**M1.**          (a)     (i)      oxygen

*do not credit air*

**1**

(ii)     lung(s)

*do not credit blood* ***or*** *nose or windpipe alone but accept as a neutral answer if included with lungs*

**1**

(b)     oxygen

**1**

lactic acid

*both words required*

**1**

**[4]**

**M2.**(a)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Structure** | **Organ** | **Organ system** | **Tissue** |
|  | Stomach |  |  |  |
|  | Cells lining the stomach |  |  |  |
|  | Mouth, oesophagus, stomach, liver, pancreas, small and large intestine |  |  |  |

all 3 correct = 2 marks

2 correct = 1 mark

1 or 0 correct = 0 marks

**2**

(b)     (i)      diffusion

*allow phonetic spelling*

**1**

(ii)     glucose

**1**

(iii)    mitochondria

**1**

**[5]**

**M3.**(a)     LHS – glucose

**1**

RHS – water

*allow H2O / H20*

**1**

(b)     so the earthworms’ body temperature would change to 20°C

**1**

(c)     (i)      56 or 55 or 54

*if incorrect answer given accept 60 - 5 for* ***1*** *mark*

*or 60 – 6 for* ***1*** *mark*

*or 60 – 4 for* ***1*** *mark*

**2**

(ii)     one-tenth of answer to (c)(i) eg 5.5

**1**

(at 10°C / lower temperature):

lower rate of respiration

*allow chemical reactions slower or enzymes less active*

*ignore breathing*

*do not allow anaerobic*

**1**

worms less active / worms release less energy / worms use less energy

**1**

(d)     (i)      anomalous result / not in line with other data / does not fit the pattern

**1**

(ii)     more representative / more reliable / can check ‘repeatability’ / see if get similar values / identify anomalies

*ignore valid / more fair*

*ignore reproducible*

*ignore ‘to remove’ anomalies*

*do not accept more accurate or more precise*

**1**

**[10]**

**M4.**(a)    any **two** from:

***or*** *allow converse for outdoors*

•         constant speed

*•        variable speed*

•        constant effort

*•        variable terrain*

•        constant temperature

*•        traffic conditions*

*•        variable temperature*

*•        wind (resistance)*

*•        rain / snow*

|  |  |
| --- | --- |
|  |  |

*allow pollution only if qualified by effect on body function but ignore pollution unqualified*

*if no other marks obtained allow variable conditions outdoors*

**2**

(b)     Brain

**1**

(c)    (i)      20 800

*correct answer with or without working gains* ***2*** *marks*

*if answer incorrect, allow* ***1*** *mark for use of 1200 and 22 000 only*

**2**

(ii)     oxygen

*apply list principle*

**1**

*do* ***not*** *accept other named substances eg CO2 water*

glucose / sugar

*allow glycogen*

*ignore food / carbohydrate*

**1**

(iii)    respire aerobically

**1**

(iv)    carbon dioxide

**1**

lactic acid

**1**

(d)     increased heart rate

*ignore adrenaline / drugs*

*accept heart beats more but not heart pumps more*

**1**

**[11]**

**M5.**          (a)     respire

**1**

****

**2**

blood

**1**

****

**2**

**[6]**

**M6.**(a)     A = cytoplasm

**1**

B = (cell) membrane

**1**

(b)     in yeast:

*’it’ equals yeast*

makes alcohol / makes CO2 / does not make lactic acid

*do not allow uses / involves alcohol / CO2*

**1**

(c)     (i)      any two from:

*allow amount of yeast*

•        volume of yeast / suspension

•        volume of sugar / solution•        concentration of sugar*amount of sugar = max 1 for sugar*

•        temperature

*(total) volume = 1 mark if no other volume*

*ignore concentration of yeast*

**2**

(ii)     most / more CO2 given off with fructose **or**

*’it’ equals fructose*

faster CO2 production

**or**

faster respiration

*allow faster fermentation*

**1**

*do* ***not*** *allow aerobic respiration*

so (rate of) alcohol production will be greatest / more (with fructose)

**1**

**[7]**

**M7.**          (i)      6 in both spaces

*do not credit if any formula has been altered*

**1**

(ii)      glucose

*allow fructose* ***or*** *dextrose*

**1**

(iii)     mitochondria

*accept organelles*

**1**

**[3]**

**M8.**          (a)     (i)      19 800

*for correct answer ignore working or lack of working*

*165 × 120 but no answer / wrong answer =* ***1*** *mark (ignore extras)*

**2**

(ii)     any **two** from:

•        for respiration

*ignore oxygen debt*

•        energy released

*allow energy produced*

•        prevents anaerobic respiration

•        prevents build-up of lactic acid

**2**

(b)     any **two** from:

•        increased breathing rate(\*)

•        increased depth of breathing **or** deep breathing(\*)

*(\*)more breathing is max* ***1*** *mark*

*ignore increase in heart rate*

*allow heavier breathing*

*do* ***not*** *allow harder breathing*

•        dilation of arteries / vasodilation

*allow blood vessels dilate*

*do* ***not*** *allow veins / capillaries dilate*

•        blood diverted from elsewhere

*ignore name of organ*

**2**

**[6]**

**M9.**          (a)     (i)      points correctly plotted

*all correct gains 2 marks  
2 correct gains 1 mark*

         each part of line correctly drawn (i.e. curve + straight line)

