



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/31

Paper 3 Core Theory

October/November 2019

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)(i)	B and C ;	1
1(a)(ii)	any two from: vacuoles ; cell walls ; chloroplasts ;	2
1(a)(iii)	white blood cell ; phagocytosis / description of phagocytosis ;	2
1(b)(i)	plasma ;	1
1(b)(ii)	glucose underlined ; oxygen underlined ;	2
1(b)(iii)	respiration ; lungs / alveoli ;	2

Question	Answer	Marks
2(a)(i)	A and it is on left of the Periodic Table ;	1
2(a)(ii)	C and B ;	1
2(b)	(element D) noble gases / Group VIII / Group 0 ; (element E) transition metals / transition elements ;	2
2(c)(i)	copper oxide + sulfuric acid → copper sulfate + water reactants ; products ;	2
2(c)(ii)	to make sure all the acid is used up ;	1

Question	Answer	Marks
2(c)(iii)	(bond) ionic ; (explanation) (electron) transfer / loss and gain ;	2

Question	Answer	Marks
3(a)	gravitational kinetic kinetic electrical 1 or 2 correct = 1 mark 3 correct = 2 marks All correct = 3 marks	3
3(b)(i)	radio waves / microwaves ;	1
3(b)(ii)	visible light ;	1
3(c)(i)	C and because more waves in same time / higher frequency ;	1
3(c)(ii)	A and because waves have largest amplitude ;	1
3(c)(iii)	any value below 20 (Hz) ; Hz / hertz ;	2
3(c)(iv)	below the (normal) lower limit / frequency of human hearing ;	1

Question	Answer	Marks
4(a)(i)	<i>any two from:</i> for photosynthesis ; transport in plants ; as a solvent ;	2
4(a)(ii)	cortex ; xylem ; mesophyll ;	3
4(b)	gravitropism ;	1
4(c)(i)	root continued and bending downwards ;	1
4(c)(ii)	roots respond to gravity;	1
4(d)	no light for photosynthesis ;	1

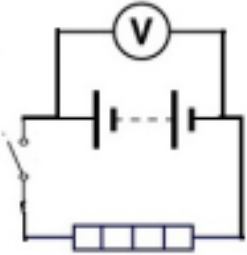
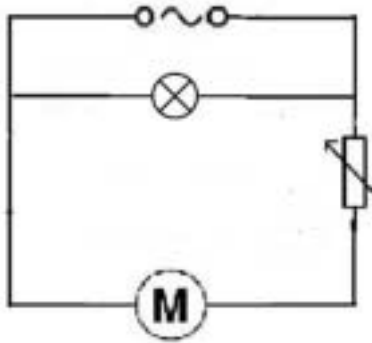
Question	Answer	Marks
5(a)(i)	hydrogen / H ₂ ;	1
5(a)(ii)	increases ;	1
5(a)(iii)	increases ;	1
5(a)(iv)	increases ;	1
5(b)(i)	loses oxygen ;	1
5(b)(ii)	thermal (heat) energy absorbed/taken in ;	1
5(c)	gas ammonia carbon dioxide oxygen test use damp red litmus paper use a glowing splint use limewater three correct lines = 2 marks one or two lines correct = 1 mark	2

Question	Answer	Marks
6(a)(i)	Earth (only) ;	1

Question	Answer	Marks
6(a)(ii)	<i>(data selected from the table to show) any two from:</i> temperature on surface of Earth is above melting point of water ; temperature on surface of Earth is below boiling point of water ; temperature on Venus higher than boiling point of water (at 100 °C) ; temperature on Mars lower than melting point of water (at 0 °C) ;	2
6(b)(i)	(infrared) radiation ;	1
6(b)(ii)	(conduction and convection) need a medium to travel through / no medium in space ;	1
6(c)	time in hours = 365×24 ; speed = distance / time or $940 \times 10^6 / 365 \times 24$; = 107 306 / 107 000 (km/h) ;	3
6(d)	two converging rays ; coming to a focus at the burning grass;	2

Question	Answer	Marks
7(a)(i)	grass → cricket → frog → owl organisms in correct order ; arrows in correct direction ;	2
7(a)(ii)	(an organism that) makes its own (organic) nutrients/food ; using energy from (sun)light / photosynthesis ;	2
7(b)	<i>any two from:</i> the breakdown of large, insoluble food molecules ; into small water-soluble molecules ; so (small molecules) can be absorbed ;	2
7(c)(i)	loss of shelter / loss of habitat / loss of food / reduction in population of part of food chain ;	1
7(c)(ii)	loss of soil / flooding / increase of carbon dioxide in the atmosphere ;	1

Question	Answer	Marks
8(a)(i)	fractional distillation ;	1
8(a)(ii)	compound/molecule that contains carbon and hydrogen ; only ;	2
8(a)(iii)	(raw material) to make chemicals ;	1
8(b)(i)	(test) copper((II)) sulfate or cobalt((II)) chloride ; (result) (white) turns blue (blue) turns pink ;	2
8(b)(ii)	toxic / poisonous (to humans/animals) / breathing difficulties / combines with haemoglobin in place of oxygen / reduces oxygen carrying capacity of the blood ;	1
8(b)(iii)	(percentage) $\leq 1(\%)$;	1
8(b)(iv)	nitrogen = 78% and oxygen = 21% or nitrogen + oxygen = 99% ;	1

Question	Answer	Marks
9(a)	 correct choice of meter with symbol ; connection in parallel with cells ;	2
9(b)	13 A ;	1
9(c)	arrow(s) from heater going upwards ;	1
9(d)	 lamp in parallel with motor (above or below) ; variable resistor symbol ; variable resistor in series with motor only ;	3



