cardio - respiratory system

PAGE

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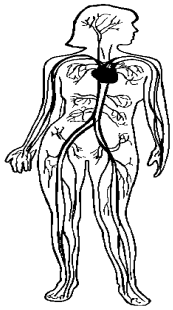


Explain the journey of an oxygen molecule from the environment through to the working muscle of an athlete.

Include in your discussion information about :

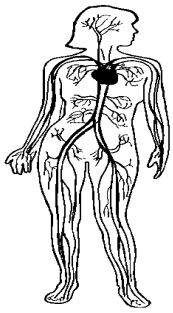
*** the body parts the oxygen molecule travels through or past and the function of each of these body parts.**

*** how the oxygen molecule is transported.**

*** how the oxygen molecule can be exchanged from one structure to another.**

*** any differences between rest and exercise.**

the cardio-respiratory system



Prepare a 300 word written report on:

The benefits of a strong and healthy cardiorespiratory system.
and
Ways of achieving a strong and healthy cardiorespiratory system.

Include discussion of the following in your report:

- the heart

- the blood

- the blood vessels

- blood circulation

- blood pressure

- lung structures

- lung volumes

- mechanics of breathing

- exchange of gases

- VO2 max and aerobic fitness

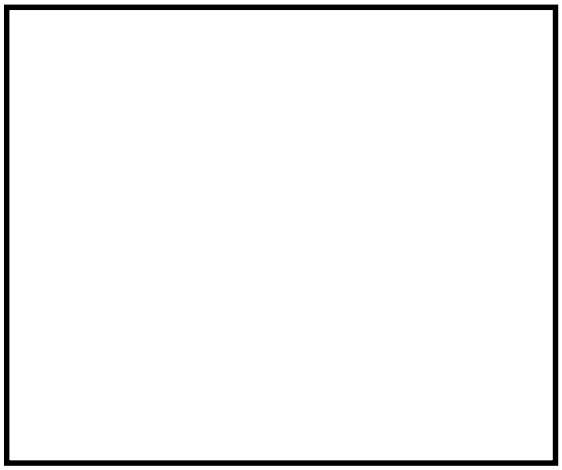
- acute responses to exercise

- the role of exercise in improving strength and efficiency of the cardiorespiratory system

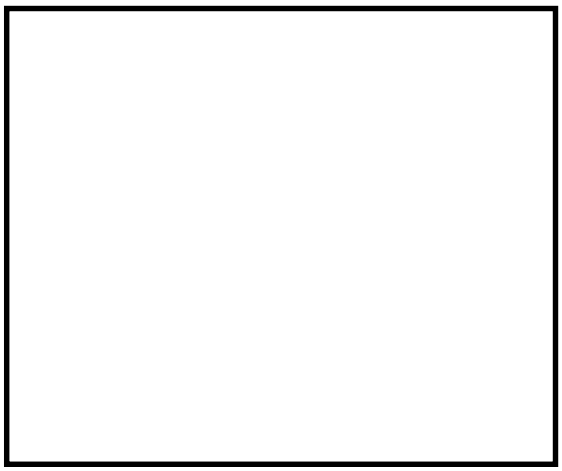
- etc.

the mechanics of breathing

INSPIRATION - **draw a picture of the lungs and diaphragm muscle during inspiration and explain what takes place in order for air to be inhaled.**



EXPIRATION - **draw a picture of the lungs and diaphragm muscle during expiration and explain what takes place in order for air to be exhaled.**



Introduction :

The respiratory system allows the body to deliver oxygen(extracted from the air) into the blood and to the body's cells and it also allows the removal of carbon dioxide to the environment.

Oxygen is critical to the survival of body cells and is of particular importance in the production of energy in *aerobic* activities.

When air is breathed in, it takes the following pathway:

Nose and Mouth, Pharynx, Larynx (voice box), Trachea, Bronchi, Bronchioles, Alveoli.

A strong and healthy respiratory system is important in the performance of physical activity as people with conditions such as *asthma* and *lung disease* will be limited in their exercise capacity.

Aim : **To measure vital capacity and investigate ventilation responses to exercise.**

Equipment : **Exercise bikes** **Stop watches** **Spirometers**

Procedure :

1. **Measure each subject's vital capacity.**

2. **(a) Measure each subject's resting respiratory rate for one minute.**

   (b) Observe changes in respiratory rate and depth (tidal volume) in response to increasing exercise bike intensities:
   - **(i) 2 minutes at 300 kpm / min.**
   - **(ii) 2 minutes at 600 kpm / min.**
   - **(iii) 2 minutes at 900 kpm / min.**

   Measure respiratory rate by taking readings for the last 10 seconds and multiplying this figure by 6.

3. **Comment on changes in depth of breathing (tidal volume) in the spaces provided in the results table.**

Results :

Vital capacity:

Your result	Male average	Female average	Class average	Highest score	Lowest score
				name: score:	name: score:

Ventilation:

Subject	Respiratory rate				Comments on observed changes in depth of breathing
	Rest	300	600	900	
1.					
2.					
3.					
4.					
Averages.					

Discussion :

1. **(a) How did your vital capacity compare to the same sex average and why ?**

   (b) Is there a difference between the average results for males and females and why ?

   (c) Who had the greatest vital capacity in the class and what was the score ?
   Suggest possible reasons for this person having the best vital capacity.

   (d) Who had the smallest vital capacity in the class and what was the score ?
   Suggest possible reasons for this person having the lowest vital capacity.

2. **(a) Graph the changes in respiratory rate from your table of results.**

   (b) Explain the changes that occurred as a result of increasing exercise loads and suggest possible reasons why ?

