**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

International General Certificate of Secondary Education

# MARK SCHEME for the November 2005 question paper

## 0654 CO-ORDINATED SCIENCES

**0654/03** **Paper 3, maximum 100**

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

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**1** **(a)** primary colours cannot be made by mixing colours together/secondary colours are made by mixing two primary colours together ; **[3]**

primary – red/blue/green ;

secondary – cyan/magenta/yellow ;

**(b)** **(i)** any except sound and ultrasound ; **[1]**

**(ii)** sound/ultrasound ; **[1]**

**(iii)** infra-red ; **[1]**

**(c)** **(i)** d = s x t = 1600 x 0.2 = 320m ;

so distance = 160m ; **[2]**

**(ii)** $v = f \times \lambda$ ;

so $f = v/\lambda = 1600/0.2$ ;

= 8000 Hz ; **[3]**

**Total [11]**

**2** **(a)** **(i)** left atrium ; **[1]**

**(ii)** label correctly placed ; **[1]**

**(b)** oxygen needed for <u>respiration</u> ;

supplies energy ;

for muscle contraction ; **[3]**

**(c)** **(i)** chance is greater as you get older ;

steady increase/use of figures ; **[2]**

**(ii)** 1 smoking increases the risk of having a heart attack ;

2 (almost) doubles the risk/giving up smoking would halve the risk ;

3 diabetes increases the risk of having a heart attack ;

4 so her risk is already very high ;

5 you can't give up diabetes but you can give up smoking ; **max [3]**

**(iii)** taking more exercise/less (saturated) fat in diet/not being too fat ; **[1]**

**Total [11]**

**3** **(a)** **(i)** 2 ; **[1]**

**(ii)** (each ion) gains one electron ; **[1]**

**(b)** water reacts (with lithium) to form hydrogen ;

hydrogen is a flammable gas/hydrogen could cause explosion/owtte ; **[2]**

**(c)** **(i)** $CO_3^{2-}$ ;

2– needed to balance the positive charges on two $Li^+$ ions ; **[2]**

**(ii)** 7 crew x 18 (= 126 moles) ;

(126 moles) for 10 days = 1260 (moles) ; **[2]**

**(iii)** use of 2:1 ratio in equation so 1260 x 2 (= 2520 moles of LiOH required) ;

calculate molar mass LiOH = 7 + 16 + 1 = 24 g ;

calculate total mass of LiOH = 2520 x 24 =60480 g/60.5 kg ; **[3]**

**(iv)** same number of moles of any other would have greater mass ;

reference to the need to reduce mass to minimum ; **[2]**

**Total [13]**

**4** **(a)** **(i)** increasing, velocity/speed ; **[1]**

**(ii)** less than 20N ;

overall downward force ; **[2]**

**(iii)** F = m x a     10 = 2 x a ;

a = 5 m/s$^2$ ; **[2]**

**(b)** **(i)** 20N ;

forces are balanced ; **[2]**

**(ii)** air resistance increases as speed increases ; **[1]**

**(iii)** pressure = 20/0.4 ;

= 50 N/m$^2$ ; **[2]**

**Total [10]**

**5** **(a)** **(i)** A  contracts ;

B  slackens/becomes looser ;    (*not 'relaxes'*) **[2]**

**(ii)** refracts light ;

light (rays) from near object diverge (more) ;

need to be, refracted more/bent inward more, to focus onto retina ;

fatter lens, refracts/bends, more ; **max [3]**

**(b)** **(i)** parents are    Bb and Bb ;

gametes   B and b from both parents ;

offspring shown as BB, Bb, Bb (or bB) and bb ;

yellow-eyed offspring identified as bb ; **max [3]**

**(ii)** damages DNA ; **[1]**

**(iii)** only sperm and eggs can pass on genes ;

DNA/genes/mutation, only altered in iris cells ; **[2]**

**Total [11]**

**6** **(a)** **(i)** appearance of liquid (in Tube **B**) ;

limewater becoming cloudy/gas formed ;

