Answer **all** the questions.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **1.** | Mammals use lungs for gas exchange. The following passage describes how gases are moved in and out of the lungs.  Complete the passage using the most appropriate words or phrases.  When air enters the trachea, mucus secreted by ............................. cells traps dust and microorganisms. Air diffuses through the bronchi and the bronchioles. Smooth muscle in the bronchioles relaxes during the ‘fight or flight’ response. This response is produced by the sympathetic nervous system, which contains neurones that secrete the neurotransmitter ............................. . During inspiration, both the ............................. and external intercostal muscles contract. The internal intercostal muscles only contract when expiration is .......................... .   |  |  | | --- | --- | |  | **[4]** | | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **2.** | Fig. 1.2 The figure represents the volume changes in the lung of a human.  C:\core\files\questions_migrate\1493223196\H020BiologyAH020-022016Jun\img\p4_01a_150.png  **Fig. 1.2**   1. Select the letter, **A** to **H**, that corresponds to each of the following lung volumes.  The first one has been done for you.  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  | | --- | --- | | **Lung volume** | **Letter** | | Inspiratory reserve volume | **A** | | Residual volume |  | | Total lung capacity |  | | Tidal volume |  | | Vital capacity |  | |  |  1. Volume **C** can be measured using an instrument such as a spirometer.  What **breathing** instructions would be given to a person whose volume **C** was being measured?   **[2]** | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **3.** | 1. Name the **two** types of epithelial tissue found in the lungs and airways.   **[2]**   1. The epithelial cells in the lungs are arranged into structures called alveoli.  Explain how the alveoli create a surface for efficient gaseous exchange.  C:\core\files\questions_migrate\1494950615\H021BiologyAF211-01Jun15\img\p1_01a_150.pngIn your answer you should use appropriate technical terms, spelled correctly.   **[5]** | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **4.** | Describe how the components of tobacco smoke can affect the **cardiovascular system** of smokers.  **[7]** | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **5.** | The following spirometer trace shows the results of an experiment. Soda lime was used to extract carbon dioxide from exhaled air.  C:\core\files\questions_migrate\1481388552\H020BiologyAH020-01NewSAM\img\p8_02_150.png  What is the rate of oxygen consumption in the experiment?   1. 1.0 dm3 2. 3.0 dm3 min−1 3. 5.0 dm3 min−1 4. 12 breaths min−1   **[1]** | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **6.** | Adult flies have a very different body structure from that of maggots.   * Flies have complex and well-developed exchange surfaces and transport systems. * Maggots have only a small number of tracheae and a small volume of tracheal fluid.   Suggest why maggots do not need such well-developed exchange surfaces and transport systems.  **[3]** | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **7.** | When walking, the abdomen of caterpillars expands and contracts slowly. Air is taken into the tiny holes along the side of the body.  One of these holes is labelled in Fig. 16.  C:\core\files\questions_migrate\1525389181\H020H420-BiologyA-H420-01-Jun17\img\pg13_001_150.png  **Fig. 16**   1. Name these holes.   **[1]**   1. Fluid is found in the tubes responsible for gaseous exchange in insects.  Name this fluid.   **[1]** | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **8(a).** | **Fig. 1.1** shows a microscopic image of part of a fish gill.  C:\core\files\questions_migrate\1488471454\H020BiologyAH020-02NewSAM\img\p2_01_150.png  Name structure **A**.  **[1]** | | | |  |  | | --- | --- | |  |  | | **(b).** | Explain how **Fig. 1.1** shows that gills are adapted for efficient gas exchange.  **[4]** | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **(c).** | Each gill is supported by a gill arch made of bone. Bone tissue is made of living cells, collagen and an inorganic component.  Explain why bone is described as a tissue and gills are described as organs.  **[3]** | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **9.** | A student planned to carry out a dissection of insect and fish gaseous exchange systems.  The student planned to complete diagrams of the different tissues. They were advised to observe the following guidelines:   * use a sharp pencil * use ruled label lines * include a scale bar.   