   (c) Explain the observed changes in tidal volume and suggest possible reasons why ?

Conclusion :

1. **With reference to your results, explain the role of the respiratory system in the performance of physical activity and sport and the acute responses that take place during exercise.**

2. **Outline your suggested approach to improving the strength and efficiency of a person's respiratory system. Justify the methods chosen.**

Introduction :

Maximal oxygen uptake (VO2 max.) is the maximum rate at which oxygen can be consumed per minute, per kilogram of body weight.

*** VO2 max. = Cardiac output X arteriovenous oxygen difference.**

Maximal oxygen uptake is used as the most accurate measure of a person's aerobic power or fitness.

A higher VO2 max. reflects an increased ability of the :

- **heart to pump blood.**
- **lungs to ventilate large volumes of air.**
- **blood to transport oxygen.**
- **muscles to take up oxygen.**

The most accurate tests to measure an individual's VO2 max. are conducted in the laboratory but a number of field tests have been developed for predicting VO2 max. levels.

Aim :

To predict students' maximal oxygen uptake.

Equipment :

- Stop watches - Cones - Tape measure.

Procedure :

Cooper's Twelve Minute Run -

Measure a course by placing cones at ten metre intervals.
Each subject runs as far as they can in twelve minutes.

Record: (i) Distance covered.

(ii) VO2 max. (ml/kg/min) using the table supplied.

	Subject 1	Subject 2	Subject 3	Subject 4
Distance run (metres)				
VO_2 max. (ml/kg/min)				

COOPER'S 12 MINUTE RUN

Distance covered (M)	VO_2 MAX ml / kg / min
1000	13
1100	15
1200	17
1300	19
1400	21
1500	23
1600	25
1700	27
1800	29
1900	31
2000	33
2100	35
2200	37
2300	39
2400	41
2500	43
2600	45
2700	47
2800	49
2900	51
3000	53
3100	55
3200	57
3300	59
3400	61
3500	63
3600	65
3700	67
3800	69

Table based on graph - "Relationship b/w O2 consumption and total distance covered in 12 minute run".
Fox,E.L., Kirby,T.E., Fox,A.R.
Bases of fitness (Macmillan publishing 1987)

Maximal oxygen uptake for selected athletes

MALE

Athletes	VO_2 Max ml/kg/min
Age 16 - 25 Sedentary	47
Age 16 - 25 Active	51
AFL Footballers	54
NBL Basketballers	54.5
State grade squash	60
National league hockey	61
Elite middle distance runner	67
Elite marathon	74
Long course Triathlon	80

FEMALE

Athletes	VO_2 Max ml/kg/min
Age 16 - 25 Sedentary	35
Age 16 - 25 Active	45
Elite hockey player	50
State grade squash	52
Elite Middle distance runner	62

Discussion :

1. **Graph the VO2 max. scores for each subject.**
2. **Did you perform / score as well as you thought you would ? Why / why not ?**
3. **From your general knowledge of each subject, did the expected fittest individuals score the highest VO2 max ? Why / why not ?**
4. **Discuss other factors that could have influenced the scores gained in the test.**
5. **Discuss the advantages and disadvantages of the test.**
   Within the limits of the test situation, do you think it gave an accurate measure of VO2 max. ?

Conclusion :

1. **Which athletes would you expect to have a high maximal oxygen uptake ?**
2. **Based on the results you obtained, which sport / event would each subject be best suited to in terms of aerobic fitness and why ?**
3. **Outline a method which would provide a more accurate measure of VO2 max. Why is this test more accurate ? What are the disadvantages of this test compared to the ones conducted in this lab ?**

heart rate responses to exercise

Introduction:

Heart rate increases in response to exercise as the demand for oxygen to working muscles increases. The rise in heart rate continues to maximal levels, although if the activity is sub-maximal the heart rate will stabilise or reach a steady state. If the intensity of the exercise increases the heart rate will rise to meet the new demands for oxygen.

Aim: **To investigate the heart rate response of individuals to exercise of varying intensities.**

Equipment:

- **Exercise bikes (or running space)**
- **Stop watches**
- **Heart rate monitors (if available)**

Procedure:

- **Record resting heart rates**

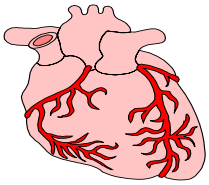
- **Each subject will work at two workloads for a period of six minutes per workload.**
  Workload 1 = 300 kpm / min. (or slow jog)
  Workload 2 = 600 kpm / min. (or stride)

- **Record heart rate for each minute of the activity.**

- **Warm down for 3 minutes. Record heart rates.**

Results: **See table over.**

Discussion:



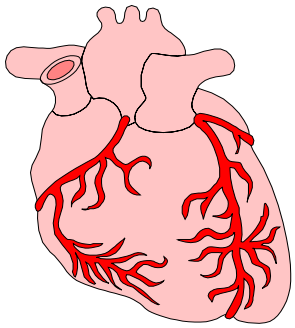
1. **Graph the heart rate responses for each subject and the average.**
2. **Explain why heart rate increases in response to exercise and exercise intensity.**
3. **Describe the predicted changes in stroke volume and cardiac output in response to this exercise. Why would this happen ?**
4. **Did you achieve steady state during the activity? Why / why not ?**
   What indicates that steady state has been achieved and how does steady state influence your ability to continue an activity for a prolonged period ?
5. **What happened to the heart rate during recovery and why ?**

Conclusion:

1. **Based on general activity levels and the types of physical activity each subject participates in, rate each subject's level of aerobic fitness.**
2. **Compare the heart rate responses of the four subjects.**
   Is there a correlation between the perceived fitness of the subjects and their heart rate response to exercise?
3. **Design a three week training program (3 sessions per week) to improve aerobic capacity.**

Results:

	SUBJECT 1	SUBJECT 2	SUBJECT 3	SUBJECT 4	AVERAGE
REST					
WORKLOAD ONE					
1 MIN					
2 MIN					
3 MIN					
4 MIN					
5 MIN					
6 MIN					
WORKLOAD TWO					
7 MIN					
8 MIN					
9 MIN					
10 MIN					
11 MIN					
12 MIN					
RECOVERY					
1 MIN					
2 MIN					
3 MIN					



Introduction :

The circulatory system plays a critical role in the sustaining of life and in the performance of physical activity.

