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COMBINED SCIENCE

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Paper 4 Extended Theory

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MARK SCHEME

Maximum Mark: 80

Published

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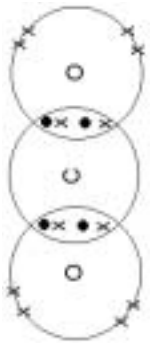
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This document consists of **12** printed pages.

Question	Answer	Marks
1(a)	<i>any two of the following correctly labelled:</i> nucleus ; chloroplast ; cell wall ; vacuole ;	2
1(b)	for (rapid) absorption of water ;	1
1(c)(i)	for movement ;	1
1(c)(ii)	acrosome containing enzymes used in fertilisation / many mitochondria to release energy for swimming ;	1
1(d)(i)	glucose ;	1
1(d)(ii)	haemoglobin ; red blood cells ; diffusion ;	3
1(d)(iii)	capillary <u>walls</u> are thin ;	1

Question	Answer	Marks
2(a)	covalent ; bond between two non-metals ;	2
2(b)(i)	heat / <u>high</u> temperature ; catalyst ;	2
2(b)(ii)	(4) C ₂ H ₄ ;	1
2(c)(i)	 one carbon atom and two oxygen atoms shown and correct electron distribution for carbon atom ; correct electron distribution for both oxygen atoms/lone pairs on both oxygen atoms ;	2
2(c)(ii)	<u>enhanced</u> greenhouse effect / global warming / climate change / consequence of climate change ;	1

Question	Answer	Marks
3(a)(i)	lake surface ;	1
3(a)(ii)	<i>any 2 from:</i> penstock (pipe from dam to turbine) ; turbine ; generator ;	1
3(b)	<i>advantage:</i> no emissions / can be used for flood control ; <i>disadvantage:</i> creating reservoirs can flood useful land / destroy local ecosystems ;	2
3(c)(i)	3×10^8 m/s ;	1
3(c)(ii)	use of $v = f\lambda$; $(\lambda = v \div f = 3 \times 10^8 \div 600 \times 10^6) = 0.5$ m ;	2
3(c)(iii)	microwaves ;	1
3(d)	vibrations / oscillations of particles / air molecules or compressions and rarefactions ; longitudinal / vibration (direction) is parallel to direction of wave propagation / energy propagation ;	2

Question	Answer	Marks
4(a)(i)	$6 \text{ CO}_2 + 6 \text{ H}_2\text{O} \longrightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2$ LHS ; RHS ;	2
4(a)(ii)	respiratory substrate / for respiration / to release energy ; to make starch (for storage) ;	2
4(b)(i)	B ;	1
4(b)(ii)	greatest number of chloroplasts / large amounts of chlorophyll present ; to absorb light / needed for photosynthesis ;	2
4(c)	(less transpiration means) less <u>diffusion</u> of water (vapour through the stomata / out of leaf) ; due to increased concentration of water vapour in the air / due to reduced difference in water potential ;	2

Question	Answer	Marks
5(a)	high density / high melting point / acts as catalyst ;	1
5(b)(i)	cathode ;	1
5(b)(ii)	gains electrons ; two electrons ;	2
5(c)(i)	carbon ;	1
5(c)(ii)	aluminium is too reactive / aluminium more reactive than carbon ;	1
5(d)	(aqueous) sodium hydroxide ; (pale) blue ppt ; or flame test ; blue–green / turquoise colour ;	2

Question	Answer	Marks
6(a)	Earth ;	1
6(b)	use of $d = m/V$; $(3.29 \times 10^{23} / 0.608 \times 10^{20}) = 5.41 \times 10^3$ (3sf) ; kg/m ³ ;	3
6(c)	Earth ; greatest mass / highest gravitational field strength ;	2
6(d)	darker colour / duller surface ;	1
6(e)	(on Venus) pressure of atmosphere much higher so molecules more concentrated ; so (atmospheric) resistance is greater / more work done by probe pushing molecules aside / owtte ; ORA	2

Question	Answer	Marks
7(a)(i)	(a unit containing) all the organisms and their environment ; interacting together ;	2
7(a)(ii)	light ; chemical (potential) energy ;	2
7(b)	<i>any two from:</i> death of organisms ; (excretion of) waste products from organisms ; respiration ; heat ;	2
7(c)	die / become extinct ; source of food/energy has gone / loss of habitat ;	2

Question	Answer	Marks
8(a)(i)	30 to 55 °C inclusive ;	1
8(a)(ii)	violent / very fast ;	1
8(b)(i)	RbOH ;	1
8(b)(ii)	in range 8–14 ; the solution is an alkali ;	2
8(c)	RbOH is ionic attractive forces between ions are strong more thermal energy (heat) needed to separate ions or water is covalent ; attractive forces between molecules are weak ; less thermal energy (heat) needed to separate molecules ;	3
8(d)	temperature increases / thermal energy released ; chemical energy is changed into thermal energy ;	2

Question	Answer	Marks
9(a)(i)	use of $1/R = 1/R_2 + 1/R_3$; ($1/3 + 1/6$ or $3/6 \rightarrow$) combined $R = (6/3) = 2 \Omega$; total $R = 8 + 2 = 10 \Omega$;	3
9(a)(ii)	$2.7 - 1.8 = 0.9 \text{ (A)}$;	1
9(a)(iii)	current from the source (ammeter reading) is the sum of the currents in the separate branches (in R_2 and R_3) of a parallel circuit / owtte ;	1
9(a)(iv)	must be resistance inside the battery / resistance of connecting wires / the idea of greater resistance ;	1
9(b)	use of $P = VI$ or $P = I^2R$; (45×9 or $9^2 \times 5$) = 405 W ;	2