Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/22**

Paper 2 Core Theory **October/November 2016**

MARK SCHEME

Maximum Mark: 120

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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Question	Answer	Marks
1(a)(i)	nitrogen ; oxygen ;	**2**
1(a)(ii)	little change / no overall change ; (but) some fluctuations ; increases from 1800 ; by 65 ppm ;	**max 3**
1(b)(i)	respiration / decomposition / excretion ;	**1**
1(b)(ii)	photosynthesis ;	**1**
1(c)(i)	increase, because less photosynthesis ;	**1**
1(c)(ii)	increase, because CO_2 released by combustion ;	**1**
1(d)	flooding ; melting ice-caps ; extinction / migration of species ; hurricanes / unpredictable weather patterns ; increased agricultural pests ;	**max 2**
	Total:	**11**

Question	Answer	Marks
2(a)(i)	**C** and hydrogen ;	**1**
2(a)(ii)	**B** and carbon dioxide ;	**1**
2(a)(iii)	**D** and silver chloride ;	**1**
2(b)(i)	substance / material that speeds up / alters rate of a chemical change / reaction ; is itself not permanently changed ;	**2**

Question	Answer	Marks
2(b)(ii)	28 ; 23 ;	**2**
2(b)(iii)	transition (series / metals) ;	**1**
2(c)(i)	SO_3 ;	**1**
2(c)(ii)	(**Y**) oxygen has been added to the molecules ;	**1**
	Total:	**10**

Question	Answer	Marks
3(a)(i)	water has expanded <u>because it is hotter</u> ;	**1**
3(a)(ii)	some of the water has boiled away / evaporated ;	**1**
3(a)(iii)	temperature at which all the liquid can turn into a gas ;	**1**
3(a)(iv)	(water is) **B** most particles are touching and random arrangement ; (water vapour is) **C** particles are spread out (and random arrangement) ;	**2**
3(b)	Convection ;	**1**
3(c)	R = V / I or = 250 / 8 ; = 31.25 ; Ω ;	**3**
3(d)	fuses cut electricity to a device if there is a power surge / too much current flows / a fault ; (too much current) causes fuse to melt ;	**2**
	Total:	**11**

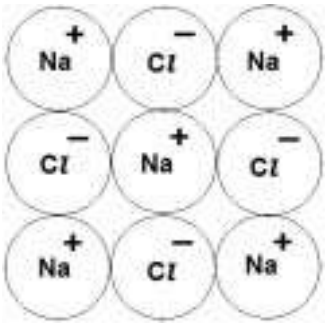
Question	Answer	Marks
4(a)(i)	production of genetically identical offspring ; from one parent ;	**2**
4(a)(ii)	Aa ;	**1**
4(b)(i)	root hair (cells) ; xylem ; transpiration ;	**3**
4(b)(ii)	retains water in the air around the leaves / increases humidity ;	**1**
4(b)(iii)	photosynthesis ; transport ; support ; AVP ;	**max 2**
4(c)(i)	for protein synthesis ;	**1**
4(c)(ii)	for chlorophyll synthesis ;	**1**
	Total:	**11**

Question	Answer	Marks
5(a)(i)	**S** is magnesium oxide ; **G** is hydrogen ;	**2**
5(a)(ii)	no change / reaction ; copper too unreactive / less reactive than hydrogen ;	**2**
5(b)(i)	the temperature (initially) increases ;	**1**
5(b)(ii)	3 minutes ; no heat given out after this time / temperature no longer increases ;	**2**
5(b)(iii)	increase concentration of copper sulfate solution ; increase (starting) temperature of copper sulfate solution ; use powdered magnesium / increase surface area of magnesium ;	**max 1**
	Total:	**8**

Question	Answer	Marks
6(a)(i)	acceleration line gradient correct ; constant speed line correct at 45m / s for 150 s anywhere ;	**2**
6(a)(ii)	distance = speed × time ; = 45 × 150 = 6750 (m) ;	**2**
6(b)	mass = density × volume or 8 × 512 000 ; = 4 096 000 (g) ;	**2**
6(c)	D is greater than F ; D is equal (and opposite) to F ;	**2**

Question	Answer	Marks
6(d)(i)	fuel is burned ; chemical energy to thermal energy ; water is turned into steam ; thermal to kinetic energy ; steam drives turbine / generator ; kinetic to electrical ;	**max 4**
6(d)(ii)	example of non-renewable and example of renewable ;	**1**
	Total:	**13**