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Question	Answer	Marks
1(a)(i)	R cell membrane ; S cytoplasm ;	2
1(a)(ii)	<i>any two from:</i> (it has a) cell wall ; (it has a large) vacuole ; (it has) chloroplasts ;	2
1(b)	(LHS) carbon dioxide + water ; (RHS) glucose + oxygen ;	2
1(c)(i)	snail ;	1
1(c)(ii)	thrush ;	1
1(c)(iii)	decrease and (they have) less food / no food ;	1

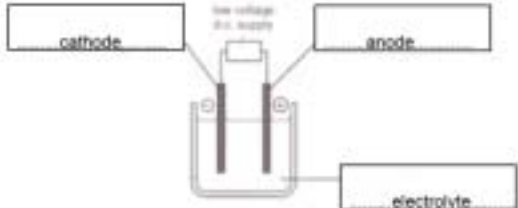
Question	Answer	Marks
2(a)(i)	cracking ;	1
2(a)(ii)	(from) brown / orange / yellow / red-brown ; (to) colourless / lighter ;	2
2(a)(iii)	poly(ethene) ;	1
2(b)(i)	hydrocarbon ;	1
2(b)(ii)	covalent ;	1
2(b)(iii)	carbon dioxide / CO ₂ ; water / H ₂ O ;	2

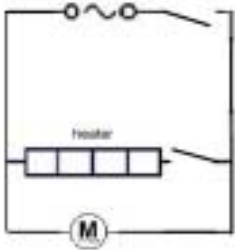
Question	Answer	Marks
2(b)(iv)	three further hydrogen atoms drawn around the carbon atom ; one pair of electrons between each hydrogen and the carbon ;	2

Question	Answer	Marks
3(a)(i)	horizontal arrow to the right ;	1
3(a)(ii)	<i>any two from:</i> changes (object's) shape ; changes (object's) size ; changes (object's) motion ;	2
3(a)(iii)	force (applied) ; distance (moved) ;	2
3(b)	kinetic ; gravitational ;	2
3(c)	density = mass / volume or density = 6.0 (g) / 0.75 (cm ³) ; = 8.0 or 8 (g/cm ³) ;	2

Question	Answer	Marks
4(a)(i)	A petal ; B sepal ;	2
4(a)(ii)	pollen nucleus fuses ; with a nucleus in the ovule ;	2
4(b)(i)	stigma / carpel / style / ovary ;	1
4(b)(ii)	anthers / stamen ;	1
4(c)(i)	oviduct ;	1

Question	Answer	Marks
4(c)(ii)	zygote ;	1
4(c)(iii)	wall / lining ; of the uterus ;	2

Question	Answer	Marks
5(a)(i)	 all three correct = 2 marks one or two correct = 1 mark	2
5(a)(ii)	sodium hydroxide / NaOH ; hydrogen / H ₂ ;	2
5(a)(iii)	(test) damp litmus paper ; (result) (blue / red to) white ;	2
5(b)	(protons) 11 ; (neutrons) 12 ;	2
5(c)	(chlorine atom) 2, 8, 7 drawn ; (chloride ion) 2, 8, 8 drawn ;	2

Question	Answer	Marks
6(a)	 heater inserted in a parallel branch ; second switch in series with heater in same branch ;	2
6(b)(i)	use of $R = V/I$ or $R = 240 / 3$; = 80 ; Ω / ohm(s) ;	3
6(b)(ii)	5 A ;	1
6(c)(i)	evaporation ;	1
6(c)(ii)	escape of faster (water) molecules ;	1
6(c)(iii)	<i>any two from:</i> thermal energy transferred from body (to water molecules) ; remaining molecules slower (on average) ; slower molecules means lower temperature ;	2

Question	Answer	Marks
7(a)	molecules ; absorbed ;	2
7(b)(i)	(test-tube 1) red / orange / yellow / green ; (test-tube 2) blue ;	2
7(b)(ii)	boiling makes the enzyme inactive ;	1
7(c)	(digestion) mouth / stomach / small intestine ; (egestion) anus ; (ingestion) mouth ;	3

Question	Answer	Marks
8(a)(i)	alloy(s) ;	1
8(a)(ii)	(electrical / heat / thermal) conductor / malleable / high melting point / high boiling point ;	1
8(b)(i)	carbon + copper oxide → (copper) + carbon dioxide LHS ; carbon dioxide ;	2
8(b)(ii)	reduction ;	1
8(b)(iii)	releases / gives out (heat / thermal) energy ;	1

Question	Answer	Marks
9(a)	positive and negative ;	1
9(b)	volt(s);	1
9(c)	loss / gain / transfer of electrons (between molecules) ;	1
9(d)	visible light; ultraviolet ;	2
9(e)(i)	speed = distance / time or $d = \text{speed} \times \text{time} = 330 \times 5.0$; = 1650 (m) ;	2
9(e)(ii)	light travels (much) faster than sound ;	1



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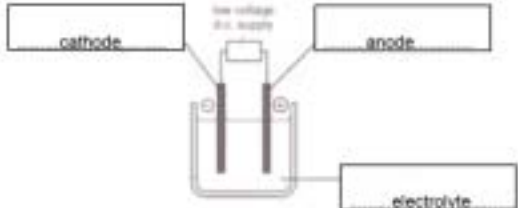
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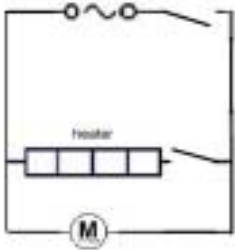
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