Suggest **two** further guidelines for the student to follow to ensure they present their diagrams clearly and accurately.  **[2]** | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **10.** | Bony fish and insects have different gas exchange systems. Both can be observed by dissection.  Describe how you would carry out the dissection to display maximum detail of either gas exchange system.  **[2]** | | |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **11.** | The electrical activity of the heart can be monitored using an electrocardiogram (ECG) trace.  **Fig. 16.1** shows the ECG pattern for a single normal heartbeat.  C:\core\files\questions_migrate\adminupload\68012\16.1_150.png  **Fig. 16.2** shows an ECG trace for a person with normal heart rhythm and **Fig. 16.3** shows the trace for a person with tachycardia.  C:\core\files\questions_migrate\adminupload\68012\16.2_150.png  C:\core\files\questions_migrate\adminupload\68012\16.3_150.png   1. Calculate the percentage increase in heart rate for the person with tachycardia compared to the person with normal heart rhythm.  Use the data between points **A** and **B** on **Fig. 16.2** and points **C** and **D** on **Fig. 16.3** for your calculations. Show your working. Give your answer to the nearest whole number.  |  | | --- | | Answer........................................................... % **[4]** |  1. The most obvious feature of tachycardia is an increased heart rate.  Using the information in **Fig. 16.1**, **Fig. 16.2** and **Fig. 16.3**, what are **other** key features of tachycardia?   **[2]** | | |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **12.** | The rhythm and rate at which a human's heart beats can be determined by several factors.  Fig. 5.1 shows electrocardiogram traces (ECGs) from two different individuals, **X** and **Y**.  C:\core\files\questions_migrate\1481911676\H020BiologyAH420-03Practice\img\p16_01_150.png  Draw an ECG trace **on Fig. 5.1** (next to **Z**) to represent a recording from a patient with an ectopic heartbeat.  Show at least three cardiac cycles.   |  | | --- | | **[2]** | | 1. Describe and explain the differences between the two ECGs. **[4]** 2. An individual's cardiac output is calculated using the following equation:   Cardiac output = stroke volume x heart rate  The individual who produced ECG **Y** on Fig. 5.1 had a stroke volume of 80 cm3.  Calculate the cardiac output of the individual responsible for ECG **Y**.  Include appropriate units in your answer. | | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **13.** | **Fig. 16.4** is an ECG trace of a person with an abnormal heart rhythm.  C:\core\files\questions_migrate\adminupload\68012\16.4_150.png  Using the information from **Fig. 16.4**, what conclusions can you draw about the way in which this person's heart is functioning abnormally?  **[3]** | | |
| |  | | --- | |  | |
|  |
| |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **14.** | Fig. 3.3 shows two ECG traces.   * **Trace A** is a normal trace * **Trace B** is from a patient that has been treated with the drug digoxin.   C:\core\files\questions_migrate\1482170650\H020BiologyAH020-02Practice\img\p12_01_150.png   1. Before being given digoxin, the patient's heart rate was 75 beats per minute.  Using **Trace B** in Fig. 3.3, calculate the percentage change in the patient's heart rate after receiving digoxin.  |  | | --- | | Answer ....................% **[3]** |  1. Explain why the answer calculated in part **(i)** may not be an accurate representation of the patient's heart rate **and** suggest how a more accurate answer could be obtained.   **[3]**   1. Digoxin caused the heart rate to change.  Identify **one other** effect of digoxin evident from Fig. 3.3.   **[1]** | | |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **15.** | In the graph below, the top electrocardiogram (ECG) trace shows normal heart activity and the ECG trace below shows abnormal heart activity.  C:\core\files\questions_migrate\1524890305\H020H420-BiologyA-H020-01\img\pg08_001_150.png  What is the heart condition represented by the bottom ECG trace?   |  |  | | --- | --- | | **A** | fibrillation | | **B** | tachycardia | | **C** | ectopic heartbeat | | **D** | bradycardia |  |  |  |  | | --- | --- | --- | | Your answer | C:\core\files\questions_migrate\adminupload\3569\Square_150.png | **[1]** | | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **16.** | The figure shows the oxygen dissociation curves at different carbon dioxide concentrations.  