**(b)** water ;

elements 2 x H and 1 x O required to balance/owtte ; **[2]**

**(c)** **(i)** precipitation/double decomposition ; **[1]**

**(ii)** hardness caused by <u>soluble</u> calcium (ions)/calcium chloride ;

calcium precipitated/converted into insoluble form ; **[2]**

**(d)** reference to giant structures ;

strong chemical bonds must be broken (to melt) ;

very many (strong) bonds must be broken (to melt) ;

this requires much (heat) energy ; **max [3]**

**Total [10]**

**7** **(a)** **(i)** correct symbols for lamps, battery and switch ;

lamps connected in parallel ;

switch controls both lamps ; **[3]**
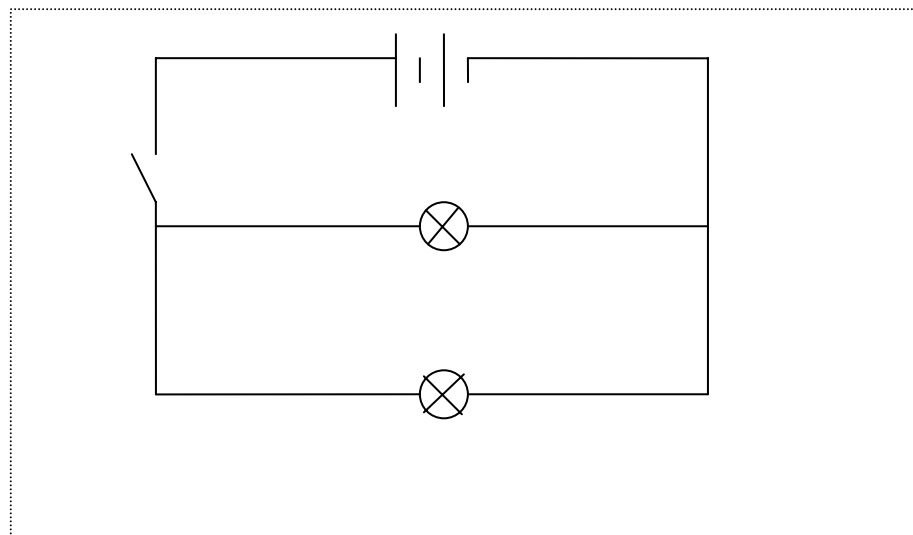


**(ii)** electricity can still flow <u>through</u> the other lamps/still a complete circuit through the other lamps ; **[1]**

**(iii)** working ;

12 A ; **[2]**

**(b)** (alternating current) produces <u>changing</u> magnetic field ;

(changing magnetic field) attracts/repels, permanent magnet ;

causes movement in, coil/wires ; **[3]**

**(c)** **(i)** more particles ;

to collide with walls of tyre ;

**(ii)** (heat energy makes) particles move faster ;

collide with walls of tyre more often ; **[2]**

**Total [13]**

**8** **(a)** A and B: the more light the faster the rate of photosynthesis ;

light is a <u>limiting factor</u> ;

B and C: plant unable to make use of extra light ; **max [3]**

something else is now limiting rate ;

**(b)** **(i)** methane + oxygen → carbon dioxide + water ; **[1]**

**(ii)** supplies (extra) carbon dioxide ;

increases temperature ; **[2]**

**(c)** **(i)** ammonium salt/named nitrate ; **[1]**

**(ii)** needed for protein synthesis ;

proteins needed for, making new cells/enzymes/other named function
;

nitrogen may be in short supply ; **max [2]**

**(iii)** leach into the water ;

cause, algal bloom/growth of plants ;

blocks light ;

plants die and are fed on by bacteria ;

which use up oxygen ;

so animals cannot get oxygen and, die/leave ; **max [3]**

**Total [12]**

**9** **(a)** X high          high ;

         Y low          low ;

    **(b)** **(i)** <u>carbon</u> has gained oxygen/formed carbon monoxide ;        **[1]**

       **(ii)** shared pair shown ;

           remaining electrons shown on chlorine atoms ;        **[2]**

     **(iii)** magnesium atoms lose (two) electrons/outer shell ;

           originally 2.8.2 becomes 2.8 ;        **[2]**

    **(c)** alloy is stronger/less likely to break/bend (under the weight) ;

         different sized atoms (in the structure) make alloy less
malleable/layers of atoms cannot move/slide so easily ;        **[2]**

                                                         **Total [9]**