



CO-ORDINATED SCIENCES

0654/31

Paper 3 Theory (Core)

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MARK SCHEME

Maximum Mark: 120

Published

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This document consists of **10** printed pages.

Question	Answer	Marks
1(a)(i)	cell membrane, cytoplasm and nucleus labelled ;;;	3
1(a)(ii)	<i>any two of the following</i> chloroplasts ; cell wall ; vacuole ;	max 2
1(b)(i)	glucose and oxygen ;	1
1(b)(ii)	<i>any two of the following</i> muscle contraction ; protein synthesis ; cell division ; growth ; the passage of nerve impulses ; maintenance of a constant body temperature ;	max 2

Question	Answer	Marks
2(a)(i)	conduction ;	1
2(a)(ii)	to enable / facilitate convection ; description of convection ;	2
2(a)(iii)	good (thermal) insulator ;	1
2(b)(i)	lost as heat / lost to surroundings / lost as sound energy ;	1
2(b)(ii)	useful energy out ÷ total energy in ;	1
2(c)	bare copper wire / damaged insulation ; can cause short circuit / electrocution / fire ;	2
2(d)(i)	<u>temperature</u> at which (all of) a liquid turns to gas ;	1
2(d)(ii)	B – particles close together and randomly arranged ; C – particles widely spaced (and randomly arranged) ;	2

Question	Answer	Marks
3(a)	78 ; 21 ;	2
3(b)(i)	incomplete combustion of fuel ;	1
3(b)(ii)	toxic to humans ;	1
3(c)	green to orange / red ; solution is acidic / non-metal oxides are acidic ;	2
3(d)(i)	NH ₃ ;	1
3(d)(ii)	elements contain only one type of atom ; compounds contain different atoms (bonded) ; any correct reference to the example molecules ;	max 2

Question	Answer	Marks
4(a)(i)	<p>;;;</p>	3
4(a)(ii)	oviduct ;	1
4(a)(iii)	fusion / joining of, sperm and egg ; nuclei ;	2
4(b)	only one parent ; no variation ; does not involve gametes ; less time / energy spent looking for a mate ;	max 2

Question	Answer	Marks
5(a)	<i>fat</i> butter ; <i>protein</i> fish ; <i>vitamin C</i> melon / tomatoes ;	3
5(b)(i)	growth / repair ;	1
5(b)(ii)	carbon hydrogen oxygen nitrogen ;	1
5(b)(iii)	amino acids ;	1
5(c)(i)	(teenager) more active ; has a higher metabolic rate ; is still growing ;	max 1
5(c)(ii)	(female athlete) lower metabolic rate ; generally, smaller in size / mass ;	max 1

Question	Answer	Marks
6(a)(i)	$\begin{array}{c} \text{H} \\ \\ \text{H} - \text{C} - \text{H} \\ \\ \text{H} \end{array}$ <p>1 carbon and four hydrogens ; all correct single bonds ;</p>	2
6(a)(ii)	carbon dioxide ; water ;	2
6(b)(i)	<u>fractional distillation</u> ;	1
6(b)(ii)	similarities hydrocarbons / mixtures / contain alkanes / other correct ; differences boiling point/range / colour / odour / flammability / other correct ;	2
6(c)(i)	bromine ;	1
6(c)(ii)	no change / colour remains / solution stays orange ; bromine does not react with saturated hydrocarbons ;	2
6(c)(iii)	ethene ;	1

Question	Answer	Marks
7(a)(i)	when time is 0 s / 40–50 s ;	1
7(a)(ii)	4 (m / s) ;	1
7(a)(iii)	distance = speed \times time / 5×4 ; = 20 (m) ;	2
7(b)	reference to friction or description / transfer of electrons / negative charge ;	1
7(c)	no deviation at first interface and first reflection correct ; second reflection correct ;	2
7(d)(i)	move faster ;	1
7(d)(ii)	more frequent collisions / collide at greater speed (with wall) ; more force exerted on tyre walls ;	2

Question	Answer	Marks
8(a)	one arrow pointing into the roots ; one arrow pointing out from the leaf ;	2
8(b)	xylem ;	1
8(c)	light / carbon dioxide / chlorophyll ;	1
8(d)	higher temperature / hot ; increased wind speed / windy ; arid / dry (conditions) ;	max 2

Question	Answer	Marks
9(a)(i)	12 ; 14 ; 12 ;	3
9(a)(ii)	8 ;	1
9(b)(i)	hydrogen ;	1
9(b)(ii)	increases ; mixture becoming less acidic / the acid is being used up / is becoming less ;	2
9(b)(iii)	(incorrect) reaction is exothermic ; because temperature increased / endo thermic would show temperature decrease ; reference to transfer of chemical to thermal energy / or vv if endothermic ;	max 2
9(c)	increase acid concentration ; increase temperature ; increase surface area of magnesium ;	max 2

Question	Answer	Marks
10(a)	flow of energy ; from one organism to the next ;	2
10(b)(i)	grass → rabbit → fox / grass → rabbit → hawk ;;	2
10(b)(ii)	<i>producer</i> grass / blackberries ; <i>carnivore</i> hawk / fox ; <i>herbivore</i> butterfly / grasshopper / mouse / rabbit ;	3
10(c)	fewer, mice / rabbits eaten by hawks ; less <u>competition</u> ; more, food / mice / rabbits (for foxes) ; fox population increases ;	max 3

Question	Answer	Marks
11(a)	chemical ; water ; turbine ;	3
11(b)(i)	use a geiger counter ; ref to passing through lead etc. ;	2
11(b)(ii)	cancer etc. ;	1
11(c)(i)	resistance increases ;	1
11(c)(ii)	change length / material ;	1
11(d)	contract in cold weather ; damage cables / pylons ;	2

Question	Answer	Marks
12(a)(i)	S ; insulator (shows it is a non-metal) / liquid because m.pt. less than RT and b.pt. greater than RT ;	2
12(a)(ii)	high density / malleable / sonorous / lustrous / conducts heat (well) ;	1
12(b)(i)	sodium chloride ;	1
12(b)(ii)	loses electrons / an electron ;	1
12(b)(iii)	opposite charges (attract) ;	1
12(c)(i)	electrolysis ;	1
12(c)(ii)	Y anode ; Z cathode ;	2

Question	Answer	Marks
13(a)	gravitational (potential) energy ;	1
13(b)	measure the number of seconds / time between noise and echo ; divide distance by time ; divide double the distance / multiply by 2 ;	3
13(c)	infra-red to right of visible ; ultraviolet to left of visible ;	2
13(d)(i)	middle ray passes through without deviation and bottom ray passes out parallel to principal axis ;	1
13(d)(ii)	inverted arrow drawn at intersection of three rays ;	1
13(d)(iii)	principal focus / focal point ;	1