The circulatory system

Mark Scheme 6

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Transport in mammals
Sub Topic	The circulatory system
Booklet	Theory
Paper Type	Mark Scheme 6

Time Allowed : **40 minutes**

Score : **/ 33**

Percentage : **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 **(a)** communicable / transmissible / contagious / transferable / AW **;**
A passed from one (infected), host / organism / one person, to another
A 'passed on'

caused by, a pathogen / microorganism / *at least* **two** named types of pathogen **;**
A virus, bacterium, fungus, protoctist, worm **;**
R parasite unqualified by two types [max 2]

(b) *Plasmodium, falciparum / ovale / vivax / malariae* **;**
A phonetic spellings for specific name, **A** plasmodium
R if specific name first, [1]

(c) **(i)** (only) female feeds on blood / male does not feed on blood **;**
female requires blood (protein) for (development of) eggs **;**
(only) female carries, pathogen / disease-causing organism / *Plasmodium* / parasite **;**
A (only) female transmits the disease
(only) female is vector **;** ***ora ignore*** female carries, the disease / malaria [max 1]

(ii) anti-coagulant (in saliva) is passed when mosquito, sucks blood / feeds / bites / takes a blood meal **;**
anti-coagulant prevents blood clotting when mosquito, sucks blood / feeds / bites / takes a blood meal **;** [max 1]

(iii) *in marking accept*
Plasmodium / pathogen / causative organism / malarial organism *where parasite is given below*

short time (in blood plasma)
for exposure to cells of the immune system / AW **;**

next stage(s) of life cycle inside cells **;**
A sporozoites into merozoites in liver /
merozoites into schizonts in red blood cells

parasite gains, food / energy, from cells **;**
parasite, reproduces / multiplies, inside (liver / red blood) cells **;**
damage to / bursting of / lysis of / impaired function of, cells **;**

(antimalarial) drugs cannot penetrate (liver / red blood) cells **;**
parasite, concealed / 'hides', from host immune system **;**
A antigen concealment **;**

no symptoms, until parasite leaves cells / while parasite is in cells **;**
idea that people incubating disease are symptomless **;**
A symptomless carriers
idea that treatment unlikely to prevent spread from infected person **;**

AVP **;** *examples*
different stages provide problems with drug / vaccine development
AVP **;** mode of action of potential drugs – block attachment sites on cells
parasite in blood cells allows testing by taking blood samples
further development of any idea given above [max 2]

(d) *if virus / bacterium / disease used instead mark to max 3*
in marking accept
Plasmodium / pathogen / causative organism / malarial organism *where parasite is given below*

distribution described for one mark

either
(mainly in) tropics / between the tropics
or
any **two** named, areas and/or countries, affected **;**
e.g. *areas* (sub-Saharan) Africa, Central America, South America, South Asia, Central Asia, Middle East, Caribbean
e.g. *countries* India, Sri Lanka, China, Vietnam, Cambodia, Brazil, Kenya

discussion to max four

1 (areas where) both parasite, **and**, vector / mosquito / Anopheles, are present **;**
2 Anopheles / mosquito / vector, survives / breeds / lives, in, hot and humid areas / moist tropical areas **; *ora*** **A** standing / stagnant, water

3 parasite, needs to reproduce within the mosquito (at temperatures above 20°C) **;**

4 eradicated in some countries / any e.g. (USA, Italy) **;**

5 ref to LEDCs and, poor / non-existent, control programmes **;**
A poor health facilities / poor drug supplies / AW

6 mosquitoes resistant to, DDT / insecticides / pesticides **;**
7 parasite resistant to, chloroquine / drugs **;**

8 link between human population density and *Anopheles* **;**
e.g. human activity provides (lots of) breeding sites for *Anopheles*
9 occurs where named high risk group(s) exist **;**
e.g. refugees, HIV-positive pregnant women (more likely to pass HIV to unbo children), (young) children
10 (outside tropics) disease spread by, travellers / tourists / migrants / refugees **;**

