

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**NOVEMBER 2002**

**INTERNATIONAL GCSE**

**MARK SCHEME**

**MAXIMUM MARK : 110**

**SYLLABUS/COMPONENT : 0654/3**

**CO-ORDINATED SCIENCES  
(EXTENDED)**



UNIVERSITY of CAMBRIDGE  
Local Examinations Syndicate

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- 1a formula shown or correct substitution ;  
1.03(1) ;  
427 ; 3
- b 15-20 kHz ;  
10-20 Hz ; 2
- c 2, 4, 5, (1) 3, 6 ; ; ; 3
- d signal is added to a carrier wave ;  
this changes the, amplitude / frequency ; 2
- 2(a)(i) 0.03 % / 0.04 % ; 1
- (ii) carbon dioxide concentration is a limiting factor ;  
carbon dioxide is a reagent in photosynthesis / equation given ;  
so rate of photosynthesis increases ;  
photosynthesis makes, glucose / substances required for fruit growth ; 2 max
- (b)(i) convection ;  
warm air rises (out through ventilators) ;  
as it is less dense (than cold air) ; 2 max
- (ii) opening at a higher temperature keeps more carbon dioxide inside ;  
photosynthesis / reactions, happen faster at higher temperature ;  
because, molecules / enzymes / reactants, have more kinetic energy ; 3
- (iii) enzymes, damaged / denatured, at this high temperature ;  
optimum temperature for plant enzymes is below 27 °C ;  
reactions / photosynthesis, take place more slowly ; 2 max
- (c)(i) transparency / don't react (with air / water) ; 1
- (ii) no extra carbon dioxide / heating provided ; 1
- (iii) polyethylene ;  
extra light ;  
extra carbon dioxide ;  
(ventilators open at) 25 °C ;  
*half mark each* 2

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- 3a(i) trend in a property / named property ;  
which repeats across periods ; 2
- (ii) silicon / the Group IV element ;  
follows pattern from second period / third period will have  
similar pattern to second ; 2
- (b) carbon has a giant structure / diagram ;  
neon has a simple structure / simple molecular / atomic / diagram ;  
carbon needs more energy to break bonds (in order to melt) ;  
little energy needed to separate neon atoms ; 3 max
- (c)(i) three shared pairs ;  
other outer electrons correct ; 2
- (ii)  $N_2 + 3F_2 \rightarrow 2NF_3$ ; 1
- 4a 0.5 A ;  
0.5 A ; 2
- b 9 V; 1
- c 6 V ;  
3 V ; 2
- d  $1/R = 1/R_1 + 1/R_2$  ;  
 $= 1/6 + 1/6$  ;  
R = 3 ohms ; 3
- e electrons ;  
have a negative charge ;  
move ;  
from polythene to cloth / vice versa ;  
the flow of electrons is the electric current ; 4 max

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- 5(a)(i) A ureter ;  
B bladder ;  
C urethra ; 3
- (ii) label to renal artery or aorta ; 1
- (iii) right atrium ; 1
- (b) less water lost from body (on cold day) ;  
by sweating ;  
so blood contains more water ;  
kidneys respond by excreting more water in urine ;  
*allow all v.v. for hot day* 3 max
- (c) evaporation ;  
water vapour in air ;  
condensation ;  
forms water droplets / clouds ;  
rain / precipitation ;  
absorbed, through root hairs / by osmosis ; 3 max
- 6a dissolve, an ionic compound / named soluble compound ; 1
- b(i) zinc atoms are losing electrons ;
- (ii) zinc atoms are ionising (to a greater extent than copper) ;  
metals of higher reactivity ionise more readily ;  
electrons flow from more reactive to less reactive ; 2
- (iii) increases ;  
voltage depends on reactivity difference / greater reactivity difference  
between Zn and Ag than between Zn and Cu ; 2

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- c ions / (positive) particles, shown in lattice ;  
surrounded by delocalised electrons / sea of electrons ;  
forces of attraction between ions and electrons ;  
ref. to electrons moving easily through the structure ; 3 max
- d(i) red / brown / coppery, solid formed ;  
magnesium dissolves ;  
mixture becomes warm ;  
solution loses its colour / becomes colourless ; 1 max
- (ii) moles of magnesium =  $0.48 \div 24 = 0.02$  ;  
use of equation to show 1 : 1 ratio Mg : Cu ;  
mass of copper =  $64 \times 0.02 = 1.28$  g ;  
*allow other suitable methods of working* 3
- e magnesium and calcium ;  
because the same number of atoms ; 2
- 7(a)(i) in red blood cells ;  
oxygen transport ; 2
- (ii) in blood plasma / produced by lymphocytes ;  
destroy, antigens / pathogens / bacteria ; 2
- (iii) in stomach / small intestine ;  
digests proteins to, amino acids / polypeptides ; 2
- (iv) in blood plasma / made in pancreas ;  
reduces blood sugar levels / stimulates conversion of glucose to glycogen /  
increase takeup of glucose by (liver or muscle) cells ; 2
- (c) biuret test ;  
add biuret reagent / potassium hydroxide and copper sulphate (solution) ;  
look for purple colour ;  
*(maximum two marks if heated)* 3

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- 8a(i) pressure = force  $\div$  area ;  
10 000  $\div$  7.2 ;  
= 1389, N m<sup>-2</sup> / Pa ; 3
- (ii) the same as answer to (i) ;  
pressure is the same everywhere in the liquid ; 2
- (b) output force is greater than input force ;  
same pressure on a larger area ; 2
- (c)(i) particles are touching ;  
cannot be compressed ; 2
- (ii) gases can be compressed ;  
would not transmit forces ; 2
- (d)(i) pressure increases ;  
directly proportional / particles hit walls of container, more often / harder ; 2
- (ii) -273 °C / 0K ;  
temperature at which all particles have zero motion ; 2

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- 9a  $\text{CO}_3^{2-}$  ;  
working refers to need for charge balance ; 2
- b(i) calcium carbonate ;  
+ sodium chloride ; 2
- (ii) calcium now insoluble / soluble calcium compounds removed ; 1
- (iii) shake hard water with soap ;  
standardise shaking ;  
find out amount of soap needed for lather ;  
add sodium carbonate to equal volume of the hard water ;  
find out amount of soap needed for lather ;  
if sodium carbonate effective then less soap needed ;
- or*
- one sample of water with  $\text{NaCO}_3$  and one without ;  
equal volumes of both samples ;  
add equal amount of soap to each ;  
shake ;  
standardise shaking ;  
if  $\text{NaCO}_3$  softens water then that one has more lather ; 4 max
- (iv) ion exchange  
water passed through, resin / small beads ;  
calcium (and magnesium) ions stick to resin ;  
and are replaced by sodium ;
- or*
- distillation  
water is boiled ;  
vapour collected and condensed ;  
calcium compounds, do not vaporise / are removed ; 3