Its major functions include:

- *** Circulating blood around the body.**
- *** Bringing oxygen, water, and nutrients to the cells.**
- *** Taking carbon dioxide and other wastes away from the cells.**
- *** Maintaining body temperature and hydration levels.**
- *** Fighting disease and blood clotting.**

The main components of the circulatory system are the *heart,* the *blood,* and the *blood vessels*.

Heart rate varies as a result of exercise, as too does blood pressure.
Blood pressure is the reason why blood circulates around the body.
Blood will always flow from an area of high pressure to one of low pressure.
***Systolic* blood pressure is the highest and results when blood is pumped into the arteries as the left ventricle contracts.**
***Diastolic* blood pressure is the pressure in the arteries when the left ventricle relaxes and is a lower pressure.**

Aim : **To measure and analyse the acute changes in heart rate and blood pressure as a result of varying exercise intensities.**

Equipment : **Exercise bikes (running track if these are not available).**
Stop watches.
Sphygmomanometers.

Procedure :

1. **Measure each subject's resting heart rate and blood pressure.**

2. **Measure the subjects' HR and BP after one minute of exercise at these loads:**
   (a) 300 kpm / min (b) 600 kpm / min (c) 900 kpm / min

   If bikes are not available then use the following running intensities:
   (a) 400m slow jog (b) 400m half pace / stride (c) 400m sprint

Notes: * The subject should exercise with the blood pressure cuff on the arm so as to minimise delays in the measurement of blood pressures.

*** The subjects should rotate through the exercises in the group so as to allow sufficient rest between exercise bouts.**

*** After intense exercise the diastolic blood pressure may be difficult to ascertain because the sounds may not disappear. In this situation, a change from loud to softer sounds can be taken as the diastolic pressure.**

*** Avoid long delays with the arm cuff pumped up so as to avoid pain and possible blackouts for the subject.**

Results :

Heart rate responses to exercise:

Load	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Average
Rest						
300 kpm / min						
600 kpm / min						
900 kpm / min						

Blood pressure responses to exercise:

Load	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Average
Rest						
300 kpm / min						
600 kpm / min						
900 kpm / min						

Discussion :

1. **Plot a graph demonstrating the changes in heart rate due to increasing exercise intensities.**

2. **On the same graph plot the changes in (a) Systolic blood pressure.**
   (b) Diastolic blood pressure.

3. **Why should the results obtained be treated as estimates only ?**

4. **What does your graph indicate about the changes in heart rate with increasing loads ?**
   Suggest possible reasons for your findings.

5. **What does your graph indicate about the changes in blood pressures with increasing loads ?**
   Suggest possible reasons for your findings.

6. **How can you explain the variations in HR and BP from subject to subject ?**

Conclusion :

1. **With specific reference to your results, discuss the statement that:**
   " The circulatory system play a vital role in the performance of physical activity. "

2. **Outline a three week training program for a person wanting to improve the efficiency of their circulatory system. Pay particular attention to the results of the lab and discuss the types of exercise you feelshould be included in the program and why ?**

the cardio-respiratory system

The cardio-respiratory system is called upon to work hard during physical activity.

It must take in air, extract oxygen, circulate blood quickly to supply oxygen, water and nutrients to the muscle cells as well as take carbon dioxide and wastes away from the cells and breathe out to expel the carbon dioxide.

Participate in an aerobic workout or sport and observe and record your body's acute responses to exercise.

Measure your heart rate, blood pressure, respiratory rate and tidal volume before and immediately after the practical activity.

Introduction :

1. Define the following:

Heart rate: _____

Stroke volume: _____

Cardiac output: _____

_____

Systolic blood pressure: _____

_____

Diastolic blood pressure: _____

_____

Respiratory rate: _____

Tidal Volume: _____

Data :

	Before Exercise	After Exercise
Heart rate		
Blood Pressure		
Respiratory Rate		
Tidal Volume		

Discussion :

1. Describe the acute cardiorespiratory responses to exercise that occurred as a result of this practical activity:

(a) What was the effect of exercise on your heart rate and why ?

_____

_____

_____

_____

(b) What was the effect of exercise on your blood pressure and why ?

_____

_____

_____

_____

(c) What was the effect of exercise on your respiratory rate and why ?

_____

_____

_____

_____

(d) What was the effect of exercise on your tidal volume and why ?

_____

_____

_____

_____

(e) Did you feel yourself getting hotter during the activity and why ?

_____

_____

_____

(f) Did you sweat during the activity and why ?

_____

_____

_____

2. With specific reference to the circulatory system, why is it important to drink fluids during and after exercise ?

3. What are the implications of regular participation in this activity for a person's circulatory system?

4. What are the implications of regular participation in this activity for a person's respiratory system?

circuit training

The purpose of this session is to identify the acute response of the body to exercise and training.

Students are required to participate in the following circuit training session completing two laps of the circuit.
Students are to complete 1 min at each station with a 30 sec rotation time.

