



COMBINED SCIENCE

0653/43

Paper 4 Extended Theory

May/June 2018

MARK SCHEME

Maximum Mark: 80

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.

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

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)(i)	$6\text{CO}_2 + 6\text{H}_2\text{O} \longrightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$;;	2
1(a)(ii)	makes the leaf float ; good light absorption ;	2
1(b)(i)	more plants produced in B than A / greater increase in B than A ; use of supporting data e.g. increase of 5 in A and 19 in B ;	2
1(b)(ii)	nitrate ions causes population to increase more rapidly ;	1
1(c)(i)	becomes covered with duckweed / algae / plants ;	1
1(c)(ii)	(bacteria) decompose the dead plants ; bacteria use up oxygen / oxygen concentration in pond decreases ; due to <u>respiration</u> of the bacteria ; fish die / suffocate due to lack of oxygen ;	max 3

Question	Answer	Marks
2(a)(i)	(metal ion) any moving towards negative electrode and (non-metal ion) any moving towards positive electrode ; (electrolyte) solution ; (anode) positive electrode ;	3
2(a)(ii)	the idea that electron transfer occurs between ions and electrodes ; positive ions gain electrons and negative ion lose electrons ;	2
2(b)	electrolysis ; molten (sodium chloride) ; relevant additional detail e.g. high temperature needed / inert electrodes used ;	max 2
2(c)(i)	carbon / coke ;	1
2(c)(ii)	carbon monoxide / CO / carbon / C ;	1
3(a)(i)	upward vertical force arrow acting on the drone at any point ;	1

Question	Answer	Marks
3(a)(ii)	falls to ground ; accelerates ;	2
3(a)(iii)	(moves / accelerates due to) unbalanced forces / weight / gravitational force ;	1
3(b)(i)	PE gained = $mgh = 5 \times 10 \times 50$; = 2500 ; joules / J ;	3
3(b)(ii)	chemical > electrical > kinetic > (grav PE) ;; all 3 correct for 2 marks; any 2 correct for 1	2
3(c)(i)	electromagnetic waves ;	1
3(c)(ii)	$v = f \lambda$ OR rearranged / $\lambda = 3.0 \times 10^8 / 35 \times 10^6$; = 8.6 m ;	2

Question	Answer	Marks
4(a)	A stigma ; feathery structure / large area to trap pollen ; B anther ; hangs outside the flower to (allow the wind) disperse pollen ;	4
4(b)	no need to attract insects ;	1
4(c)	haploid nuclei fuse / join ; to form a diploid zygote ; genetically dissimilar offspring ;	max 2

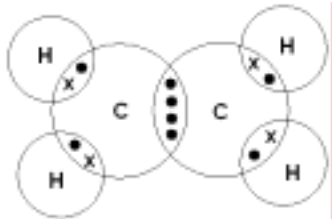
Question	Answer	Marks
5(a)(i)	(13) 13 electrons so 13 protons / same no. electrons and protons ;	1
5(a)(ii)	aluminium ;	1
5(b)(i)	(mass no.) 37 ; (neutron no.) 20 ;	2
5(b)(ii)	2, 8, 8 shown on a diagram with concentric shells ;	1
5(b)(iii)	(chlorine is an element but) sodium chloride is a compound / not an element ;	1
5(c)	(test) silver nitrate / aqueous/solution (acidic conditions) ; (result) white precipitate ;	2

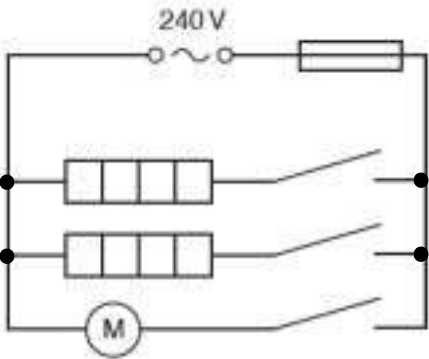
Question	Answer	Marks
6(a)	line starts from -5° ; line rises to meet cooling line ; curves meet at or after 200 seconds ; line matches cooling line and follows it as temp rises again at end ;	Max 3
6(b)(i)	convection ;	1
6(b)(ii)	cold water denser than warm (so sinks to bottom, displacing warmer water back to top) ;	1

Question	Answer	Marks
7(a)(i)	larynx correctly labelled ;	1
7(a)(ii)	<i>any bronchiole correctly labelled ;</i>	1
7(b)(i)	thin wall / short diffusion distance ; good blood supply ;	2

Question	Answer	Marks
7(b)(ii)	down concentration gradient owtte ;	1
7(c)	<i>mucus</i> traps pathogens / dust ; <i>cilia</i> (beat upwards to) remove the mucus ;	2
7(d)	(blood leaving left ventricle) has to go all round the body ; blood leaving right ventricle only has to go to lungs / high pressure in lung capillaries would damage them ;	2

Question	Answer	Marks
8(a)(i)	coal and natural gas ;	1
8(a)(ii)	<u>fractional distillation</u> ;	1
8(b)(i)	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ all formulae correct ; correct balancing (dependant on correct formulae) ;	2
8(b)(ii)	C_6H_{14} ;	1
8(b)(iii)	(B / C_6H_{14} / hexane) (B) larger molecule / surface area ; (B) greater intermolecular (attractive) forces / more energy needed to separate molecules ;	2
8(c)(i)	cracking ;	1

Question	Answer	Marks
8(c)(ii)	 <p>(circles not essential) double bond between carbon atoms ; four H atoms drawn with single pair between each and a C atom ;</p>	2

Question	Answer	Marks
9(a)	 <p>fuse in main circuit ; heating elements in parallel with each other and supply ; motor in parallel with heating elements (and supply) ; switches in series with both heaters and motor ;</p>	4
9(b)	<p>total power supply required = $1200 \times 2 + 100 = 2500 \text{ W}$; use of $P = I \times V$ e.g. current through one heater = 5 A / total current = $2500 \div 240$; = 10.4 A (which is above fuse rating) ;</p>	3

Question	Answer	Marks
9(c)	value within range 10–15 kHz ; top end of normal range is 20 kHz / older residents can hear up to 15 kHz ;	2