

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

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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 → 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)

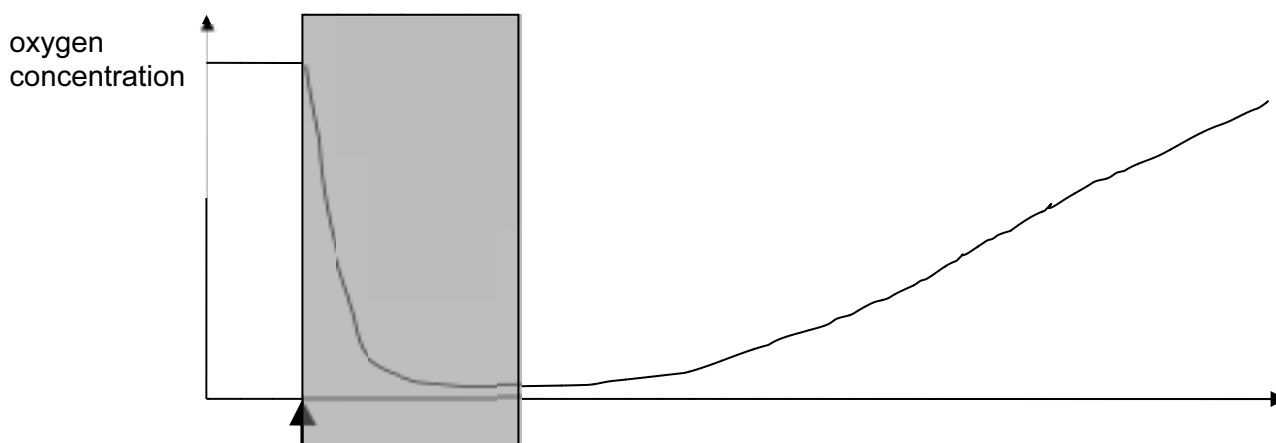
[3]

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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 × 28 = 784(m) ; [2]
- (c) (i) L₁ and L₃ ; [1]
- (ii) L₁ and L₂ ; [1]
- [Total: 7]**