Record the number of repetitions at each station, heart rate after every 2 stations and general comments on your body's response to the activities -
eg: breathing rate, breathing depth, body temperature, sweating, fatigue, etc.

Exercise Station	Reps Circuit 1	Reps Circuit 2
1. Shuttle run		
2. Bench jumps		
3. Abdominal curls		
4. Agility run		
5. Push ups		
6. Vertical jumps		
7. Bicep curls		
8. Step ups		
9. Dumbbell flys		
10. Skipping		

STATION	2	4	6	8	10	12	14	16	18	20
HEART RATE										

Comments

Breathing rate :
Breathing depth :
Body Temperature :
Sweating :
Fatigue :
Other :

D i s c u s s i o n :

1. Describe your heart rate responses to the circuit session. Why did this happen ?

2. Refer to your recorded heart rate responses at different times during the circuit training session. Did your body respond consistently ? Did your body respond differently according to the different exercises ? Discuss.

3. What happen to the breathing rates and depths during the circuit and why ?

4. What happen to your body temperature ? Did you sweat ? Why might these changes have occurred ?

5. Refer to your comments on fatigue. Did you tire during the second circuit ? Why or why not ?

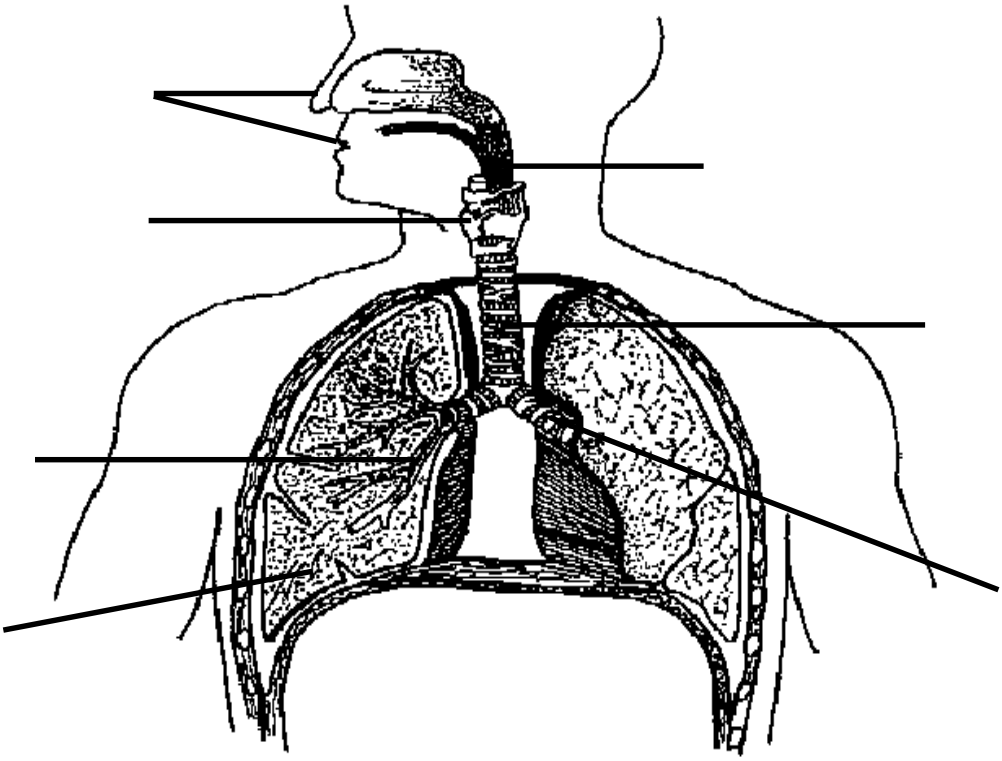
C o n c l u s i o n :