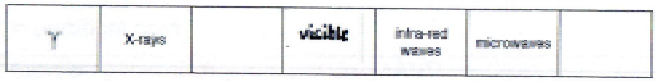
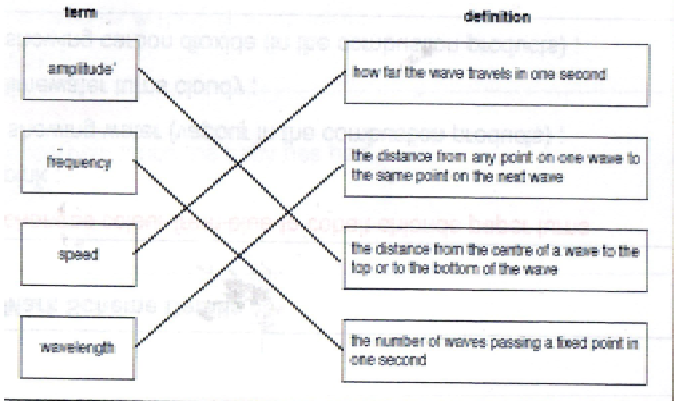
Question	Answer	Marks
7(a)	environment ; shiver ; arterioles ; vasoconstriction ; capillaries ;	**5**
7(b)(i)	16.30 ;	**1**
7(b)(ii)	exercise / activity ; sweating / vasodilation ;	**2**
7(b)(iii)	is a good insulator ; reduces heat loss to the environment ;	**2**
	Total:	**10**

Question	Answer	Marks
8(a)(i)	sodium + chlorine ⟶ sodium chloride ;; LHS and RHS	**2**
8(a)(ii)		**1**
8(a)(iii)	atom gains (an) electron / completes its outer shell ;	**1**
8(b)(i)	make copper chloride into a(n aqueous) solution ; add solution to the beaker so electrodes are immersed ; close the switch ;	**3**
8(b)(ii)	changes from black to brown / pink / copper coloured ; copper is deposited (on the cathode) ;	**2**
8(c)(i)	alloy ;	**1**
8(c)(ii)	malleable refers to ability to be shaped (without breaking) / does not break / change shape when subjected to a force / other correct ;	**1**
8(c)(iii)	less likely to be dented when rung / owtte ;	**1**
	Total:	**12**

Question	Answer	Marks
9(a)(i)	(nucleus) splits ;	1
9(a)(ii)	α β γ ;	1
9(a)(iii)	alpha (is ionising but) has low penetration ;	1
9(b)(i)	resistance reduced ;	1
9(b)(ii)	length / material / temperature ;	1
	Total:	**5**

Question	Answer	Marks
10(a)(i)	X = ovary ; Y = cervix ; Z = vagina ;	3
10(a)(ii)	release of female gametes ;	1
10(b)(i)	oviduct ;	1
10(b)(ii)	divides ; forms a ball of cells ; implants ; in lining / wall of uterus ;	max 3
	Total:	**8**

Question	Answer	Marks
11(a)(i)	cobalt chloride paper goes pink ; showing water (vapour in the combustion products) ; limewater turns milky ; showing carbon dioxide (in the combustion products) ;	**4**
11(a)(ii)	decreases ;	**1**
11(b)(i)	hydrocarbon contains hydrogen and carbon only ; saturated it contains only single bonds / it fits the general formula C_nH_{2n+2} ;	**2**
11(b)(ii)	**I** is ethanol ; **K** is ethene ;	**2**
11(b)(iii)	H_2O ;	**1**
	Total:	**10**

Question	Answer	Marks
12(a)	gamma – box to left of X rays and visible light – box to left of infra-red ; 	1
12(b)	amplitude = 3rd answer, frequency = 4th answer, speed = 1st answer, wavelength = 2nd answer 4 correct = 2 marks , 3, 2 or 1 correct = 1 mark ;; 	2
12(c)(i)	angle of reflection correctly indicated ;	1
12(c)(ii)	36° angle of incidence = angle of reflection ;	1
12(d)	mirror image of comet drawn laterally inverted and same size ;	1
12(e)(i)	principal focus identified ;	1
12(e)(ii)	focal length identified ;	1
12(e)(iii)	refraction ;	1

Question	Answer	Marks
12(f)(i)	sound requires a medium / sound cannot travel through vacuum ;	**1**
12(f)(ii)	light waves are electromagnetic / sound waves are not ; light waves are transverse / sound waves are longitudinal ;	**max 1**
	Total:	**11**