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BIOLOGY **9700/23**

Paper 2 AS Level Structured Questions **October/November 2017**

MARK SCHEME

Maximum Mark: 60

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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

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Mark scheme abbreviations

;	separates marking points
/	alternative answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or by extra guidance)
AW	alternative wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
I	ignore

Question	Answer	Marks
1(a)	actual length = image length / magnification **;** **A** A = I / M M = I / A I = A × M or magnification triangle 2.5 (μm) **;;** *for 40 mm **X**–**Y** length* **A** 2.6 (*for 40 / 41 mm*) **A** 2.4 (*for 38 / 39 mm*) *max 1 for* *incorrect or no answer but correct calculation e.g. 40 000 ÷ 16 000* *correct answer but to more than one decimal place* *correct measurement and correct calculation but incorrect conversion*	**3**
1(b)(i)	mitochondrion **; A** mitochondria *max 1 for function* produces / makes / synthesises / provides / AW, ATP **or** releases / provides / supplies, energy **or** aerobic respiration **;** AVP **;** e.g. part of the urea cycle β-oxidation of fat oxidative phosphorylation	**2**
1(b)(ii)	rough endoplasmic reticulum **;** **A** rough ER **I** RER ribosomes are attached **;** *accept mp2 if organelle identified as endoplasmic reticulum / RER*	**2**

Question	Answer	Marks
2(a)	*two from* 1 to generate a high(er) blood pressure (during systole) **;** **A** force **I** withstands / AW, high blood pressure 2 to overcome high(er) resistance (in systemic circuit than in pulmonary circuit) **;** 3 to transport blood a greater distance / greater distance in systemic circuit **;** 4 *ref. to* right ventricle generating low pressure to avoid damaging (capillaries in the) lungs / AW **;**	**2**
2(b)(i)	**F** (inferior / posterior) vena cava **;** **I** superior **G** pulmonary artery **;**	**2**
2(b)(ii)	diastole **;** **I** ventricular / atrial	**1**
2(c)	*five from* 1 wave of excitation / wave of depolarisation / impulses, from, atrioventricular node / AVN **;** 2 pass(es) down Purkyne fibres (to ventricles) **;** **A** Bundle of His 3 (both) ventricles contract / ventricular systole **;** 4 from the base (upwards) / AW **;** 5 blood pressure in ventricles, increases / becomes higher **;** 6 blood pressure in ventricles greater than in atria **;** 7 atrioventricular / AV / tricuspid and bicuspid, valves close **;** 8 blood pressure in ventricles greater than in, artery / aorta / pulmonary artery **;** 9 semi-lunar / pulmonary and aortic, valves open **;** **A** blood flows through 10 blood flows, into arteries / to lungs and rest of the body **;** *at end of description only* 11 atria relaxing / atrial diastole / blood flows into atria **;**	**5**

Question	Answer	Marks
3(a)	(cell) thin / squamous / flat / pavement ; **R** cell wall **I** one cell thick short distance for, diffusion of (named) gases / gas exchange ; **A** diffusion between (air in) alveolus and (blood in) capillary	**2**
3(b)	*two from* phosphate / 'heads', are, polar / hydrophilic **and**, fatty acids / hydrocarbon chains / 'tails', are, non-polar / hydrophobic ; **A** hydrophilic / polar, heads **and** hydrophobic tails tails, face away from fluid *or* water / project into air ; **A** diagram heads form hydrogen bonds with water ; *max 1 if answer is about a bilayer*	**2**
3(c)	*three from* 1 prevention of infections (of, gas exchange system / named part) ; **A** in context of a named disease (TB, pneumonia, influenza) 2 prevent (named) pathogen entering, rest of body / blood ; *3 idea that macrophages* patrol / move around / AW, alveoli / lungs ; 4 (carry out) phagocytosis / endocytosis ; **A** are phagocytes 5 engulf / remove / destroy / kill / digest , pathogens ; 6 macrophages are, antigen presenting cells / APCs ; **A** description of antigen presentation **A** part of the immune system 7 AVP ; e.g. reduce excess surfactants **I** *ref. to* mucus	**3**

Question	Answer	Marks
3(d)(i)	*two from* breakdown / AW, elastin / elastic fibres / elastic tissue **;** makes a pathway, to alveolus / through alveolar wall ***or*** goes through alveolar wall ***or*** to reach, respiratory tract / gas exchange surface / air space **;** to reach, pathogens / site of infection, in alveoli / AW / implied **;**	**2**
3(d)(ii)	*three from* 1 no / less, inhibition of elastase **;** 2 too much / more, elastin / AW, is broken down **;** 3 *ref. to* lack of elastin so, no / less, recoil (during expiration) **;** 4 alveoli, over expand / overstretch / increase in size **;** 5 alveoli burst **;**	**3 max**