C:\core\files\questions_migrate\1493539155\H020BiologyAH020-012016Jun\img\p22_01a_150.png   1. What name is given to a change in the oxygen dissociation curve due to increasing carbon dioxide concentration?   **[1]**   1. Letter **T** in the figure indicates the partial pressure of oxygen in actively respiring tissues.  Explain why the blood off-loads more oxygen to actively respiring tissues than to resting tissues.   **[2]** | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  |  | | --- | --- | |  |  | | **17.** | The following events occur when carbon dioxide enters an erythrocyte in a capillary.   1. Hydrogencarbonate ions diffuse into the plasma from the erythrocyte. 2. Dissociation of carbonic acid. 3. Carbon dioxide reacts with water forming carbonic acid. 4. Chloride ions diffuse into erythrocyte from plasma.   In which sequence do they occur?  C:\core\files\questions_migrate\1481388552\H020BiologyAH020-01NewSAM\img\p06_02_150.png  Your answer C:\core\files\questions_migrate\1481388552\H020BiologyAH020-01NewSAM\img\p2_01_150.png  **[1]** | | |

**END OF QUESTION paper**

# Mark scheme

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Question** | | | **Answer/Indicative content** | **Marks** | **Guidance** |
| 1 |  |  | goblet ✓ noradrenaline ✓ diaphragm ✓ forced / conscious / active / voluntary ✓ | **4** | **ACCEPT** phonetic spelling throughout **ACCEPT** norepinephrine  **Examiner’s Comments** This question proved to be a good differentiator, with only the most capable candidates scoring 4 marks. The most common errors seen by examiners were Acetylcholine or Adrenaline being used instead of Noradrenaline, and the term occurring/finished/happening being used to explain when internal intercostal muscles are used in expiration. |
|  |  |  | **Total** | **4** |  |
| 2 |  | i | **H   ✔**  **D   ✔**  **F   ✔**  **C   ✔** | 4 | **Mark the first answer in each cell.** If an additional answer is given that is incorrect then = **0 marks**   **IGNORE** correct combinations of letters that correspond to D (e.g. A + F + G + H)   **IGNORE** correct combinations of letters that correspond to C (e.g. A + F + G or B + G)  **Examiner's Comments**  It was good to see so many correct responses for this question. It provided a useful scaffold with letter A provided (to emphasise the direction of the trace) but, nonetheless, the candidates did show a good grasp of the features displayed via the spirometer trace. It was interesting to note that a common error was to select E (the expiratory reserve volume) instead of the correct choice H for the residual volume. Total lung capacity was most frequently correct. Several candidates confused F and C. |
|  |  | ii | 1   breathe in as deeply as possible / AW **✔**     2   (and) then force as much air out as possible **✔** | 2 | **IGNORE** ref to using nose clip If they have the deepest breath out before the deepest breath in, then **max 1** (for correct mp 2)  1   e.g. ‘breathe in as much as possible’   ‘inhale as much as you can’    ‘inhale to maximum’    ‘breathe in all the air that you can’  2.   e.g.‘breathe out as hard as possible’    ‘exhale as much as you can’    ‘exhale to maximum’    ‘breathe out all the air that you can’ **DO NOT CREDIT** *all* of the air pushed out of lungs  **Examiner's Comments**  This question was generally answered really well. It demonstrates the emphasis on practical work and the fact that its assessment is now embedded in the question papers. Those with experience were better equipped to describe the process. However, a large minority struggled to link the ‘as much as possible’ idea to both inhalation and exhalation in terms of quality of expression. Unfortunately, some candidates described breathing out before breathing in and this limited their overall score to 1 mark for this question. |
|  |  |  | **Total** | **6** |  |
| 3 |  | i | columnar / ciliated; squamous / pavement; | 2 | **Mark the first two answers.** **IGNORE** ‘cilia cells’   **Examiner's Comments**  Candidates were asked to name two types of epithelial tissue found in the lungs and airways. The most common responses were ‘squamous’ and ‘ciliated’ and the majority of candidates scored both marks. The most common incorrect response was to write ‘ciliated’ and ‘goblet’. |
