

**MARK SCHEME for the May/June 2011 question paper  
for the guidance of teachers**

**0654 CO-ORDINATED SCIENCES**

**0654/22**

Paper 2 (Core Theory), maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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Page 2	Mark Scheme: Teachers' version	Syllabus	
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- 1 (a) (i) reference to:  
timescale / time to renew ;  
action of heat / pressure ;  
action of microorganisms / decay ; [max 3]
- (ii) oxygen ; [1]
- (iii) glucose molecules join / link together ;  
to form long chains ; [2]
- (b) (C<sub>6</sub>H<sub>14</sub>) largest / heaviest ; [1]
- (c) (i) nitrogen ;  
water (vapour) ; [2]
- (ii) (mix gas with) limewater ;  
goes cloudy ; [2]
- (iii) carbon monoxide ;  
nitrogen dioxide ; [2]
- [Total: 12]
- 2 (a) power = energy / time ;  
= 8000 / 600 = 13.3 ;  
W ; [3]
- (b) (i)  $KE = \frac{1}{2} mv^2$  ;  
=  $0.5 \times 2 \times 40 \times 40 = 1600$  (J) ; [2]
- (ii) 1600 J (or same answer as (i)) ;  
energy is conserved ; [2]
- (c) expanded polystyrene / air / gas is a poor conductor of heat ;  
concrete block is a poor conductor of heat ;  
trapped air cannot carry heat around by convection ;  
aluminium reflects heat back into house ; [max 3]
- [Total: 10]

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- 3 (a) (i) triceps ;  
biceps ;
- (ii) **B**: contracts ;  
**A**: transmits force from **B** to bone ;  
**C**: relaxes ; [3]
- (b) (i) increases ;  
steady / linear, (increase) ;  
from 0.6 to 1.1 (g / cm<sup>3</sup>) / by 0.5 (g / cm<sup>3</sup>) ; [max 2]
- (ii) these foods contain calcium ;  
needed for bones ; [2]
- (iii) any citrus fruit / blackcurrants / other valid food source ; [1]
- (c) (i) (bone is) harder / stronger / less elastic / less smooth ; [1]
- (ii) (on the surface of the bones) at the joint ;  
reduces friction / allows bones to move smoothly over each other ; [2]
- [Total: 13]

- 4 (a) work done = force × distance ;  
= 700 × 55 = 38500 (J) ; [2]
- (b) (i) 50 s ; [1]
- (ii) constant speed ;  
of 36 m / s ; [2]
- (c) relationship between pressure, force and area ;  
pointed end has small area and large pressure ;  
disc has large area and small pressure ; [max 2]
- (d) less friction ; [1]
- [Total: 8]

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- 5 (a) (i) hair ;
- (ii) large ears / large eyes / long neck (so eyes high above ground) / long legs ;
- (b) (i) diffusion ;  
from alveoli ; [2]
- (ii) more oxygen can be absorbed (from the air) / taken in by lungs /  
compensates for less oxygen ;  
more oxygen supplied to cells ;  
for respiration ; [max 2]
- (c) (i) ref. to limiting factors ;  
not enough grass to eat ;  
many eaten by, foxes / pumas ; [max 2]
- (ii) ref. to species diversity ;  
idea of their importance in food chain / provide food for pumas / so pumas  
won't become extinct ;  
other, e.g. tourism / moral arguments ; [max 2]
- [Total: 10]**

- 6 (a) (i) Group 1, Period 2 ; [1]
- (ii) lithium is (very) reactive / easily combines with other elements / substances ;  
oil prevents reaction with air / oxygen / water / forms a protective barrier ; [2]
- (iii) lithium atoms have two shells / only have two electrons in first shell ;  
lithium atoms have three electrons ; [2]
- (b) (i) hydrochloric (acid) ; [1]
- (ii) carbon dioxide ; [1]
- (iii) chlorine ; [1]
- (c) (i) substance which changes the way the body works ; [1]
- (ii) avoid unexpected / uncontrolled effects (of impurities) ;  
avoid harming the user ;  
ensure correct dosage / owtte ; [max 1]
- [Total: 10]**

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- 7 (a) straight lines ;  
approx angles of incidence and reflection (correct by eye) ;
- (b) correct diagram ; [1]
- (c) (i) red, blue, green ; [1]  
(ii) frequency **or** wavelength ; [max 1]
- [Total: 5]**
- 8 (a) (i) petals / nectary ; [1]  
(ii) anther / stamen ; [1]  
(iii) ovule ; [1]
- (b) (pollination is) the transfer of pollen from anther to stigma ;  
(fertilisation is) the fusion of male and female gametes ;  
pollination takes place before fertilisation ; [max 2]
- (c) (i) 17 ; [1]  
(ii) nucleus ; [1]  
(iii) DNA ; [1]
- (d) (i) sugars produced by photosynthesis in leaves ;  
transported to flowers in phloem ;  
as sucrose ;  
mineral ions in xylem ; [max 2]  
(ii) for respiration / for energy / to make nectar / any energy-requiring process ; [1]
- [Total: 11]**

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- 9 (a) (i) temperature ;  
acid concentration ;  
use the same acid ;  
surface area of the metal ;  
volume of acid ; [max 2]
- (ii) ignites / pops ;  
hydrogen is given off ; [2]
- (iii) both **A** and **C** did not react/cannot decide between **A** and **C**/two of the  
metals did not react ; [1]
- (b) (i) electrolyte in beaker ;  
electrodes in electrolyte ;  
voltmeter connecting electrodes ; [3]
- (ii) voltage changes ;  
because voltage depends on the metals used for electrodes ; [2]
- [Total: 11]
- 10 (a) (i) uranium ; [1]
- (ii) nuclei ;  
energy ;  
turbine, generator ; (both needed for mark) [3]
- (b) (i) lead or concrete ; [1]
- (ii) causes ionisation inside cells ; [2]  
damages cells / kills cells / mutation / damages DNA ;  
cancer ;  
radiation sickness ;  
radiation burns / burns skin ; [max 2]
- (c) (i) Geiger counter / GM tube etc. ; [1]
- (ii) 3 half-lives ;  
300 (years) ; [2]
- [Total: 10]