



COMBINED SCIENCE

0653/32

Paper 3 Extended Theory

May/June 2016

MARK SCHEME

Maximum Mark: 80

Published

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1 (a)

ingestion	mouth ;
absorption of digested food	small intestine ;
secrete digestive enzymes	two from salivary glands ; small intestine ; pancreas ;

[4]

(b) has a thin wall / (wall) one cell thick / walls are permeable ;
(reject semi-permeable)
allows (rapid) diffusion ;

[2]

(c) (i) 2.7 ± 0.1 ;

[1]

(ii) enzyme has become denatured ;
use of graph e.g. enzyme shows no activity at pH 8 / above about 4.5 ;
enzyme / active site has changed shape / enzyme cannot bind to
substrate / owtte ;

[max 2]

(iii) smooth curve showing a rounded maximum ;
maximum at pH 8 ± 0.2 ;

[2]

2 (a) (i) electrolysis ;

[1]

(ii) Pb^{2+} **and** Br^{-} ;

[1]

(iii) name: bromine ;
colour: brown / orange-brown ;

[2]

(b) (i) $CuCl_2(aq) \rightarrow Cu(s) + Cl_2(g)$
state symbols (aq) on LHS and (s) and (g) on RHS ;
all formulae correct ;

[2]

(ii) test: (damp) litmus paper ;
result: bleaches / turns white ;

[2]

(c) (i) increase ;

[1]

(ii) 2, 7 ;

[1]

(iii) 10 ;

[1]

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- 3 (a) weight ;
(do not allow gravity or gravitational force)
accept weight in a list if other members are neutral [1]
- (b) (i) P placed at co-ordinates (8, 8) ; [1]
- (ii) statement of formula
distance = (average) speed \times time /
(distance =) area under graph ;

working and answer
1. $8 \times 4 = 32$ (m) ;

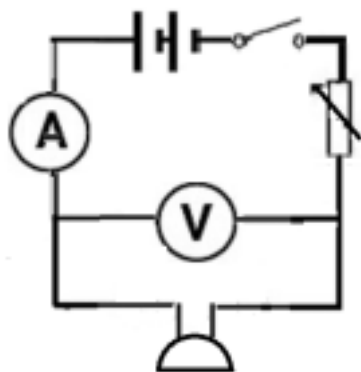
2. $\frac{1}{2} \times 8 \times 1 = 4$ (m) ; [3]
- (c) (i) thermal / heat ; *accept* sound [1]
- (ii) working
(PE =) $mgh / 150 \times 10 \times 10$;
(= $150 \times 10 \times 10$) = 15 000 (J) ; [2]
- (iii) use of PE lost = KE gained (= 15 000 J) ;
use of (KE =) $\frac{1}{2} mv^2 / \sqrt{(15\,000 \times 2 / 150)}$;
($\sqrt{(15\,000 \times 2 / 150)}$) = 14.1 (m/s) (*accept* 14) ; [3]
- 4 (a) cell membrane ;
ions ;
xylem ; [3]
- (b) (i) $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
correct formulae ;
balanced (dependent on formulae) ; [2]
- (ii) traps light (energy) ;
converts it to chemical energy ; [2]
- 5 (a) P ;
S ; [2]
- (b) (i) (thermal / catalytic) cracking ; [1]
- (ii) molecule B
contains a (C=C) double bond ; [1]
- (iii) (aqueous) bromine ;
result for propane no change / mixture remains coloured ;
result for propene decolourises ; [3]

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- 6 (a) (thermal) expansion (of sea water)/(sea) water volume increases ; [1]
- (b) (i) infra-red located in correct position ; [1]
- (ii) all e/m radiation travels at same speed/speed of light ; [1]
- (c) faster/more energetic molecules (able to) escape/leave surface/evaporate ;
(average) speed/energy of remaining molecules less/lower ; [2]
- (d) land surface better absorber of infrared radiation/other correct ; [1]
- 7 (a) (i) $(114\,200 \div 2\,400\,000) \times 100$;
= 4.8/4.76(%) ; [2]
- (ii) $(114\,200 - 52\,000 - 39\,200) = 23\,000$ (kJ/m²/year) ; [1]
- (iii) too much energy lost between trophic levels/not enough energy or very low energy (in secondary consumers/carnivores) to pass on to another level ; [1]
- (iv) protein synthesis/cell division/growth ; [1]
- (b) (i) burning fossil fuel ;
(release of) sulfur dioxide/oxides of nitrogen (to the atmosphere) ;
SO₂/NO_x dissolves/mixes in/reacts with water/rain (water) ; [max 2]
- (ii) numbers would reduce (no mark)
less energy/food available in plants for herbivores ;
fewer herbivores to provide energy/feed the carnivores ; [max 2]
- 8 (a) exothermic ;
chemical (potential) ;
heat/thermal ; [3]
- (b) decreases ;
particles collide less often/collide with less energy ; [2]
- (c) (i) speed of reaction is zero ;
copper is less reactive than hydrogen/copper does not react with (dilute)
acid ; [2]
- (ii) carbon reduction/heat with carbon ; [1]
- 9 (a) (i) variable resistor/variable resistance/rheostat ; [1]
- (ii) to change the resistance in the (main) circuit ;
to change the current through the buzzer/p.d. across the buzzer ; [2]

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(iii)



ammeter symbol correctly drawn ;
ammeter in series with buzzer and rest of circuit correct ;

[2]

(b) (correct reading from graph at 6 V is) 0.015 A ;
(resistance at 6 V = $6 \div 0.015$) = 400 (Ω) ;

[2]

(c) $v = f\lambda / 3000 \times 0.11$;
= 330 (m/s) ;
time = $1000 / 330 = 3.03$ (s) ; (accept 3 s) (allow ecf from previous stage)

[3]