|  |  | ii | 1. wall is one cell thick for short(er) **diffusion**, distance / pathway; 2. **squamous**, cells / epithelium , provide short diffusion distance / pathway; 3. **elastic** so, **recoil**/ expel air / helps **ventilation**; 4. create / maintain, **concentration** **gradient** / described; 5. large number (of alveoli) provide large(r) **surface area**; 6. small size (of alveoli) provide large(r) **surface area to volume ratio** ; 7. (cells secrete) surfactant to maintain surface area;   **max 4**  **QWC;** **max1** | 5 max | Mp 1 & 2 the phrase ‘for short(er) diffusion distance’ only needs to be stated once to gain both marks  **IGNORE** ref to rate of diffusion  **ACCEPT** ‘alveolus / epithelium one cell thick’ **DO NOT CREDIT** ‘membrane / cell wall, one cell thick’  **ACCEPT** pavement / thin / flat for squamous **IGNORE** thin wall  **ACCEPT** gas for air **IGNORE** CO2 / O2  **IGNORE** diffusion gradient   Take care not to confuse mp 5 & 6 **DO NOT CREDIT** large in number so large SA:Vol **DO NOT CREDIT** small so provide large surface area  **CREDIT** SA:Vol   **ACCEPT** surfactant to prevent collapse  Any **two** technical terms from the list below used appropriately and spelled correctly :  **concentration gradient**         **squamous** **surface area to volume ratio**       **ventilation** **elastic**      **recoil** **surface area** (note: do not allow as part of ‘surface area to volume ratio’) **diffusion** (note: do not allow as part of ‘diffusion gradient’)   **Examiner's Comments**  Candidates were asked to explain how the alveoli create a surface for efficient gaseous exchange. To award a mark Examiners were looking for the description of a feature accompanied by an explanation of how this feature improves gaseous exchange. For example, ‘alveoli have a wall that is one cell thick’ needed to be combined with ‘to create a short diffusion pathway’ in order to achieve a mark. This question differentiated well as there were good responses from those who really understood the significance of the question and planned their points carefully to gain full credit. However, many responses displayed evidence of rote learning with full descriptions of the features that make a good exchange surface that were not accompanied by an explanation of how this improved exchange. It was clear that many candidates still do not fully understand the concepts of surface area and surface area to volume ratio. Many candidates thought it enough to say ‘Alveoli have a big surface area’ without any mention of the presence of many alveoli. Many candidates simply stated that ‘alveoli have a large surface area to volume ratio’ without mentioning that this is achieved because they are so small. Some candidates simply used the two terms in the same sentence as if they are synonymous. Many candidates wrote detailed descriptions of the capillary network despite the question being specific to alveoli. There is still a widespread belief that gas exchange surfaces must be moist to allow efficient diffusion, with the gases needing to dissolve in water before they can diffuse. Candidates should be aware that gases such as oxygen and carbon dioxide can dissolve in the phospholipid bilayer and diffuse across without first dissolving in water. The mark for use of terms was usually awarded as most candidates referred to ‘surface area’ and ‘diffusion’. However, these terms were occasionally used in the wrong context such as referring to ‘small alveoli have a large surface area’. |
|  |  |  | **Total** | **7** |  |
| 4 |  |  | **N1** nicotine;    **N2** increases stickiness of platelets;  **N3** thrombosis / formation of blood clot; **N4** causes release of adrenaline;  **N5** causes constriction of, arterioles / small arteries;  **N6** reduced, blood flow / oxygen supply, to (named) extremities;     **C7** carbon monoxide / CO;    **C8** combines (permanently) with haemoglobin / forms carboxyhaemoglobin;  **C9** reduced oxygen carrying capacity of blood;     **10** increased, heart rate / blood pressure;  **11** damage to, lining / endothelium, (of blood vessels);  **12** atherosclerosis / atheroma;  **13** coronary heart disease / CHD / heart attack / stroke / myocardial infarction / MI / angina; | 6 max | ***N*** marking points  **N1 DO NOT CREDIT** if any **N** mark is associated with a chemical other than nicotine  **N2 ACCEPT** makes platelets sticky  **N3 ACCEPT** thrombus formation   **N5 IGNORE** narrowing of lumen     ***C*** marking points    **C7 DO NOT CREDIT** if any **C** mark is associated with a chemical other than carbon monoxide  **C8 IGNORE** carbamino   **C9 ACCEPT** reduced amount of oxygen in blood **C9 IGNORE** ‘less oxygenated blood is delivered to tissues’ as this could imply reduced cardiac output  **10 IGNORE** heart must work harder  **11 ACCEPT** epithelium   **12 IGNORE** plaques  **13 IGNORE** conary / chronic / part of heart dying / cardiac arrest / heart failure |
