i) 108.6 - 43.4 = 65.2 g   (ecf)

[1]

    (ii) 108.6 - 93.6 = 15 g   (ecf)

[1]

             (note: if the mass of salt is found by subtracting the mass of water
             (50g) from 65.2, the answer is 15.2)

(c)   55 cm^3

[1]

(d)   (c) and (b) (i) (both correct)
accept (b) and (c) if mass and volume are mentioned (or D = M/V)
(accept 65.2g and 55cm^3 or 65.2/55 = 1.19 g/cm^3)

[1]

(e)   Place hexane in measuring cylinder to a known volume (1) (weigh
out 15g sodium chloride) and add to the hexane (1) note the new
volume and subtract (1)
Use of displacement can and measuring cylinder correctly described
can get full marks

[3]

Total 10 marks

Grade thresholds taken for Syllabus 0654 (Co-ordinated Sciences) in the June 2003 examination.

	maximum mark available	minimum mark required for grade:			
		AA	CC	EE	FF
Component 1	40	-	27	20	17
Component 2	100	-	57	36	28
Component 3	110	70	48	-	-
Component 5	45	33	24	16	12
Component 6	60	45	33	22	14

The threshold (minimum mark) for B is set halfway between those for Grades A and C.
The threshold (minimum mark) for D is set halfway between those for Grades C and E.
The threshold (minimum mark) for G is set as many marks below the F threshold as the E threshold is above it.
Grade A* does not exist at the level of an individual component.