Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/31**

Paper 3 Theory (Core) **May/June 2017**

MARK SCHEME

Maximum Mark: 120

Published

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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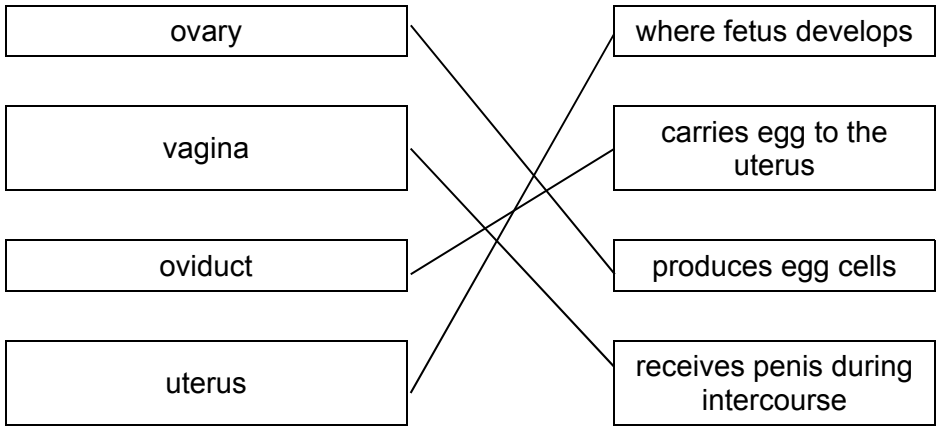
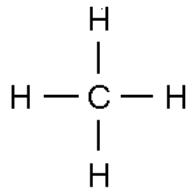
Question	Answer	Marks
1(a)(i)	cell membrane, cytoplasm and nucleus labelled ;;;	**3**
1(a)(ii)	*any two of the following* chloroplasts ; cell wall ; vacuole ;	**max 2**
1(b)(i)	glucose and oxygen ;	**1**
1(b)(ii)	*any two of the following* muscle contraction ; protein synthesis ; cell division ; growth ; 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)	 ;;;	**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)	*fat* butter ; *protein* fish ; *vitamin C* 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)	 1 carbon and four hydrogens ; all correct single bonds ;	**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 × 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)	*producer* grass / blackberries ; *carnivore* hawk / fox ; *herbivore* butterfly / grasshopper / mouse / rabbit ;	**3**
10(c)	fewer, mice / rabbits eaten by hawks ; less competition ; 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**