1. How important is the role of the cardio-respiratory system in exercise ? Discuss.

2. In terms of the acute responses to exercise you recorded and observed, what are the advantages of circuit training?

3. What would the long term (or chronic) responses to regular participation in a circuit like this be ?

1. Label the diagram of the respiratory system below:



2. Explain the function of each of the structures identified in question 1.

(a) _____

_____

(b) _____

_____

(c) _____

_____

(d) _____

_____

(e) _____

_____

(f) _____

_____

(g) _____

_____

3. Explain the mechanics of breathing.

_____

_____

_____

_____

4. Define the following lung volumes:

Vital capacity: _____

Tidal volume: _____

Inspiratory reserve volume: _____

Expiratory reserve volume: _____

Residual volume: _____

Total lung capacity: _____

5. Explain how the exchange of gases occurs:

in the lungs: _____

_____

_____

at the muscle: _____

_____

_____

6. Define the term VO2 max.

_____

_____

7. Outline one method of testing VO2 max.

_____

_____

_____

_____

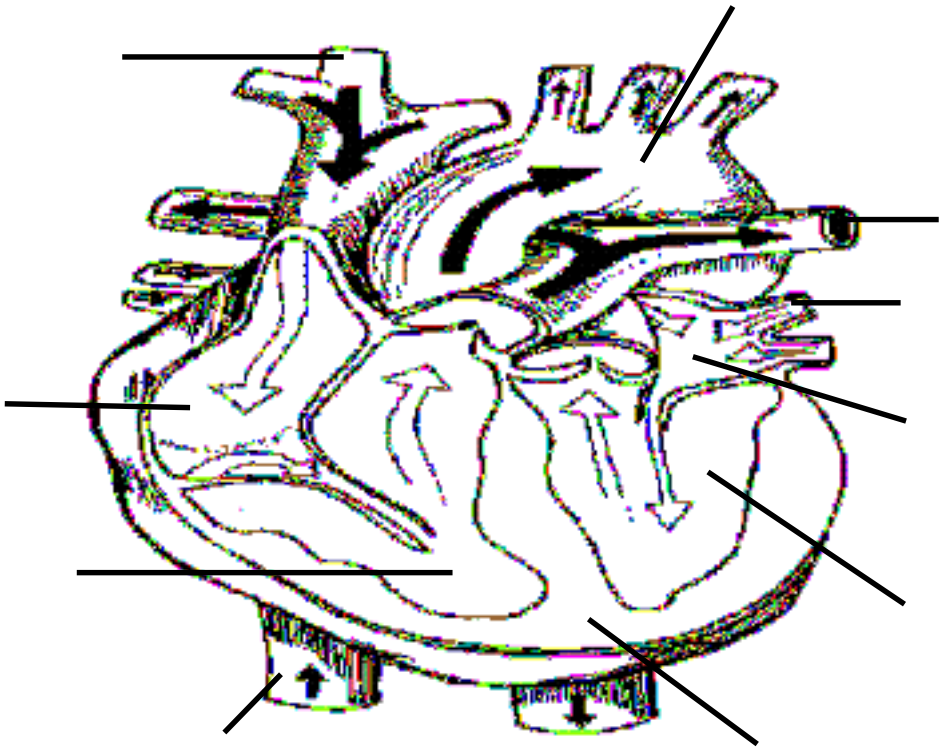
8. How can VO2 max be improved ?

_____

_____

_____

1. Label the diagram of the heart below:



2. List the functions of the circulatory system.

_____

_____

_____

_____

3. Define the following:

Heart rate: _____

Stroke volume: _____

Cardiac output:: _____

Oxygen uptake: _____

_____

Pulmonary circulation: _____

Systemic circulation: _____

4. Apart from exercise, name other factors that affect heart rate.

_____

_____

_____

5. List four components of blood and describe each one's function.

(i) _____

_____

(ii) _____

_____

(iii) _____

_____

(iv) _____

_____

6. List, in order after leaving the heart, the pathway of blood flow around the body.

_____

7. Describe the function of each structure named above in Question 6.

_____

_____

_____

_____

_____

_____

_____

8. Define the following:

Systolic blood pressure: _____

Diastolic blood pressure: _____

9. List the factors that affect blood pressure:

_____

_____

_____

1. Explain the body's short term or acute responses to physical activity :

*** Heart rate**

*** stroke volume**

*** cardiac output**

*** pulmonary circulation**

*** blood flow to the working muscles**

*** blood flow to the heart**

*** blood flow to the organs**

*** oxygen uptake by the working muscles (VO2)**

*** arterio - venous oxygen difference**

*** blood pressure - systolic**
- diastolic

*** respiratory rate**

*** tidal volume**

*** ventilation**

*** lung diffusion**

*** body temperature**

*** sweating**

*** blood plasma level**

2. Explain the reasons for the responses indicated in question 1 above.

Section A - Multiple Choice Questions:

1. The average adult would breathe approximately:
- **A/ 35 times per minute.**
- **B/ 25 times per minute.**
- **C/ 15 times per minute.**
- **D/ 5 times per minute.**

2. The pathway from the environment to the lungs is as follows:
- **A/ pharynx - larynx - trachea - bronchi - bronchioles - alveoli.**
- **B/ trachea - pharynx - bronchi - larynx - bronchioles - alveoli.**
- **C/ alveoli - bronchioles - bronchi - trachea - pharynx - larynx.**
- **D/ larynx - pharynx - trachea - bronchi - bronchioles - alveoli.**

3. The larynx is guarded by a flap of skin called the:
- **A/ cartilagenous ring.**
- **B/ epiglottis.**
- **C/ Adam's apple.**
- **D/ voice box.**

4. The membranes surrounding the lungs are known as the:
- **A/ thorax.**
- **B/ periosteum.**
- **C/ pulmonary membranes.**
- **D/ pleura.**

5. The major muscles used in respiration are the:
- **A/ diaphragm and abdominals.**
- **B/ diaphragm and intercostals.**
- **C/ Abdominals and intercostals.**
- **D/ trapezius and peroneus longus.**

6. During *expiration* the diaphragm:
- **A/ contracts and flattens.**
- **B/ relaxes and flattens.**
- **C/ contracts and becomes dome shape.**
- **D/ relaxes and becomes dome shape.**

7. Ventilation is:
- **A/ the amount of air breathed in one minute.**
- **B/ tidal volume multiplied by respiratory rate.**
- **C/ the amount of air per breath multiplied by the number of breaths per minute.**
- **D/ all of the above.**
- **E/ none of the above.**

8. The volume of air remaining in the lungs after a forced max. expiration is the:
- **A/ expiratory reserve volume.**
- **B/ tidal volume.**
- **C/ residual volume.**
- **D/ vital capacity.**

9. Asthma reduces which lung volume ?
- **A/ vital capacity.**
- **B/ inspiratory reserve volume.**
- **C/ expiratory reserve volume.**
- **D/ tidal volume.**

10. Breathing rate and depth is controlled by the respiratory centre which is located in the:
- **A/ brain.**
- **B/ lungs.**
- **C/ heart.**
- **D/ diaphragm.**

/10

Section B - Shortanswer Questions:

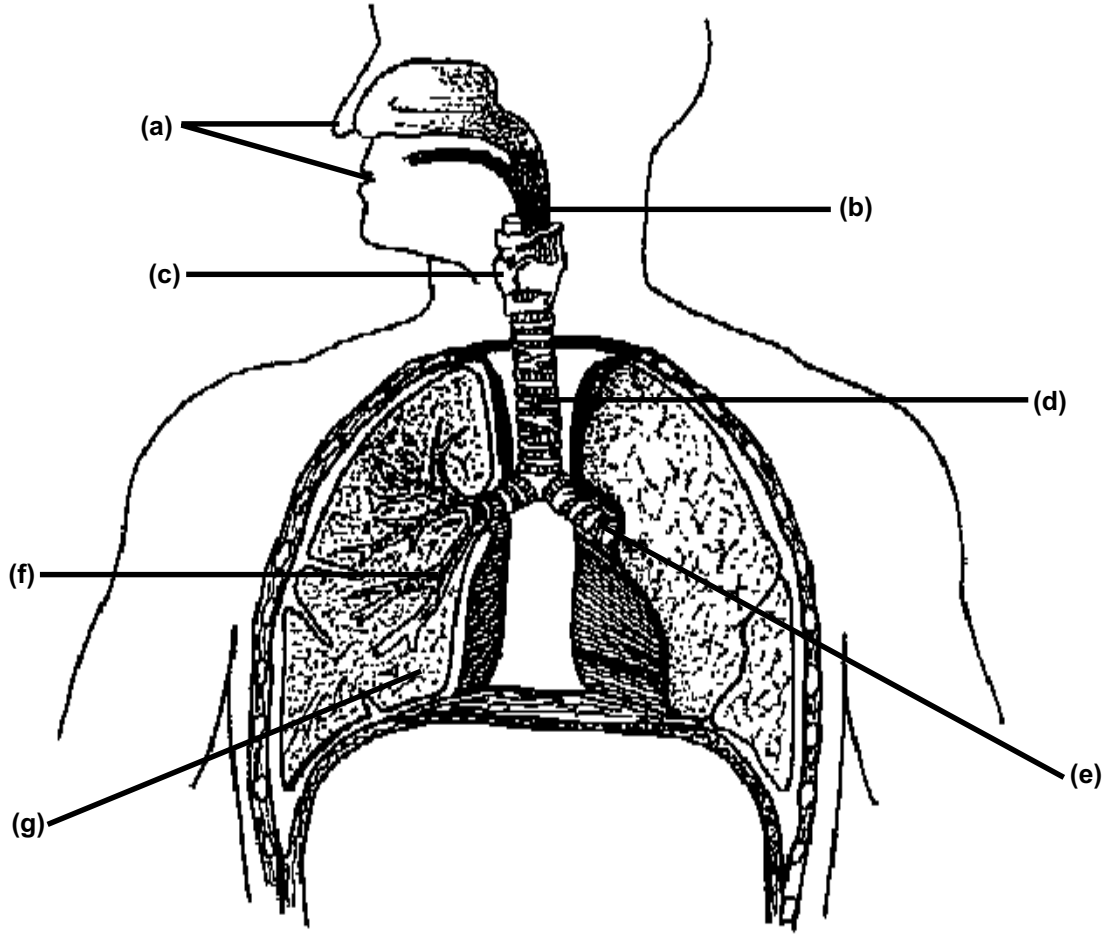
1. What are the primary functions of the respiratory system ?

_____

_____

_____ **/3**

2. Label the diagram of the respiratory system below:



/7

3. The exchange of gases in the lungs takes place between which two structures ?

_____ **/2**

4. How is the exchange of gases in the lungs made possible ?

_____

_____

_____

_____

_____ **/4**

5. Describe how the action of the *diaphragm* muscle assists in breathing.

_____

_____

_____

_____

_____

_____

_____ **/5**

6. Define the following lung capacities.

Vital capacity: _____

Inspiratory reserve volume: _____

_____

Expiratory reserve volume: _____

_____

Tidal volume: _____

Residual volume: _____ **/5**

7. Explain how oxygen is carried in the blood.

_____

_____

_____

_____ **/2**

8. What is the *oxygen cost* of breathing ?

_____

_____

_____

_____ **/2**

MULTIPLE CHOICE = /10 SHORT ANSWER = /30 TOTAL = /40

Multiple Choice Questions:

1. C	**2. A**	**3. B**	**4. D**	**5. B**
6. D	**7. D**	**8. C**	**9. A**	**10. A**

Short Answer Questions:

1. **take in air (oxygen)** **transfer oxygen to bloodstream**
remove carbon-dioxide from blood **breathe out air**
create speech

2. **(a) nose & mouth** **(b) pharynx** **(c) larynx** **(d) trachea**
(e) bronchus **(f) bronchioles** **(g) alveoli**

3. **Alveoli and Capillaries.**

4. **Because of a pressure difference - gases will always want to move (through the thin cell walls) from an area of high pressure to an area of low pressure.**

5. **Inspiration - diaphragm contracts and flattens which increases the volume of the lungs and creates a low pressure. Therefore air moves into the lungs.**

Expiration - diaphragm relaxes and becomes dome shaped which reduces the volume of the lungs and creates a high pressure and the air moves out.

6. **Vital capacity - max amount of air breathed out after max inspiration.**
Inspiratory reserve vol - max vol of air that can be breathed in on top of a normal inspiration
Expiratory reserve vol. - max amount of air breathed out after a normal expiration.
Tidal vol. - volume of air breathed in and out during normal breathing.
Residual vol. - volume of air remaining after a max forced expiration.