|  |  |  | **QWC - N1 and C7 plus** another **N** mark or **C** mark **and no** discussion of tar | 1 | **DO NOT AWARD** QWC if candidate discusses a lung disease or any non-cardiovascular effects  **DO NOT AWARD** QWC tar is discussed at all  **IGNORE** nicotine is addictive  **IGNORE** ‘tar’ if it appears as a list of chemicals   **Examiner's Comments**  Most candidates were very comfortable with the topic and wrote lengthy answers which often gained 6 of the 7 available marks. Responses that discussed nicotine and carbon monoxide in the context of only the cardiovascular system often got full marks. The QWC mark was frequently not awarded because candidates discussed effects on the respiratory system. |
|  |  |  | **Total** | **7** |  |
| 5 |  |  | B | 1 |  |
|  |  |  | **Total** | **1** |  |
| 6 |  |  | maggots are smaller so have greater surface area to volume ratio (than adult flies) ✓  shorter diffusion distance ✓  idea that maggots less active so lower metabolic demand for O2 ✓  no (hard) exoskeleton so can absorb oxygen by diffusion through, skin / cuticle ✓ | 3 | **ALLOW** ORA throughout  **ALLOW** SA:V ratio |
|  |  |  | **Total** | **3** |  |
| 7 |  | i | spiracle (s) ✔ | **1** | **ALLOW** stigma(ta) **DO NOT ALLOW** stomata  **Examiner’s Comments** The majority of candidates correctly named spiracles for **Q16(b)(i)** and whilst **Q16(b)(ii)** was also generally well-answered there were a number of incorrect responses referring to haemolymph or tissue fluid. |
|  |  | ii | trachea(l) (fluid) ✔ | **1** | **IGNORE** haemolymph **IGNORE** tracheole  **Examiner’s Comments** The majority of candidates correctly named spiracles for **Q16(b)(i)** and whilst **Q16(b)(ii)** was also generally well-answered there were a number of incorrect responses referring to haemolymph or tissue fluid. |
|  |  |  | **Total** | **2** |  |
| 8 | a |  | lamella | 1 | **ALLOW** lamellae. |
|  | b |  | *three from* many / AW, lamellae / structure A, provide large surface area (1) (presence of) secondary lamellae on main lamellae provide large surface area (1) short distance between blood and, water / outside (1) idea that blood maintains diffusion gradient (1) | 4 |  |
|  |  |  | *any of above linked to* faster diffusion (of oxygen, carbon dioxide) (1) |  | **ALLOW** only if linked to another marking point.  **IGNORE** refs to squamous cells as not visible on Fig. 1.1. |
|  | c |  | *three from* tissue has, one / few, types of cell **and** performs, one / few, functions (1)  *idea that* bone has, one / few, types of cell **or** *idea that* bone performs, one / few, functions (1)  organs consist of several tissues (1) | 3 |  |
|  |  |  | gills contain two or more **named** tissues (1) |  | **ALLOW** bone, blood, epithelial, connective. |
|  |  |  | **Total** | **8** |  |
| 9 |  |  | |  |  | | --- | --- | | **1** | large size / at least 50% of available space ✔ |  |  |  | | --- | --- | | **2** | title / heading ✔ |  |  |  | | --- | --- | | **3** | labels outside diagram ✔ |  |  |  | | --- | --- | | **4** | label lines should not cross over others ✔ |  |  |  | | --- | --- | | **5** | continuous lines ✔ |  |  |  | | --- | --- | | **6** | no shading ✔ |  |  |  | | --- | --- | | **7** | use plain paper ✔ |  |  |  | | --- | --- | | **8** | state magnification ✔ |  |  |  | | --- | --- | | **9** | correct proportions ✔ | | **2 max** | ***IGNORE*** numbered lines and mark as prose ***IGNORE*** references to detail of diagram      **ALLOW once only** no, sketching / feathering for **either** mp5 **or** mp6  **Examiner’s Comments** The nine possible mark points for a two mark question meant that the vast majority of candidates were able to achieve at least one mark for **Q16(d)** with over 50% of candidates being credited with both marks. It is pleasing to note that there was a clear indication that practical guidelines had been addressed by centres. |
|  |  |  | **Total** | **2** |  |
| 10 |  |  | removal of operculum (of fish) / move operculum out of the way / cut open exoskeleton (of insect) **✓**  method to, observe / display, gills / tracheae / tracheoles **✓** | **2** | **ACCEPT** any suitable detail of display method e.g. observe structures under water placing a rod / pencil into buccal cavity to display lamellae staining tracheoles with methylene blue  **Examiner’s Comments** Candidates’ responses indicated that few had observed or carried out this practical. Few could correctly name the structures, such as the bony fish operculum or the insect exoskeleton, which needed to be cut through or removed in order to reach the gas exchange systems. Usually only vague descriptions of cutting down the length of the organism were supplied. Very few candidates offered any further detail of how to observe or display the gills or tracheae by flooding with water, lifting relevant parts or the use of appropriate stains. |
