



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)	$\begin{array}{cccc} 1 & 1 & (1) & (0) ; \\ (7) & (14) & 7 & 7 ; \end{array}$	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)	<p>68 (g) ;</p> <p>A_r of ammonia = $(14 \times 1) + (1 \times 3) = 17$; so moles of ammonia = $68 \div 17 = 4$;</p> <p>so volume of ammonia = $4 \times 24 = 96 \text{ (dm}^3\text{)}$;</p>	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 = $\frac{1}{2} mv^2 / \frac{1}{2} \times 400 \times 9$; 1800 (J) ;	3
4(b)	pressure = force / area / $4000 / 4 \times 0.035$; $28\ 600$ (N / m ²) ;	2
4(c)(i)	allow between $20\ 000$ Hz and $35\ 000$ Hz ;	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 <u>translocation</u> ; 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)	<i>if attach to animals</i> (seeds are) barbed / AW ; <i>if eaten by animals</i> (seeds are) surrounded by <u>fruit</u> / 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 <u>water potential gradient</u> ; 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 <u>eye</u> ;	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 ; <u>induces</u> 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)	$f = v / \lambda / 2 / 12$; 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