11 AVP **;**
most cases / over 90% cases, in (sub-Saharan) Africa
not, at high altitude / in deserts
different species of *Plasmodium* differ in geographical distribution / AW
misdiagnosis (so not reported)
changing pattern linked to, global warming / changes in land use / deforestation / irrigation / other relevant named
R references to sickle cell [max 4]

[Total: 11]

2 **(a) (i)** squamous / pavement (epithelial) **;** [1]

(ii) stretch / expand, on inspiration and recoil on expiration **;** **R** contraction

(stretch) to increases, surface area / volume of air, for, diffusion / gas exchange **;**

(recoil) to help, expel air / force air out **;** **A** carbon dioxide
A if destroyed then cannot expel air

prevent alveoli, bursting / breaking / AW **;**

ref. to emphysema if elastic fibres destroyed **;** [max 2]

(b) *award two marks if correct answer (anything in range 336–346)*
allow +/– 1 mm in reading the line (74–76 mm)

75000 μm / 220 μm =
341 **;;**

if answer incorrect, award one mark for correct measurement with unit and division by 220
award one mark if correct answer given to one or more decimal places [2]

(c) *look for two ideas – follow usual rules for marking numbered answer lines*

thin, alveolar wall / epithelial lining / AW **;**
A short diffusion distance (between air in alveolus and blood in capillary)
A squamous cells are thin
R thin, membrane / cell membrane **R** large surface area

surrounded by, capillaries / capillary network **;**
A close contact with, capillaries / blood (vessels / cells)
A many capillaries
A large area of alveolus in contact with, capillaries / blood [2]

(d) ***max 3 if no ref. to diffusion***

(named) gas(es), <u>diffuse</u> down, pressure gradients / concentration gradient / AW **;**
A from high(er) partial pressure to low(er) partial pressure
A high(er) concentration to low(er) concentration
ignore 'along a concentration gradient'

in the answers accept the following AWs
capillaries / haemoglobin for blood
lungs for alveoli
body for tissues

lungs

valid statement linking information in table below – 1 mark for each row

comparison in partial pressure may be 'higher / lower' not both or high and low, but if not then figures have to be given

blood	**ref. to gas**	**blood partial pressure**	**alveolar air partial pressure**	**gas exchange**	
in pulmonary artery / entering alveolar capillaries	pO_2	5.33 / lower	13.87 / higher	into blood from alveolus	;
	pCO_2	6.00 / higher	5.33 / lower	out of blood into alveolus	;

respiring tissue

valid statement linking information in table below – 1 mark for each row

blood	**ref. to gas**	**blood partial pressure**	**tissue partial pressure**	**gas exchange**	
in systemic artery / entering tissue capillaries	pO_2	13.33 / higher	< 5.33 / lower	into tissue from blood	;
	pCO_2	5.33 / lower	> 6.00 / highe	out of tissue into blood	;

[max 4]

R differences between pO_2 and pCO_2 in the same place

[Total: 11]

Question 3

(a)

engulf / remove / breakdown red blood cells ;
haemoglobin broken down ;
into haem and globin ;
iron removed (from haem) ;
remainder passes to liver cells to form bile pigments ;
globin broken down into amino acids ; **4 max**

(b)

forms lipoproteins ;
stores fats ;
synthesises cholesterol ;
forms bile salts from cholesterol ;
converts glucose to fats ;
converts fats to fatty acids and glycerol;
converts fats/glycerol to glucose; **3 max**

(c)
diffuses into sinusoids;
dissolved/in solution ;
in blood/ plasma ;
via hepatic vein ;
via renal artery; **2 max**

(d)
(i)
less glucose / amino acids / fatty acids and glycerol / nutrients/**more** urea; **1**
(ii)
less oxygen / **more** carbon dioxide; **1**

Total : 11