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**COMBINED SCIENCES**

**5129/21**

Paper 2 Theory

**May/June 2016**

MARK SCHEME

Maximum Mark: 100

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**Published**

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.

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- 1 (a) **A** = cell wall ;  
**B** = vacuole ;  
**C** = chloroplast ; [3]
- (b) difference : no chloroplasts / chlorophyll present ;  
reason : cell receives no light ;
- difference : shape ;  
reason : more water absorption ; [4]
- 2 (a) **A** ; [1]
- (b) **D** ; [1]
- 3 (a) chemical ;  
gravitational potential / GPE ;  
kinetic ; [3]
- (b) (i) 800 (W) ; [1]
- (ii) 18 (m) ; [1]
- 4 (a) **T** ; [1]
- (b) only one spot / colour (in chromatogram) ; [1]
- (c) (i) it does not dissolve / is insoluble ; [1]
- (ii) **R** ; [1]
- 5 (a) (i) 4000 (kg per hectare) ; [1]
- (ii) more fertiliser added, the greater the yield ;  
effect becomes less pronounced as more is added ; [2]
- (b) any **one** from
- temperature
  - (amount of) light
  - carbon dioxide (concentration) ; [1]

6 (a) 23.7 ; allow 23.67 [1]

(b) radiation ;  
conduction ; [2]

(c) any **one** from  

- black absorbs heat
- shiny reflects heat ;

[1]

7 (a) 402 ; 32 ;  
10.05 ; [3]

(b) glowing splint ;  
relights ; [2]

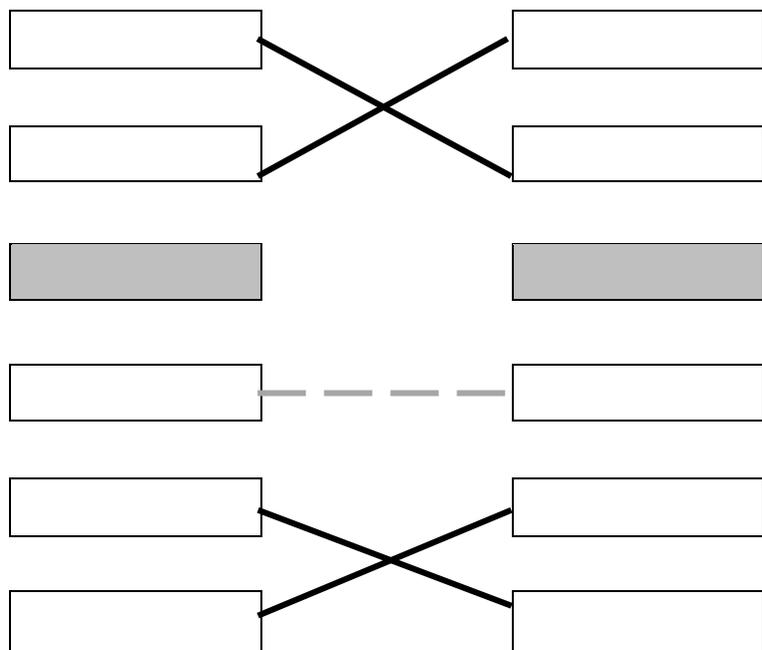
(c) any **one** from  

- making steel
- welding ;

[1]

(d) (s) (l) (g) [1]

8



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[5]

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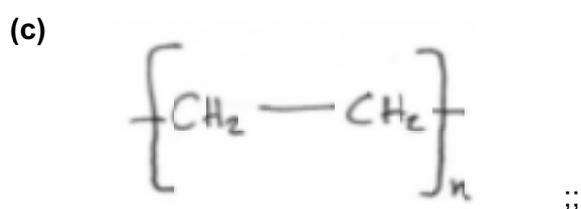
- 9 (a) line parallel to incident ray from the block ; [1]
- (b)  $1.5 = \sin i / \sin r$  ;  
 $r = 32.6$  ; [2]
- allow  $\sin r = \sin 54 / 1.5$   
allow 33
- 10 (a) (i) 9 ; [1]
- (ii) 19 ; [1]
- (b) 2, 7 (drawn on shells) ; [1]
- (c) (i) halogens ; [1]
- (ii) decreases ; [1]
- 11 (a) (i) any **three** from
- water
  - light
  - temperature
  - oxygen ;;; [3]
- (ii) **E** ;  
**G** ; [2]
- (b) any **three** from
- starch stored in seed / cotyledon
  - starch broken down
  - (amylase) starch to glucose / maltose
  - glucose / maltose soluble
  - (glucose used in) respiration
  - energy used for growth (during germination) ;;; [3]
- 12 (a) 30 ; [1]
- (b) (i) 1.5 ;  
Volts / V ; [2]
- (ii) 20(C) ; [1]

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- (c) any **two** from
- current is the same
  - more work done (by the charge against higher resistance)
  - resistance proportional to potential difference
  - **R** has the highest resistance ;;
- [2]

- 13 (a) **A** = oxidation ;  
**B** = polymerisation ;  
**C** = steam/water ;
- [3]

- (b) speed up the reaction
- [1]



CH<sub>2</sub> chain open ended  
 bracket showing multiple units

[2]

- 14 (a) stronger magnet ;  
more coils ;  
louder sound ;
- [3]

answers must be **comparative**

- (b) (i)  $v = f\lambda$  ;  
 5.5 (m) ;
- [2]

allow  $\lambda = v/f$  **or**  $\lambda = 330/60$

- (ii) at least two waves drawn with  
 same frequency/equal time period ;  
 same amplitude ;
- [2]

ignore extra waves  
 less than two waves max 1

- 15 bacteria ;  
 acid ;  
 enamel ;
- [3]

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- 16 (a) 2 H<sub>2</sub>; both required [1]
- (b) (rocket) fuel ;  
making margarine ; [2]
- (c) evaporate to smaller volume ;  
cool/(allow to) crystallise ; [2]
- crystallisation alone is insufficient
- (d) any **two** from
- conducts electricity
  - conducts heat
  - malleable
  - ductile
  - high melting point/high boiling point
  - high density ;;
- [2]
- 17 E ;  
C ;  
D ; [3]
- 18 (a) any **one** from
- like poles repel (allow repulsion)
  - align north-south when freely suspended
  - made from iron/steel (allow nickel/cobalt) ;;
- [1]
- (b) any **one** from
- induced magnetism
  - steel bar has become magnetised/a magnet ;
- [1]
- (c) any **one** from
- will not attract
  - loses magnetism more quickly ;
- [1]
- 19 (a) the air ;  
(cracking) hydrocarbons ; allow water/petroleum (crude oil)/named hydrocarbon [2]
- (b) iron ; allow Fe [1]
- (c) (i) hydroxide ; allow OH<sup>-</sup> [1]
- (ii) sulfuric acid ; allow H<sub>2</sub>SO<sub>4</sub> [1]

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- 20** any **three** from
- nerve/brain damage
  - mental disorders (e.g. depression/ manias/ phobias)
  - pancreatitis/ damage to pancreas
  - liver damage/ cirrhosis
  - (Increased risk of) cancer
  - (increase risk of) heart disease
  - hypertension/ high blood pressure
  - strokes ;;;
- [3]**
- 21 (a)** 71 ;
- [1]**
- (b) (i)** beta ; allow electron
- [1]**
- (ii)** a neutron becomes a proton ;  
allow number of protons increases by 1 and number of neutrons decreases by 1
- [1]**