

NOVEMBER 2002

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK : 110

SYLLABUS/COMPONENT : 0654/3

**CO-ORDINATED SCIENCES
(EXTENDED)**



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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⁻² / 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 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 NaCO_3 and one without ;
equal volumes of both samples ;
add equal amount of soap to each ;
shake ;
standardise shaking ;
if 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