

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0654 CO-ORDINATED SCIENCES

0654/22

Paper 2 (Core Theory), maximum raw mark 120

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Page 2	Mark Scheme	Syllabus	Paper
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- 1 (a) mass 100 (kg) and weight less than 100 (N) ; [1]
- (b) need resultant upwards force to accelerate the rocket ; [1]
- (c) kinetic ;
gravitational ;
chemical ;
thermal/light/sound ; [4]
- (d) sound cannot travel through space/a vacuum ; [1]
- (e) (i) turns atoms into ions ;
by removal of electrons ; [2]
- (ii) destroys/damages cells/DNA ;
causes cancer/mutations/radiation burns ; [2]
- (iii)
- | | | | | | | |
|-----------------|--------|--|---------------|--|------------|------------|
| gamma radiation | X-rays | | visible light | | microwaves | radiowaves |
|-----------------|--------|--|---------------|--|------------|------------|
- ;; [2]

[Total: 13]

- 2 (a) **W** = ovary ;
X = vagina ; [2]
- (b) **Y** for zygote/embryo to become implanted/for nourishment of the embryo ;
Z to (contract to) push the baby out at birth/to contain/hold fetus ; [2]
- (c) joining together of egg and sperm ;
happens in fallopian tube ;
male gamete = sperm ;
female gamete = egg ;
forming a zygote ; [max 3]
- (d) fewer sexual partners/using a condom ; [1]
- (e) (i) blood/body fluid contact/through the placenta ; [1]
- (ii) reduced probability ; [1]
- (iii) infection through milk/breastfeeding ; [1]

[Total: 11]

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- 3 (a) (i) H and He ; [1]
(ii) neon ; [1]
(iii) period 4 (or 5 or 6) ; [1]
- (b) (i) protons and neutrons ;
3 protons ;
4 neutrons ; [3]
- (ii) reference to increased number of electron shells/orbits/rings ; [1]
- [Total: 7]**
- 4 (a) (physical) breakdown/description of breakdown ;
of (large insoluble) food molecules ;
into smaller/soluble products ; [max 2]
- (b) amylase ; [1]
- (c) (i) at the start/in first minute/in first few seconds ; [1]
(ii) maltose/sugar ; [1]
(iii) line sketched so that it is of the same general shape (not levelling off above zero) ;
and above the 35 °C line ; [2]
- (d) produces small/soluble molecules that pass into the bloodstream ;
starch too large to diffuse across into the bloodstream ; [max 1]
- [Total: 8]**
- 5 (a) Al_2O_3
 Fe_2O_3
 $NaCl$;
(three correct 2 marks, one or two correct 1 mark) [2]
- (b) (i) lead oxide + carbon \rightarrow lead + carbon dioxide ; [1]
(ii) test for electrical conductivity ;
lead will be a good conductor ;
OR
test for malleability ;
lead will be malleable ; [max 2]

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- (iii) lead oxide ;
oxygen has been removed from it ;
OR
lead ;
Pb²⁺ ions gain electrons ;

[max 2]

- (c) (i) negative electrode ;

[1]

- (ii) lead/Pb²⁺ (no mark)
atoms are electrically neutral/have equal protons and electrons ;
positive ion has more protons than electrons (so must gain electrons to form atom) ;
so positive (ionic) charge has to be neutralised by gain of (negative) electrons ;

[max 2]

[Total: 10]

- 6 (a) (i) 0.3(Hz) ;

[1]

- (ii) vibrations in different directions ;
longitudinal vibrations move in same direction as wave/energy moves ;
transverse vibrations move at right angles to direction that wave/energy moves ;

[2]

- (iii) sound/ultrasound waves ;

[1]

- (b) (i) (volume =) 7500 (cm³) ;

[1]

- (ii) (density =) $\frac{\text{mass}}{\text{volume}}$;
 $= \frac{1875}{7500} = 0.25$;
g/cm³ ;

[3]

- (c) (i) infra-red ;

[1]

- (ii) thermal energy needed/used to cause evaporation ;
some molecules have more energy/move faster than others ;
faster moving molecules escape from surface ;
escape from forces between molecules/pull of other molecules ;
water molecules turn to water vapour/leave as water vapour ;

[max 3]

[Total: 12]

- 7 (a) M
E
C
E ;;;

(four correct 3 marks, three correct 2 marks, one or two correct 1 mark)