7. **Oxygen is carried in combination with haemoglobin in the red blood cells.**

8. **The amount of oxygen used by the breathing muscles (diaphragm & intercostals).**

Section A - Multiple Choice:

1. Blood from the left side of the heart is known as:
- **A/ atrial.**
- **B/ venous.**
- **C/ deoxygenated.**
- **D/ oxygenated.**

2. When the heart contracts it pumps blood into the:
- **A/ arteries.**
- **B/ veins.**
- **C/ capillaries.**
- **D/ arterioles.**

3. The tricuspid valve of the heart separates the:
- **A/ right atria from the right ventricle.**
- **B/ left atria from the left ventricle.**
- **C/ right atria from the left atria.**
- **D/ left ventricle form the right ventricle.**

4. The relaxation phase of the heart beat is known as the:
- **A/ sino-atrial phase.**
- **B/ sinuses.**
- **C/ systole.**
- **D/ diastole.**

5. After leaving the heart the blood will take the following pathway:
- **A/ veins - venules - capillaries - arterioles - arteries.**
- **B/ arterioles - arteries - capillaries - veins - venules.**
- **C/ arteries - veins - capillaries - venules - arterioles.**
- **D/ arteries - arterioles - capillaries - venules - veins.**

6. During a bout of exercise, if the heart rate is 150 bpm. and the stroke volume is 100 ml/min. the cardiac output is:
- **A/ 300 ml/min.**
- **B/ 1500 ml/min.**
- **C/ 15000 ml/min.**
- **D/ 30000 ml/min.**

7. Arterio - venous oxygen difference (a-Vo2 diff) is greatest at:
- **A/ maximal exercise.**
- **B/ sub-maximal exercise.**
- **C/ rest.**
- **D/ none of the above - it remains constant.**

8. In which of the following does blood have the *lowest* concentration of oxygen ?
- **A/ coronary artery**
- **B/ inferior vena cava**
- **C/ pulmonary vein**
- **D/ carotid artery**

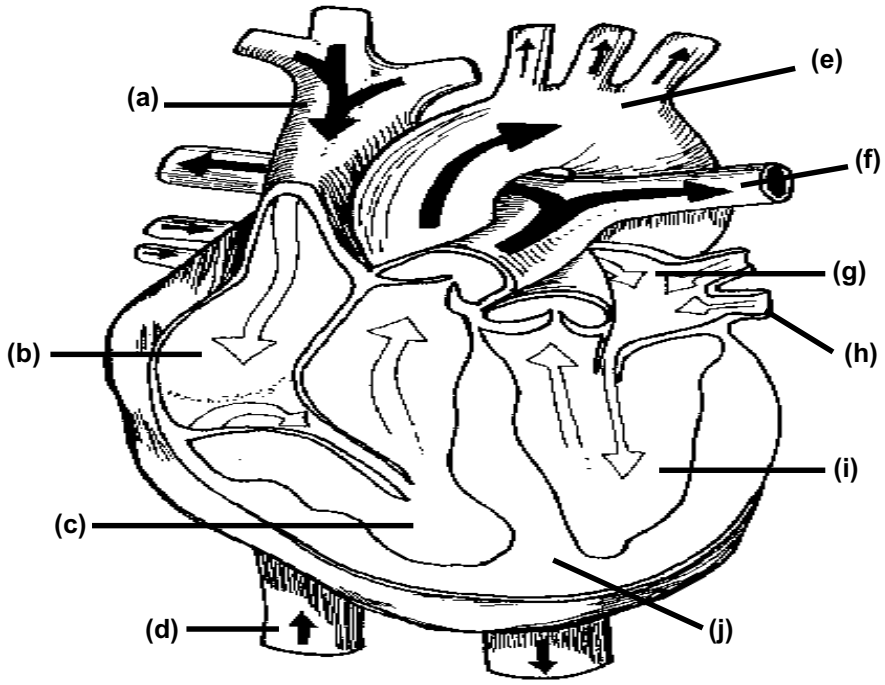
9. The blood cells responsible for blood clotting are the:
- **A/ plasma.**
- **B/ platelets.**
- **C/ red blood cells.**
- **D/ white blood cells.**

10. The resting systolic and diastolic blood pressures for a healthy person at rest are
- **A/ 200 and 100 mm Hg.**
- **B/ 120 and 180 mm Hg**
- **C/ 120 and 80 mm Hg.**
- **D/ 80 and 120 mm Hg.**

/10

Section B - Short answer questions:

1. Label the diagram of the heart below:



/10

2. Explain the function of the heart muscle.

_____

_____

_____ **/2**

3. List four functions of the circulatory system.

(i) _____

(ii) _____

(iii) _____

(iv) _____ **/4**

4. Name the four components of blood and give the function of each.

(i) _____

(ii) _____

(iii) _____

(iv) _____ **/4**

5. What is the function of *haemoglobin* ?

_____ **/2**

6. Describe the function of the following:

Arteries: _____

Capillaries: _____

Veins: _____ **/3**

7. List four factors affecting heart rate.

(i) _____ **(ii)** _____

(iii) _____ **(iv)** _____ **/4**

8. (a) Define *stroke volume*: _____

_____ **/1**

(b) Define *cardiac output*: _____

_____ **/1**

9. Where are the following pulses located ?

Radial: _____

Carotid: _____ **/2**

10. What is the function of the heart valves ?

_____

_____ **/1**

11. (a) What is the function of the *right* side of the heart ?

_____

_____ **/1**

(b) What is the function of the *left* side of the heart ?

