Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/43**

Paper 4 Theory (Extended) **May/June 2017**

MARK SCHEME

Maximum Mark: 120

Published

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Question	Answer	Marks
1(a)	liver labelled ; pancreas labelled ;	**2**
1(b)	ref. to emulsification / emulsifying ; increases surface area of fats ; for enzymes to work on ;	**max 2**
1(c)	pancreas detects high glucose concentration (in blood) ; pancreas produces insulin ; (causing) liver to convert glucose to glycogen ;	**3**
1(d)(i)	ref. to a change (from, normal / set point) ; (causes) response that, cancels out the change / returns system to normal / returns system to a set point ;	**2**
1(d)(ii)	temperature control ;	**1**

Question	Answer	Marks
2(a)	**1** **1** (1) (0) ; (7) (14) **7** **7** ;	**2**
2(b)(i)	argon atom labelled ;	**1**
2(b)(ii)	unreactive / does not form bonds / remains monatomic ; because full outer shell ;	**2**
2(b)(iii)	catalyst ; speeds up the reaction / allows reaction to proceed ;	**2**
2(c)(i)	the higher the temperature the lower the solubility ;	**1**
2(c)(ii)	68 (g) ; A_r of ammonia = (14 × 1) + (1 × 3) = 17 ; so moles of ammonia = 68 ÷ 17 = 4 ; so volume of ammonia = 4 × 24 = 96 (dm^3) ;	**4**

Question	Answer	Marks
3(a)(i)	less / shorter / smaller distance for gases to <u>diffuse</u> ;	**1**
3(a)(ii)	large surface area ; moist ; good blood supply ; well ventilated ;	**max 2**
3(b)(i)	mucus traps microorganisms / dust / particles ; cilia moves mucus, away from lungs / towards mouth ;	**2**
3(b)(ii)	cilia unable to remove mucus ; inflammation / increased coughing / irritation **/** increased, lung infections / bacteria ;	**2**
3(c)	carcinogenic / causes cancer ;	**1**

Question	Answer	Marks
4(a)(i)	area under graph / working / 75 + 150 + 450 ; 675 (m) **;**	**2**
4(a)(ii)	working or 3 / 50 ; 0.06 (m / s^2) ;	**2**
4(a)(iii)	max speed = 3 m / s ; KE = ½ mv^2 / ½ × 400 × 9 ; 1800(J) ;	**3**
4(b)	pressure = force / area / 4000 / 4 × 0.035 ; 28 600 (N / m^2) ;	**2**
4(c)(i)	allow between 20 000 Hz and 35 000Hz ;	**1**
4(c)(ii)	compressions are regions where the particles in air are close together / rarefactions are regions where the particles in air are spread out ; compressions are regions with air at higher pressure than normal / rarefactions are regions with air at lower pressure than normal ;	**2**
4(d)	radio waves or microwaves ;	**1**

Question	Answer	Marks
5(a)(i)	carbon dioxide ;	**1**
5(a)(ii)	combustion of carbon compounds / AW ; incomplete combustion ;	**2**
5(b)	two pairs of shared pairs ; four non-bonding electrons on both oxygens and correct symbols ;	**2**
5(c)	the idea that the lower the pH the higher the acid concentration ; so the lower the pH the higher the reaction rate ; greater collision frequency (between acid particles and magnesium) ;	**3**

Question	Answer	Marks
6(a)	**X** testa ; **Y** embryo ;	**2**
6(b)	oxygen, water, suitable temperature ;	**1**
6(c)(i)	food stores converted to sucrose ; ref to enzymes ; ref to translocation ; in phloem ;	**max 3**
6(c)(ii)	uses up food store (before it can, photosynthesise / reach the surface) ;	**1**
6(d)(i)	attach to animals, fur / hair / coat ; eaten by animal and dispersed in faeces / owtte ;	**max 1**
6(d)(ii)	*if attach to animals* (seeds are) barbed / AW ; *if eaten by animals* (seeds are) surrounded by fruit / seeds indigestible ;	**1**