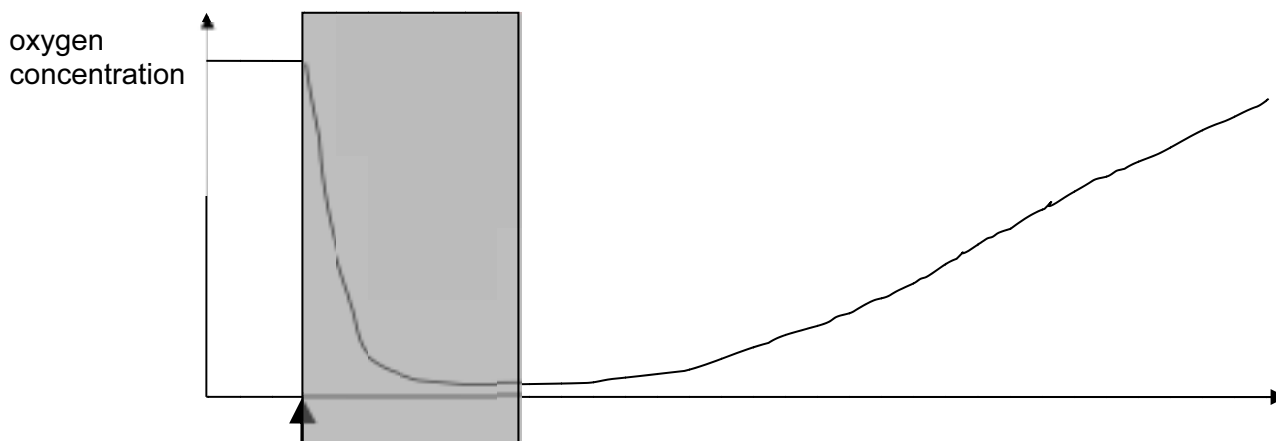
[3]

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- (b) (i) (assume answers refer to **P** if the word *it* is used)
P is more flammable/volatile/burns more easily/ORA ;
P burns with cleaner flame/owtte ;
R is too viscous/does not flow easily/not easily moved around through pipes/owtte ;
 other correct ; [max 2]
- (ii) carbon dioxide/CO₂ ; [2]
 water (vapour)/H₂O ;
- (iii) ice ; [2]
 low temperature of the air causes the water formed to freeze ;
- (c) (i) the larger/heavier/more C atoms in the molecules the higher the boiling point of the alkanes ; [1]
- (ii) 100 ± 2 °C ; [1]
- (iii) **A** and **B** ; [2]
 they have boiling points below 20 °C ;

[Total: 13]

- 8 (a) deforestation ;
 carbon dioxide ;
 temperature ;
 soil ; [4]
- (b) (i) an X anywhere in the shaded zone ;



- [1]
- (ii) decreases, then increases ; [2]
 reference to rapid decrease/slower increase ;
- (iii) (fall) respiration of bacteria/decomposers ; [2]
 (rise) photosynthesising plants/oxygen in air dissolving ;

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(iv) prevents respiration ; [1]

[Total: 10]

9 (a) $(R =) \frac{V}{I}$;
 $\frac{220}{50} = 4.4 (\Omega)$; [2]

(b) (i) identifies increased magnetic field ;
 by increasing number of turns/increasing current ; [2]

(ii) e.g. used to separate ferrous metals in scrap yard ;
 can be switched on and off/strength can be increased or decreased ; [2]

(iii) voltmeter connected (correct symbol) ;
 in parallel ; [2]

[Total: 8]

10 (a) geotropism ;
 (main) stem/shoot grows upwards/against gravity ;
 (main) root grows downwards/with gravity ; [3]

(b) (i) grow downwards so) can absorb water ;
 can absorb mineral ions ;
 better anchorage in soil ; [max 2]

(ii) (grow upwards so) can reach light ;
 for photosynthesis ; [2]

(c) stem will grow to the side/towards the light ;
 roots no response/away from light ;
 phototropism ; [max 2]

(d) *any two from:*
 nutrition ;
 excretion ;
 respiration ;
 reproduction ;
 growth ;
 movement ; [max 2]

[Total: 11]

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- 11 (a) hydrogen ;
copper chloride ;
potassium chloride, and water ; [3]
- (b) (i) limewater ;
goes cloudy/milky ; [2]
- (ii) increase acid concentration ;
increase (acid) temperature ;
grind up the (same mass of) calcium carbonate ; [max 2]
- (c) (i) soil is too acidic (for the intended crop) ;
calcium carbonate reacts with / neutralises acid (in soil) ;
so promotes healthy crop development / owtte ; [max 2]
- (ii) (calcium carbonate) is strongly heated ; [1]
- [Total: 10]**
- 12 (a) (i) QR ; [1]
- (ii) P or S ; [1]
- (iii) the higher the speed the greater the KE ; [1]
- (b) speed = $\frac{\text{distance}}{\text{time}}$;
distance = $28 \times 28 = 784(\text{m})$; [2]
- (c) (i) L₁ and L₃ ; [1]
- (ii) L₁ and L₂ ; [1]
- [Total: 7]**