Question	Answer	Marks
4(a)(i)	*Plasmodium* , *ovale* / *falciparum* / *malariae* / *vivax* ;	1
4(a)(ii)	*Anopheles* / anopheline ;	1
4(b)	*either* 1 numbers of cases have decreased in, all countries / Africa ***or*** number of deaths have decreased in, all countries / Africa ; 2 cases in Africa as a percentage of all countries decreases and, remains constant / reaches a plateau / (small) fluctuations / down + up + down ; 3 deaths in Africa as a percentage of all countries, remains constant / fluctuates (a little) ;	3
4(c)	*three from* 1 example of control of breeding of, vector / mosquitoes ; e.g. drainage of stagnant water / sterile males / aerial spraying of insecticide / oil on water / fish in water / *ref. to* bacteria 2 example of reduction of contact between vector and humans ; e.g. bed nets (impregnated with insecticide) / insect repellents 3 earlier, identification of cases / treatment of malaria ; 4 use of (new) drugs to, prevent transmission / prevent spread / treat malaria; **A** development of new drugs for malaria 5 better, awareness of / education about, transmission / control methods ; 6 AVP ; e.g. targeting people at risk (e.g. pregnant women / high drug-resistant areas better screening of blood for transfusion **I** *better access to, healthcare / AW, without further qualification*	3

Question	Answer	Marks
4(d)	**A** mosquito for *Anopheles* *four from* 1 no vaccine **;** **A** no effective vaccine 2 any problem in developing a vaccine **;** e.g. *Plasmodium* is eukaryotic / antigens differ in different life stages / intracellular parasite / antigenic concealment / different stages in life cycle 3 drug resistance in *Plasmodium* **;** 4 any example, e.g. chloroquine / artemisinins **;** 5 insecticide resistance in *Anopheles* **;** 6 any example, e.g. DDT / dieldrin / pyrethroids **;** 7 *ref. to* conditions for breeding of *Anopheles* **;** 8 problems with, funding research / AW **;** 9 cost of, drugs / insecticides, to government / health authorities / individuals **;** 10 people with HIV / AIDS are at high(er) risk than others **;** 11 lack of knowledge / lack of education / 'fatalism' / AW **;** 12 inaccessibility of some regions to healthcare **;** 13 infected people not, identified / diagnosed **;** 14 AVP **;** e.g. migration of people with malaria to places without malaria (such as countries where it has been eliminated)	**4**

Question	Answer	Marks
5(a)	*in context of / from a plant* loss of <u>water vapour</u> **;** **I** evaporation unqualified from, the aerial parts / leaves **;**	**2**
5(b)	*description of Fig. 5.1B – accept if correct unit is used only once* *four from* 1 decrease then increases **;** 2 data with units and minus sign(s) in support **;** i.e. decreases to, –1.35 ± 0.01 MPa at 1400 i.e. –0.35 ± 0.01 MPa at 0600 to –0.58 ± 0.01 MPa at 1800 *explanation to max 3* *overall decrease between 0600 and 1400* 3 water is used *or* lost and is not being replaced **;** 4 *idea of* synthesis of (named) solutes increases (so decreasing water potential) **;** *0600 to 0900 / 0915 accept any specific time within these time frames* 5 *idea that* not enough water supplied from, xylem / transpiration stream **;** 6 (because) stomata are closed / only cuticular transpiration occurs **;** *0900 / 0915 to 1400* 7 *idea that there is a* high loss of water (from cell surfaces), by evaporation / because of high rate of transpiration **;** *0900 to 1400* 8 photosynthesis occurring, stomata open (for CO_2), water vapour diffuses out / rate of transpiration increases **;** *1400 to 1800* 9 less photosynthesis as, stomata closing / lower light intensity 10 (named) solutes converted to, starch / sucrose and transported away **;** 11 AVP **;** e.g. *0900 to 1400* water is used in photosynthesis so water potential decreases	**4**

Question	Answer	Marks
5(c)	sunken stomata ***or*** stomata in, grooves / crypts / pits **;** trichomes / hairs **;** rolled / curled, leaves **;** **A** folded **R** coiled	**3**

Question	Answer	Marks
6(a)	EGF binds to receptor(s) on cell **A ; ora** **A** has receptor for, EGF / cell signaling compound **A** EGF does not bind to receptor on **B** *idea of* complementary / specific **; ora** **R** antigen to antibody **I** active site	**2**
6(b)	*accept* ***ora*** *one from* more, proteins / polypeptides, are made **;** proteins are required for growth / to provide (named) protein for DNA synthesis / proteins are required for organelles / AW **;** **A** S phase for DNA synthesis during mitosis DNA is highly condensed **;**	**1**
6(c)	*three from* ATP **;** (activated / free / DNA) nucleotides **;** **R** in context of transcription DNA polymerase **;** (DNA) ligase **;** AVP **;** e.g. topoisomerase / gyrase helicase	**3**
6(d)(i)	centromere **; A** kinetochore *one from* holds / joins / AW, (sister) chromatids together **;** attach to spindle	**2**

Question	Answer	Marks
6(d)(ii)	*max 1 if more than one chromosome shown* *two from* separate chromatids that are identical in shape **;** one arm larger than the other on both separate chromatids **;** V-shaped chromatids with centromeres pointing towards the poles **;**	**2**