CAMBRIDGE
INTERNATIONAL EXAMINATIONS

JUNE 2002

INTERNATIONAL GCSE

MARK SCHEME
MAXIMUM MARK : 110
SYLLABUS/COMPONENT : 0654/3   CO-ORDINATED SCIENCES   (EXTENDED)

UNIVERSITY *of* CAMBRIDGE
Local Examinations Syndicate

1(a)   arthropods ;   1

(b)   A - insects ;

six legs / four wings / head, thorax and abdomen ;   2

B - arachnids ;

eight legs / cephalothorax + abdomen / no antennae ;   2

C - crustacea ;

more than eight legs / two pairs of antennae   2

2 (a)   (mass of salt = 1.0 g, and mass of shells + salt is 13.5 g)

mass of, shells / calcium carbonate is, 13.5 - 1.0 *or* 12.5 (g) ;
therefore percentage composition is, (12.5 ÷ 50.0) x 100 = 25 ;   2

(b)(i) $CaCl_2$ + CO_2 + H_2O ; ;
all three for two marks
two for one mark   2

(ii)   40 + 12 + (16 x 3) = 100 ;
moles = 12.5 ÷ 100 ;
= 0.125 (moles) ;   3

(iii)   acid : carbonate ratio of 2 : 1 ;
so moles of acid required = 2 x 0.125 *or* 0.25 ;   2

(c)   *sodium*
10 electrons ;
arranged 2, 8 ;   *allow 1 mark for correct shells if atom drawn*

chloride
18 electrons ;
arranged 2, 8, 8 ;   *allow 1 mark for correct shells if atom drawn*   4

Question 3

(a) 2 Ω and 3 Ω ;

in series ;   2

(b) 3 Ω and 3 Ω ;

in parallel ;

working shown ;   3

(c)(i) NOT gate ;

signal, inverted / reversed ;   2

(ii) OR gate ;

only one input is 1 but output is 1 / words to that effect ;   2

4(a) A trachea / ring of cartilage / windpipe ;

B rib ;   2

(b)(i) and (ii) *mark together*

C contracts ;

pulls diaphragm down ;

D contracts ;

pulls rib cage up / out ;

increases volume in thorax ;

decreases pressure ;

air mover in from higher pressure outside / down pressure gradient ;   5 max

(c) stops cilia working ;

so air not cleaned of bacteria ;

increases mucus production ;

mucus builds up in lungs ;

bacteria breed in mucus ;   3 max

(d)(i)   no / inconclusive / cannot tell ;

it does show there is a link between them, but not that one causes the other ;

we don't know how many people were in each group ;

other suitable argument e.g. other factors to be taken into account ,

some nonsmokers die of heart disease ;   2 max

(ii)   don't become overweight ;

don't eat too much fat / other suitable specific comment on diet ;

reduce stress ;

take exercise ;   2 max

5(a)   outer shell is full ;

unreactive / will not burn ;   2

(b)(i)   fractional distillation ;   1

(ii)   does not easily burn / too viscous / incomplete combustion / not very volatile ;   1

(iii)   3 carbons joined ;

8 hydrogens correctly bonded to the carbons ;   2

(iv) CH_4 / C_2H_6 ;

molecules have a lower mass than those of propane / lower intermolecular attraction ;   2

(v)   combustion produces, carbon dioxide / water ;

combustion uses oxygen ;

balloon mixture more, carbon dioxide / water ;

lower proportion of oxygen (and nitrogen) ;   3 max

(c)(i)   two alternating squares and ovals ;

linked with nothing else in between ;   2

(ii)   water ;   1

6(a)   90 ;
            138 ;
            90 ;   3

(b)   same number of protons ;
            different number of neutrons ;   2

(c)   5.7 years is three half lives ;
            2 g ;   2

(d)   breakdown of <u>nuclei</u> ;   1

7(a)(i) metal <u>ions</u> have positive charge ;
            are <u>attracted</u> to negative electrode ;   2

(ii)   aluminium too reactive / more reactive than hydrogen ;
            hydrogen formed instead of aluminium (if solution used) ;   2

(iii)   -1 ;
            each ion, <u>receives / needs</u>, three electrons ;   2

(b)(i)   mix and melt copper and tin ;   1

(ii)   one diagram shows atoms of two different sizes ;
            at least one diagram shows atoms all of the same size ;
            ref. to difference in ease of slippage ;   3

8(a)   transverse because the wave direction is at right angles to the direction of travel ;   1

(b)(i)   analogue has continuously variable values ;
            digital is, on - off / 0 and 1 ;   2

(ii)   more easily distorted / not so easily read by computers ;   1

(c)(i)   0.4 m / s ;   1

(ii) $(10 \div 0.4) = 25$ s ;   1

(iii) $m_1 v_1 = m_2 v_2$ clearly stated ;
so velocity $= 50 \times 5 \div 100$;
$= 2.5$ m/s ;   3

9(a)   wind / self ;
small flowers / no coloured petals ;   2

(b)   pollen grain grows a tube ;
male. nuclei / gametes, pass down, tube / style ;
into, ovary / ovule ;
fertilize / fuse with, female gametes / female nuclei / egg / ovum ;   3max

(c)(i)   photosynthesis ;
light absorbed by chlorophyll ;
carbon dioxide combines with water ;
in mesophyll / palisade layer / spongy layer (of leaves) ;
in chloroplasts ;   3max

(ii)   as sucrose ;
in solution / in sap / in water ;
in phloem ;   2max

(d)(i)   as a control / for a comparison ;   1

(ii)   so that other variables were eliminated ;
any one example, e.g. water, light, soil conditions ;
second example ;   2 max

(iii)   (37 - 2) = 35 % ;   1

(iv)   fungicides may <u>harm</u> other organisms ;   *not 'affect'*
           detail - e.g. bioaccumulation described ;
           fungus is becoming resistant to the fungicide ;   *not 'immune'*
           may be a better market for pesticide-free rice ;   2 max

10(a)   chemical to heat ;
           chemical to light ;
           chemical to kinetic ;
           chemical potential to gravitational potential ;   max 2

(b)   answer lies between 0.8 N and 0.9 N ;
         working shows forces balance / upward force just exceeds force due to gravity ;   2

(c)   resultant force = 2.4 - 0.8 = 1.6 (N) ;
         acceleration = $1.6 \div 0.08 = 20$ m s^{-2} ;   2

(d)   f = ma ;
         less mass (means more acceleration) ;   2

(e)   distance = area under the graph / average speed x time ;
         6.25 m ;   2