|  |  |  | **Total** | **2** |  |
| 11 |  | i | normal rate 78.9 bpm (1)  rate for tachycardia 125 bpm (1)  percentage increase 58 (%) (1)(1) | 4 | **ALLOW** 1.3 bps.   **ALLOW** 2.1 bps.   **ALLOW 2 marks** for percentage increase correctly calculated using candidate's figures for rates and answer given to nearest whole number. **ALLOW 1 mark** for correct working [(125 − 78.9) ÷ 78.9 × 100 or correct use of candidate's figures for rates] **or** a correctly calculated but unrounded answer **DO NOT ALLOW** answers that divide by the rate for tachycardia as a percentage **increase** is asked for. |
|  |  | ii | two from lower (Q)R(S) peak (1) P and T equal in height (1) width of T wave greater (1) | 2 |  |
|  |  |  | **Total** | **6** |  |
| 12 |  |  | three cardiac cycles drawn (1)  second cardiac cycle closer to the first cycle than the third cycle (1)  abnormal QRS in second cycle (e.g. extended peak or lack of T phase) (1) | 2 | e.g. 2 marks for C:\core\files\questions_migrate\1481911676\H020BiologyAH420-03Practice\img\p12_01a_150.png |
|  |  | i |  | 4 | **IGNORE** references to T waves |
|  |  | i | (in X) idea of no defined P phase (1)  atrial fibrillation (1)  idea of rapid or frequent electrical impulses in atria (1)  idea of electrical impulses not only from SAN (1)  idea of smaller gaps between QRS phases (1) **ORA** idea of heart rate set by SAN is faster (1) **ORA** |  | **ALLOW** Y has a defined P phase  **ALLOW** Y does not show atrial fibrillation  **ALLOW** idea of regular bursts of electrical impulses through atria in Y  **ALLOW** electrical impulses only from SAN in Y |
|  |  | ii | 4570 (1)(1)  cm3 min−1 (1) | 3 | **Apply ECF**  **ALLOW** 4571 to 4572  **ALLOW 1 mark for** heart rate of 57.14 (allow 57.0 to 57.2) bpm (4 full cycles in 4.2 seconds) **if no other mark awarded** |
|  |  |  | **Total** | **2** |  |
| 13 |  |  | *three from* no distinct, P curve / atrial depolarisation (1) irregular / weak, atrial contraction (1) insufficient blood forced into ventricles (1) although ventricles contract there is less blood forced from the heart (1) | 3 |  |
|  |  |  | **Total** | **3** |  |
| 14 |  | i | -14 ± 1 % (1) (1) (1) | 3 | **ALLOW** 3 marks for correct answer Max 2 if no negative sign If answer is incorrect award 1 mark for 64.5 ± 1 (bpm) |
|  |  | ii | only one (full) cardiac cycle / heartbeat, shown (1) could be anomalous / atypical (1) idea that measurement of cycle from different points gives different values (1)  mean (of several cycles) would be better (1) | 3 |  |
|  |  | iii | longer T-wave or broader R wave (1) | 1 |  |
|  |  |  | **Total** | **7** |  |
| 15 |  |  | **A ✔** | **1** | **ACCEPT B**  **Examiner’s Comments**  Candidates could reasonably suggest either **A** or **B** as correct answers and both were credited in order to be fair to candidates. |
|  |  |  | **Total** | **1** |  |
| 16 |  | i | Bohr (effect / shift) ✔ | 1 | **Correct spelling only** **ACCEPT** bohr / Bohr's / bohr's  **Examiner's Comments**  The vast majority of candidates answered (and spelled) Bohr effect/shift correctly. |
|  |  | ii | *in actively respiring tissues* 1   more / high levels of, carbon dioxide (produced) **or** high pCO2 ✔  2   lowered affinity of haemoglobin for oxygen✔   3   (CO2 results in) dissociation of carbonic acid / increase of H+, leading to the release of oxygen ✔ 4   more oxygen released at same pO2 / suitable data quote from graph ✔ | max 2 | *If symbols used must be correct e.g. CO2****not*** *CO2*  1   **ACCEPT** ORA for resting tissue     2   **ACCEPT** ‘Hb’ for haemoglobin **ACCEPT** weaker affinity      4   (at, T / 3.2 kPa O2) drops from 40% to 24% saturation / 16% reduction  **Examiner's Comments**  Most candidates described the actively respiring cells’ ‘need’ for oxygen and that it is released because the tissues require it. They also stated that actively respiring tissues have a low partial pressure of oxygen (as they use up oxygen), but failed to make the link to more CO2 being produced. A worrying number of candidates thought that resting tissues did not respire or need any oxygen at all, and some thought that respiring tissues themselves have a higher affinity for oxygen. The more able candidates described the effect of increased carbon dioxide in terms of H+ from carbonic acid causing dissociation of oxygen from haemoglobin. |
|  |  |  | **Total** | **3** |  |
| 17 |  |  | B | 1 |  |
|  |  |  | **Total** | **1** |  |