

Inheritance

Mark Scheme 3

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Inheritance
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 3

CHEMISTRY ONLINE
— TUITION —

Time Allowed: 66 minutes

Score: /55

Percentage: /100

Question		Answers	Marks	Additional Guidance
1	(a)	self-pollination, occurs within same flower / between flowers of same plant ; cross-pollination, occurs between flowers on different plants ;	2	
	(b)	wastage of pollen ; wastage of energy ; explanation ; depends on presence of pollinator ; need a pollinating / other, plant (nearby) ; long time for next generation to develop ; seeds scattered to places where they cannot grow ; variation leads to plants that are not adapted to place where parents grow / seeds end up ;	max 4	A idea of pollen does not reach a stigma
	(c)	round RR wrinkled rr ;	1	

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1	(d)	cross		phenotype of seeds in the seed pods		ratio of round to wrinkled seeds
				round seeds	wrinkled seeds	
		1	pure bred for round seeds x pure bred for wrinkled seeds	✓	✗	1:0
		2	offspring of cross 1 self pollinated	✓	✓	3:1 ;
		3	offspring of cross 1 x pure bred for round seeds	✓	✗	1:0 ;
		4	offspring of cross 1 x pure bred for wrinkled seeds	✓	✓	1:1 ;
				3		
	(e)	controlled by (a) gene alone ; limited number / two, (pheno)types ; no intermediates ;		max 1	A (just) two types / round & wrinkled	
	(f)	1 colonisation / spread to new areas ; 2 where might be able to grow better ; 3 better (named) condition(s) ; 4 less competition ; 5 less (chance of) disease ; 6 <i>idea that</i> allows breeding with wider variety of plants; 7 AVP ;		max 3	light / water / minerals / CO ₂ / space e.g. bigger gene pool / more alleles / e.g. Some survive a localized disaster /	
				[Total: 14]		

Question	E Answers	Marks	Additional Guidance
2	(a) loss of water <u>vapour</u> ; from, leaves / stems / aerial parts / through stomata ;	[2]	accept evaporation accept diffusion through stomata
	(b) water moves from high(er) water potential to low(er) water potential ; by osmosis ; through partially permeable membrane ; ref to protein pores ;	[max 3]	
	(c) <i>feature plus explanation</i> no leaves ; less surface for / reduce, transpiration / loss of water ; swollen / AW, stem ; stores water ; spines ; protect against, herbivores / being eaten ; ridged stem ; allows stem to swell when water available ; upright shape ; reduce surface area for absorption of heat (at mid day)	[2 + 2]	<i>a mark can be awarded if the feature is not linked to an explanation or the explanation is incomplete or incorrect</i> <i>each explanation must be linked to a feature, no mark for an explanation alone</i>

2	(d)	<p><i>allowing to survive</i></p> <p>no / less, water (vapour) lost ; by transpiration / diffusion ; can survive, in dry areas / with shortage of water from the soil / with little rainfall ; open at night when cool without much loss of water ;</p> <p><i>limits growth</i></p> <p>cannot absorb carbon dioxide during the day ; carbon dioxide diffuses through stomata ; needed / raw material, for photosynthesis ; only happens when light available ; therefore little food (for growth) ;</p> <p>transpiration cools plants ; may overheat (during the day) ; ref to denaturation of, proteins / enzymes ; slower, reactions / metabolism / AW ;</p> <p>AVP ;</p>	[max 4]	
			[Total: 13]	

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Question		Answers	Marks	Additional Guidance
3	(a)	(gives) variation / diversity ; R 'varied species' (plural) ref to, alleles / genes / DNA, from different, plants / <i>idea that</i> increased chance for mutations to be expressed ; allows adaptation to, new conditions / changed environment / AW ; allows evolution to occur ; prevents inbreeding ; ref to disease resistance ;	[max 3]	
	(b)	(i) A – ovary / ovary wall ; R pod B – pollen tube ; C – zygote ; D – radicle / embryonic root ; E – cotyledon / seed leaf ;	[5]	accept embryo once only for D or E
		(ii) <u>mitosis</u> ;	[1]	
	(c)	(male / female) gametes are not all identical ; female gametes are not fertilised by identical male nuclei ; gametes are produced by meiosis ; meiosis gives rise to variation ; pollen grains come from different plants ;	[max 2]	

3	(d)	some seeds not, viable / AW ; some remain dormant ; no water available ; no soil ; no minerals / no nutrients ; too cold / too hot ; A extremes of temperature not enough light ; ref to competition with other plants ; eaten by animals ;	[max 3]	
			[Total: 14]	

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4	(a)	(i)	transport of oxygen	[1]	
		(ii)	amino acids	[1]	A polypeptides, haem
		(iii)	iron / Fe / Fe ²⁺	[1]	
	(b)	fewer red blood cells 2 less elastic / less flexible / sickle-shaped, red blood cells 3 haemoglobin is abnormal shape 4 haemoglobin / blood, less efficient at transporting oxygen 5 less respiration 6 less energy / fatigues / exhaustion / less active / feeling faint / breathlessness 7 death of tissues linked to oxygen supply 8 <u>capillaries</u> are blocked 9 pain 10 'sickle cell crisis' 11 slow / poor, growth 12 susceptible to infections 13 reduced life span 14 AVP e.g. problems in pregnancy, kidney disease	[max 3]	Ig ref to malaria	
	(c)	1 malaria is common in Africa 2 people who are, heterozygous / Hb^AHb^S 3 have, sickle cell trait / mild sickle cell 4 protected / AW, against malaria 5 description of sickle cells are less prone to infection 6 Hb^S continues to appear due to selective advantage / AW	[max 3]	Mpt 4 R immune A description of selection	

4	(d)	<p>Hb^A is dominant / Hb^S is recessive / (both) parents are, carriers / heterozygous</p> <p>$\text{Hb}^{\text{A}}\text{Hb}^{\text{S}} \times \text{Hb}^{\text{A}}\text{Hb}^{\text{S}}$</p> <p>$\text{Hb}^{\text{A}}, \text{Hb}^{\text{S}} + \text{Hb}^{\text{A}}, \text{Hb}^{\text{S}}$</p> <p>$(\text{Hb}^{\text{A}}\text{Hb}^{\text{A}}, \text{Hb}^{\text{A}}\text{Hb}^{\text{S}}, \text{Hb}^{\text{A}}\text{Hb}^{\text{S}}) \text{Hb}^{\text{S}}\text{Hb}^{\text{S}}$</p>	[max 3]	<p>Note:</p> <p>Ig incorrect text if genetic diagram is correct</p> <p>ECF for Mpt 2 and 3 in diagram key.</p> <p>Mpt 3 linked to correct derivation in Mpt 2</p> <p><i>do not allow genotypes for parents or children that are single alleles</i></p>
	(e)	<p>1 ref to (ionising) radiation</p> <p>2 causes / increased risk, mutation</p> <p>3 change to DNA / genes</p>	[max 2]	<p>A e.g. of radiation e.g. gamma rays</p>
			[Total: 14]	