



COMBINED SCIENCE

0653/31

Paper 3 Extended Theory

October/November 2016

MARK SCHEME

Maximum Mark: 80

Published

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

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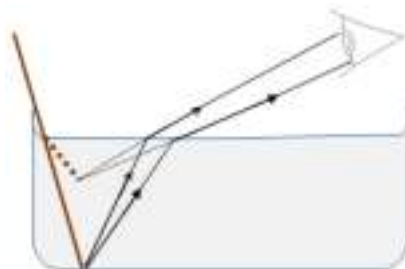
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- 1 (a) (i) light/radiation (energy) ;
kinetic (energy) ; [2]
- (ii) (average) speed = distance/time = $9/12 = 0.75$ (m/s) ; [1]
- (b) (i) 0.9 (m/s) ; [1]
- (ii) straight line – **constant** acceleration ;
curved line – **not constant** acceleration/deceleration ; [2]
- (c) (i) work done = $mgh = 10 \times 10 \times 6$;
= 600 (J) ; [2]
- (ii) power = energy transferred/time taken ;
= $600/120 = 5$ (W) [2]
- 2 (a) neutrons 12 ;
electrons 11 ; [2]
- (b) 2,8,1 ; [1]
- (c) same (number) ; [1]
- (d) (i) loss of **one** electron ; [1]
- (ii) Neon/Ne ; [1]
- (e) Li (actual 180 °C) 100 – 200 °C ;
Cs (actual 28.5 °C) 21 – 35 °C ; [2]
- (f) NaCl is a compound/strong forces between ions/particles ;
NaCl solution is a mixture/weak forces between water and ions/NaCl ; [2]

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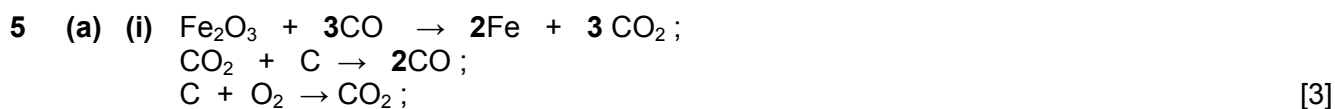
- 3 (a) geotropism/geotropic ; [1]
- (b) auxins ;
(produced) at tip of seedling ;
gather on side of seedling away from light ;
cause more cell elongation on dark side ; [3]
- (c) (i) the number of germinating seeds increases as the pH increases ;
the idea that low pH shows greater acidity ;
use of data to support description; [2]
- (ii) acid denatures the enzymes (needed for germination)/owtte ; [1]
- (iii) $(3/20 \times 100 =) 15 (\%)$; [1]
- (d) (i) reference to sulfur dioxide / nitrogen oxides ;
one from
description of process causing emission of polluting gases ;
description of mixing / dissolving of gases in rainwater ; [max 2]
- (ii) acid rain reduces germination / growth / causes crop to die / avp ; [1]
- 4 (a) (i) evaporation / molecules break free (from surface) ;
(thermal energy from Sun causes) water molecules to move faster / gain more K.E. ;
(more) molecules moving fast enough / have enough energy to escape surface ; [3]
- (ii) paint trough white / polished metal trough / other reasonable suggestion ; [1]
- (b) (i) refraction ; [1]
- (ii) two diverging rays from same point on stick to the surface ; [max 3]
at least one ray refracted (to eye) ;
refracted rays diverge ;
rays to eye projected back and converge to show the equivalent point on the image ;



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- (c) sound (waves for speech and hearing) ;
description of sound waves – need for a medium / description of compression and rarefaction / longitudinal / any other correct ;
microwaves (between mobile phones) ;
description of microwaves – e / m radiation / no need for medium / transverse / any other correct ;

[max 3]



[3]

- (ii) CO_2 / carbon dioxide ;
forms CO / carbon monoxide / loses oxygen ;
or
 Fe_2O_3 / iron (III) oxide / iron oxide / Fe^{3+} / iron ions ;
forms Fe / iron / loses oxygen / (ions) gain electrons ;

[2]

(b) (i) aluminium is more reactive than carbon ;

[1]

(ii) (ions) must be mobile / able to move ;

[1]

(iii) (Al^{3+}) gains (3 electrons) and (O^{2-}) loses (2 electrons) ;

[1]

(c) (i) (aluminium) lighter / lightweight / less dense / resists corrosion better ;

[1]

(ii) (alloys) stronger (than pure Al) ;

[1]

6 (a) (i) 48°C ;

[1]

(ii) the activity decreases at higher temperatures ;

[1]

(b) (i) growth / repair ;

[1]

(ii) vitamins / named vitamin ;
prevent diseases / named disease / role of named vitamin ;

[2]

(iii) (milk B)
it contains less fat ;

[1]

(c) prevents constipation ;

[1]

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- 7 (a) (i) $1.5 + 0.5 + 0.6 = 2.6$ (V) ; [1]
- (ii) $R = V \div I / 0.5 \div 0.3$;
 $= 1.67 / 1.7$ (ohms) ; [2]
- (iii) power = $V \times I$;
 $= 2.6 \times 0.3 = 0.78 / 0.8$ (W) ; [2]
- (b) if in parallel, lamp **would light even if motor not turning** / owtte ; [1]
- 8 (a) (i) petroleum ; [1]
- (ii) boiling point ; [1]
- (b) (i) C_3H_6 ; [1]
- (ii) ethene ; [1]
- (iii) test bromine / bromine water ;
 C_3H_8 no change / stays orange and C_2H_4 (orange) to colourless ; [2]
- (c) (octane +) oxygen \rightarrow carbon dioxide + water ; [1]
- 9 (a) umbilical cord ;
an artery ;
placenta ;
oxygen ; [4]
- (b) (i) sexual intercourse ;
sharing needles ;
blood transfusions ;
from mother to baby at birth ;
from mother to baby during breast feeding ;
avp ; [max 2]
- (ii) reduces immunity / makes a person more susceptible to disease ;
attacks white (blood) cells ; [max 2]