



CO-ORDINATED SCIENCES

0654/21

Paper 2 Core Theory

May/June 2016

MARK SCHEME

Maximum Mark: 120

Published

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Page 2	Mark Scheme	Syllabus	Paper
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- 1 (a) kinetic to electrical ; [1]
- (b) black ;
black surfaces absorb more (infra-red) radiation ; [2]
- (c) conduction ; [1]
- (d) tidal ;
wave ;
geothermal ;
HEP ;
biomass ; [max 2]
- (e) depends on amount of sunlight/will not work at night ; [1]
- (f) correctly positioned between visible light and microwaves ; [1]
- (g) (i) amplitude correctly indicated ; [1]
(ii) wavelength correctly indicated ; [1]
- (h) lower volume ;
same pitch ; [2]
- [Total: 12]**
- 2 (a) (i) sepal correctly labelled ;
stamen correctly labelled ; [2]
(ii) unable to pollinate (other flowers) ; [1]
(iii) ovule ; [1]
- (b) (i) 31–33 ; [1]
(ii) water ;
oxygen ; [2]
(iii) enzyme/chemical reactions too slow ;
enzymes don't work at high temperatures/denatured ; [2]
(iv) seeds are dead/damaged/diseased/too young/too old ; [1]
- [Total: 10]**

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- 3 (a) (i) filtration / passed through a filter ; [1]
(ii) reference to risk of disease ; [1]
- (b) (i) electrolysis ; [1]
(ii) (damp) litmus / (Universal) indicator paper ;
bleached / changes colour to white ; [2]
(iii) becomes pink / brown / copper coloured (from black) ; [1]
(iv) copper (metal) deposited ; [1]
- (c) (i) bromine ; [1]
(ii) chlorine is more reactive than bromine ; [1]
- [Total: 9]**
- 4 (a) (i) constant speed ; [1]
(ii) (constant) deceleration ; [1]
(iii) 20 (m/s) ; [1]
(iv) E or at 40 s ; [1]
(v) (distance =) speed \times time or 20×10 ;
= 200 (m) ; [2]
- (b) (i) one arrow on windscreen / wheel going in opposite direction to direction of
motion ;
labelled air resistance / breaking force / friction ; [2]
(ii) changed to thermal energy / sound ; [1]
- [Total: 9]**
- 5 (a) X = (plant) respiration ;
Y = decay / decomposition / respiration ; [2]
- (b) (i) increased CO₂ in atmosphere ;
CO₂ used in photosynthesis ;
(because) less photosynthesis / less CO₂ absorbed ;
combustion / decay of timber ; [max 3]
(ii) increased, because combustion produces CO₂ ; [1]

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- (c) (i) from the Sun/as light ; [1]
(ii) as heat ; [1]

[Total: 8]

- 6 (a) (i) nucleus ; [1]
(ii) proton positive(ly charged) and electron negative(ly charged) ;
proton has greater mass ; [2]

- (b) (i) thermal (heat) energy released during a reaction/
reaction that caused an increase in temperature ; [1]
(ii) reference to electron loss (from atom) ;
extra detail e.g. loss of one/the outer electron/
to leave filled outer shell ;
ion is positively charged ; [3]

- (c) (i) the higher the temperature the greater mass of solid dissolves/
the higher the temperature the greater the solubility ; [1]
(ii) 49 ± 1 (g) ; [1]
(iii) phosphorus and nitrogen ; [1]
(iv) reference to uptake by roots only of dissolved minerals/owtte ; [1]

[Total: 11]

- 7 (a) 1. plastic or glass
2. iron
3. glass or plastic
4. copper/aluminium
5. copper/aluminium/iron
6. plastic
6 correct = 3 marks, 4 or 5 correct = 2 marks, 1, 2 or 3 correct = 1 mark ;;; [3]

- (b) (i) 54 ; [1]
(ii) 28 ; [1]
(iii) 26 ; [1]

- (c) the temperature at which a solid changes to a liquid ; [1]

- (d) (A no mark)
because particles are in a regular arrangement ; [1]

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(e) density = mass/volume or $39/4.9$;
= 7.96 ;
g/cm³ ; [3]

[Total: 11]

8 (a) (i) energy storage/insulation ; [1]

(ii) protein;
carbohydrate ;
vitamins ;
mineral salts/ions ;
water ;
fibre/roughage ; [6]

(b) (i) pancreas labelled on Fig. 8.1 ; [1]

(ii) lipase ; [1]

(iii) small intestine ; [1]

[Total: 10]

9 (a) (i) alloys ; [1]

(ii) stronger/harder/less malleable/resists rusting ; [1]

(iii) transition (metals/series) ; [1]

(iv) elements or their compounds can behave as catalysts ;
compounds have colours other than white ; [2]

(b) (i) iron oxide + carbon monoxide → iron + carbon dioxide
[LHS and RHS] ;; [2]

(ii) (iron oxide)
oxygen removed ;
(allow fully correct discussion of electron gain) [1]

(c) credit for stating anywhere that rust requires presence of air/oxygen and water together;

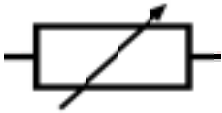
(A no rusting)
water not present ;

(B no rusting)
air/oxygen not present ;

(C no rusting)
barrier prevents air and water from reacting with the steel ; [max 3]

[Total: 11]

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- 10 (a) (i) angle of incidence correctly labelled ; [1]
- (ii) 30° ; [1]
- (iii) same size as object
virtual
upright
any two correct for 1 mark ; [1]
- (b) (i) ammeter ; [1]
- (ii) (total resistance) = voltage / current or $6 / 0.30$;
= $20 \text{ } (\Omega)$;
resistance $R = 20 - 12 = 8 \text{ } (\Omega)$; [3]
- (iii)
- 
- [1]
- [Total: 8]**
- 11 (a) (i) FF and Ff ; [1]
- (ii) ff ; [1]
- (b) (i) (gametes) H, h, H, h ;
(genotypes) HH, Hh, Hh, hh ;
(phenotypes) short fur, short fur, short fur, long fur ;
(ratio) 3.1 ; [4]
- (ii) long fur is homozygous/hh/recessive ;
parents always pass on a recessive allele/offspring will always inherit
recessive alleles ; [2]
- [Total: 8]**
- 12 (a) (i) water (vapour)/carbon monoxide/carbon ; [1]
- (ii) gasoline ;
(allow petrol/LPG) [1]
- (iii) (catalytic/thermal) cracking ; [1]
- (b) (i) (J)
it contains carbon dioxide/statements such as:
carbon dioxide molecules contain only three atoms ; [1]

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(ii) (K)
 ethane molecules have the formula C_2H_6 /
 ethane molecules contain eight atoms /
 ethane is a saturated hydrocarbon containing two carbons /
 other correct ; [1]

(c) (i) join together into chains / much larger molecules ; [1]

(ii) poly(ethene) ;
 (allow polyethene and polythene) [1]

(d) (M)
 reference to low reactivity of alkanes / sodium doesn't react with alkanes ;
 reference to reaction between water and sodium ; [2]

[Total: 9]

13 (a) palisade / mesophyll ; [1]

(b) xylem ;
 phloem ; [2]

(c) stomata ; [1]

[Total: 4]