Question	Answer	Marks
7(a)	$Q = I \times t / 0.003 \times 0.15 \times 10^{-3}$; 4.5×10^{-7} ; coulombs / C ;	**3**
7(b)	temperature change = 20 °C ; $H = mc\Delta\theta / 40 \times 4\,200 \times 20$; 3 360 000 (J) ;	**3**

Question	Answer	Marks
8(a)(i)	some components in the ink not soluble / owtte ;	**1**
8(a)(ii)	there could be more than one insoluble dye (on the origin) ; different dyes could move at same speed (so do not separate) ;	**max 1**
8(a)(iii)	no new substances produced / only separating existing substances ;	**1**
8(b)	cracking ; hydrolysis ;	**2**
8(c)(i)	magnesium atom loses two (outer) electrons ; each chlorine atom gains one electron ;	**2**
8(c)(ii)	$MgCl_2$;	**1**
8(d)(i)	**P** chlorine and **Q** hydrogen ;	**1**
8(d)(ii)	it is molten ;	**1**

Question	Answer	Marks
9(a)	increasing pH increases average number of species of fish ; additional detail ;	**2**
9(b)(i)	burning fossil fuels / volcano, releases sulfur dioxide / oxides of nitrogen ; sulfur dioxide / oxides of nitrogen, dissolve in / react with, water in the air / rain ;	**2**
9(b)(ii)	acidifies lakes / rivers / ponds / water bodies ; leaches, minerals / ions, from soil ; kills aquatic organisms / trees ; damages buildings ;	**max 2**
9(b)(iii)	catalytic converters / use of scrubbers / use alternative energy sources or example / reduce burning of fossil fuels ;	**1**

Question	Answer	Marks
10(a)(i)	–15.5 to –19.9 (%) ;	**1**
10(a)(ii)	0.4 mol (dm^3) ; no change in mass (at this concentration) ;	**2**
10(b)	water potential is less inside the potato tuber (than in the solution) / ORA ; water enters the potato tuber ; down a water potential gradient ; by osmosis ;	**max 3**

Question	Answer	Marks
11(a)	day – will reflect more / absorb less heat (by radiation) ; night – will, emit / radiate, less heat ;	**2**
11(b)(i)	X behind mirror same height as object ; same distance behind mirror as object is in front ;	**2**
11(b)(ii)	ray of light reflected at bottom of mirror AND angle of incidence and reflection approx. correct ;	**1**
11(b)(iii)	reflected ray cannot reach eye ;	**1**
11(c)(i)	correct symbol ; connected across (in parallel with) ac output ;	**2**
11(c)(ii)	approx. sine wave ; constant amplitude ;	**2**
11(c)(iii)	2 from: rotation of coil cuts magnetic field / coil experiences changing magnetic field ; induces emf ; emf / current reverses every half turn ; then: slip rings conduct current / slip rings avoid wires tangling ;	**max 3**

Question	Answer	Marks
12(a)	kinetic / gravitational / potential, energy of waves to kinetic energy of the air ; kinetic energy of the air to kinetic energy of the turbine ; kinetic energy of turbine/generator to electrical energy ;	**3**
12(b)	f = v / λ / 2 / 12 ; 0.17 / 0.167 (Hz) ;	**2**
12(c)	molecules which, are fastest moving / are most energetic / have sufficient energy ; overcome forces / break bonds, between molecules ; leave surface ;	**3**

Question	Answer	Marks
13(a)	C–C single bonds / –O–H ; all else correct ;	**2**
13(b)(i)	(anhydrous) cobalt chloride (paper) ; (blue to) pink ; OR (anhydrous) copper sulfate ; (white to) blue ;	**2**
13(b)(ii)	chemical (potential) to thermal / heat / light ;	**1**
13(b)(iii)	$C_2H_6O + 3O_2 \rightarrow 2CO_2 + 3H_2O$ formulae ; balanced ;	**2**
13(c)	ethanol has lower boiling point than water ; because intermolecular forces between ethanol molecules are lower than between water molecules ; so less thermal energy required to separate ethanol molecules ;	**3**