_____

_____ **/1**

12. List four factors affecting blood pressure.

(i) _____ **(ii)** _____

(iii) _____ **(iv)** _____ **/4**

MULTIPLE CHOICE = /10 SHORT ANSWER = /40 TOTAL = /50

Multiple Choice Questions:

1. D	**2. A**	**3. A**	**4. D**	**5. D**
6. C	**7. A**	**8. B**	**9. B**	**10. C**

Short Answer Questions:

1. **(a) superior vena cava** **(b) right atrium** **(c) right ventricle** **(d) inferior vena cava**
(e) aorta **(f) pulmonary artery** **(g) left atrium** **(h) pulmonary vein**
(i) left ventricle **(j) cardiac muscle**

2. **- receives oxygenated blood from the lungs**
- pumps blood out to the body
- receives deoxygenated blood from body
- pumps blood back to lungs

3. **circulates blood** **transports oxygen & nutrients to the cells**
takes carbon-dioxide & wastes away from cells **maintains body temperature**
fights disease

4. **Red blood cells - contain haemoglobin which carries oxygen.**
White blood cells - fight infection.
Platelets - allow blood clotting.
Plasma - fluid that carries nutrients, wastes, hormones.

5. **Haemoglobin - carries oxygen to working muscles and vital organs.**

6. **Arteries - carry blood away from heart.**
Capillaries - allow transfer of oxygen and carbon-dioxide.
Veins - bring blood back to heart.

7. **Age, gender, exercise, stress, excitement, body position, etc.**

8. **Stroke vol. - amount of blood pumped from the heart with each beat.**
Cardiac output - SV X HR and is the amount of blood pumped from the heart each minute.

9. **Radial - above wrist on the thumb side with hand supinated.**
Carotid - in neck under the chin.

10. **Heart valves - direct blood flow within the heart.**

11. **Right side of heart - receives blood that is high in carbon-dioxide concentration and pumps it to the lungs.**
Left side of heart - receives blood rich in oxygen from the lungs and pumps it around body.

12. **Age, gender, exercise, excitement, stress, cardiovascular disease.**

1. (a) Explain the relationship between Heart rate, Stroke volume and Cardiac output.

_____

_____ **/2**

(b) Why do they go up in response to physical activity ?

_____

_____

_____

_____ **/3**

2. Explain the changes in blood flow that occur as a result of physical activity and why ?

(a) Pulmonary circulation : _____

_____

_____

(b) to the heart : _____

_____

_____

(c) to the organs : _____

_____

_____ **/6**

3. (a) Define Oxygen Uptake.

_____

_____ **/1**

(b) How is it affected by physical activity and why ?

_____

_____ **/2**

(c) How does this change in oxygen uptake affect arterio-venous oxygen difference ? Explain.

_____

_____

_____

4. Explain the changes in blood pressure during exercise and why ?

(a) SYSTOLIC : _____

_____

(b) DIASTOLIC : _____

_____ **/4**

5.

(a) Define Respiratory rate. _____ **/1**

(b) Define Tidal Volume. _____ **/1**

(c) Define Steady state. _____

_____ **/1**

(d) What happens to respiratory rate and tidal volume at the start of exercise and why ?

_____

_____

_____ **/2**

(e) What happens to respiratory rate and tidal volume after exercise and why ?

_____

_____

_____ **/2**

6. Why do we sweat when we exercise hard ?

_____

_____

_____ **/3**

7. What happens to the blood plasma levels as a result of physical activity and why ?

_____

_____

_____ **/2**

8. Explain the importance of fluid replacement during and after exercise.

_____

_____

_____ **/2**

TOTAL = /35

1. (a) **HR X SV = Q (cardiac output).**

(b) **HR and SV both go up - therefore there is a large increase in Q - this is to supply the working muscles with the oxygen and nutrients they require during exercise.**

2. (a) **Pulmonary circulation - the blood flow between the heart and lungs - is increased during physical activity to bring more oxygenated blood to the heart so that it can be supplied more quickly to the working muscles. It also allows more deoxygenated blood to return to the lungs so carbon-dioxide can be expired.**

(b) **Blood flow to the heart is increased - the heart is now working harder and like every other muscle requires an increase in blood flow and therefore oxygen during physical activity.**

(c) **Blood flow to the organs - is reduced to allow the working muscles priority.**

3. (a) **Oxygen Uptake - VO2 - consumption of oxygen / volume of oxygen used for energy production.**

(b) **VO2 increases during exercise due to the body requiring more oxygen for aerobic energy production.**

(c) **A-VO2 diff. - as more oxygen is taken from the arterial blood there will be less in the blood returning to the heart via the veins - this thereby increases the A-VO2 diff.**

4. (a) **Systolic BP - goes up as more blood is pumped into the aorta at a greater rate due to increases in HR, SV and Q.**

(b) **Diastolic BP - remains fairly constant.**

5. (a) **Respiratory rate - no of breaths per minute.**

(b) **Tidal volume - relates to the depth of breathing ie: volume of each breath.**

(c) **Steady state - is where a constant sub-maximal intensity of exercise is maintained and the body's responses remain constant or "steady".**

(d) **Resp rate and Tidal vol - increase with increasing exercise intensity to supply the extra oxygen to the blood that can then be taken to the heart to be pumped to the working muscles.**

(e) **Resp rate and Tidal volume - remain higher than rest after exercise to help supply the body the oxygen it needs for recovery (oxygen debt). they will gradually return to resting levels.**

6. **Physical activity causes elevations in blood flow and energy production. A by-product of this is heat and the body then sweats. The perspiration on the surface of the body as it evaporates provides a cooling effect.**

7. **Blood plasma levels fall during exercise as a result of the fluid lost by sweating.**

8. **Rehydration during and after exercise is critical in maintaining or restoring lost blood plasma. Water and/or sports drinks will enable fluid levels to remain as close to normal as possible and avoid the effects of dehydration on performance.**