*for 1 mark each part of line*

**4**

(ii)     3 (or according to plotted graph)  
litres per second

*for 1 mark each*

**2**

(b)     lungs  
blood

*for 1 mark each*

**2**

(c)     (i)      *ideas that*

•        energy transferred faster in 100m race

•        carbon dioxide produced faster during 1500m race / more

•        carbon dioxide produced

*for 1 mark each*

**3**

         correct reference to twice / half as fast in either / both cases

*for a further mark*

**1**

(ii)

•        respiration during 100m race (mainly) anaerobic

•        respiration during 1500m race (mainly) aerobic

•        aerobic respiration produced carbon dioxide

•        anaerobic respiration produced / lactic acid

*for 1 mark each*

**1**

**[13]**

**M10.**(a)     anaerobic respiration

*allow phonetic spelling*

**1**

(b)     (i)      4.4

*4.2, 4.3, 4.5 or 4.6 with figures in tolerance (6.7 to 6.9 and 2.3 to 2.5) and correct working gains 2 marks*

*4.2, 4.3, 4.5 or 4.6 with no working shown or correct working with one reading out of tolerance gains 1 mark*

*correct readings from graph in the ranges of 6.7 to 6.9* ***and*** *2.3 to 2.5 but no answer / wrong answer gains 1 mark*

**2**

(ii)     more energy is needed / used / released

*do* ***not*** *allow energy production*

(at 14 km per hour)

*ignore work*

**1**

not enough oxygen (can be taken in / can be supplied to muscles)

*allow reference to oxygen debt*

*do* ***not*** *allow less / no oxygen*

**1**

so more anaerobic respiration (to supply the extra energy) **or** more glucose changed to lactic acid

*allow not enough aerobic respiration*

**1**

**[6]**

**M11.**          (a)     to transfer / provide / give release energy

***or*** *production of ATP / adenosine triphosphate (molecules)*

*accept to give heat*

**1**

(b)     (i)      C6H12O6 + 6O2 → 6CO2 + 6H2O

*accept any other*

*n  :  6n  :  6n  :  6n  ratio*

*do not credit if any other changes have been made*

**1**

(ii)     glucose

*do not credit sugar / sucrose*

**1**

(c)     (i)      any **two** from

large surface

thin (surface)

moist (surface)

(with a good) blood supply

**2**

(ii)     carbon dioxide

*accept water vapour*

*do not credit just water*

**1**

(d)     (i)      anaerobic (respiration)

**1**

(ii)     any **three** from

in mitochondria

glucose decomposes / breaks down / reacts

***or*** *glucose → lactic acid for (2) marks*

to give lactic acid

***or*** *breathing hard*

***or*** *lactic acid → CO2 + water*

causing pain

(leaving an) oxygen debt

(quick) source of energy

(but) less efficient than aerobic respiration

*accept less efficient than with oxygen*

**3**

**[10]**

**M12.**          (i)      the higher the rate of oxygen consumption, the shorter the   
time taken to complete

*for 1 mark*

**1**

(ii)      the faster oxygen is taken into the blood,  
the faster energy can be released in the muscles,  
and the faster the athlete can run

*for 1 mark each*

**3**

**[4]**

**M13.**         (a)      (i)     defence

*accept specific functions of white cells*

**1**

(ii)     forming clot at site of wound

**1**

(iii)    100 ÷ 0.008

*correct answer with or without working gains* ***2*** *marks*

**1**

12 500

*ignore any units*

**1**

(iv)     the size of red blood cell is approximately same size as capillary  
**or**red blood cell is too big

*allow use of numbers*

*do* ***not*** *accept capillaries are narrow*

**1**

therefore there is no room for more than one cell  
**or**only one can fit

**1**

(v)      in lungs oxygen diffuses from the alveoli into the blood

*whole statement required*

**1**

in the red blood cell, oxygen combines with haemoglobin,  
forming oxyhaemoglobin

*whole statement required*

**1**

in tissues oxyhaemoglobin splits up, releasing oxygen,  
which diffuses into the cells

*whole statement required*

**1**

(b)     (i)     (Student **Y**) because she had

the lower resting heart rate

*accept converse for Student* ***X***

**1**

the lower heart rate increase and

**1**

the quicker recovery time

**1**

(ii)     when exercising the rate of aerobic respiration in the muscles is higher

**1**

(the increased heart rate) increases rate of delivery of oxygen to the (respiring) muscles

**1**

and increases rate of delivery of glucose to the (respiring) muscles

**1**

and results in faster removal of carbon dioxide and lactic acid

**1**

**[16]**

**M14.**(a)     (i)      50

**1**

(ii)     4

*accept 3.9 − 4.0*

**1**

(b)     (i)      glucose

**1**

oxygen

**1**

(ii)     to release more energy

**1**

(c)     correct readings from graph:

a = 120

b = 60

*allow 60 - 61*

**1**

calculation correct for candidate’s figures:

e.g. a − b = 60

**1**

level of fitness correct for candidate’s figures:

e.g. very fit

**1**

(d)     any **four** from:

•        higher heart rate (at 16 km / h) (so takes longer to slow to normal)

•        more energy needed

•        not enough O2 supplied / more O2 needed / reference to O2-debt

•        (more) anaerobic respiration

•        (more) lactic acid made / to be broken down / to remove / to oxidise

•        higher blood flow needed to deliver (the required amount of) oxygen.

*‘more’ must be given at least once for full marks*

*do not allow more energy produced*

*allow higher blood flow to remove lactic acid / remove (additional) CO2*

**4**

**[12]**