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**BIOLOGY****9700/23**

Paper 2 AS Level Structured Questions

**October/November 2017**

MARK SCHEME

Maximum Mark: 60

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**Published**

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**Mark scheme abbreviations**

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

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

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

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

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

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

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



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

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

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

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(d)(ii)	<i>max 1 if more than one chromosome shown</i>  <i>two from</i> 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 ;	<b>2</b>