# Online HorseCollege

## Student Workbook

## 3.H.15 Circulatory System

Student Name: ……

Student Number: …….

Email: ……

Phone: ……..

| Other Personal Information |
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**www.OnlineHorseCollege.com**
*(Ausintec Academy P/L ATF Ausintec Academy Trust T/as)*
*Ausintec Academy*

*Mailing Address:-*
*392 Bribie Island Road,*
*CABOOLTURE QLD 4510*
*(between Brisbane & Sunshine Coast)*
*AUSTRALIA*

*Registered Training Organisation No:31352*
*Centrelink Approval No: 4P530*
*CRICOS Provider Code: Pending*

*Phone within Australia (07) 3102 5498*
*Outside Australia + 61 7 3102 5498*
*Request@OnlineHorseCollege.com*

# Contents

# *Circulatory System 3.H.15 Workbook*

Students are to complete Horse Care 3.H.09-12 online assessments prior to attempting Horse Care 3.H.13-16 and to follow all recommended safety considerations.

Practical assessments for Horse Care 3.H.13-16 are as follows:

A) Digestive System

B) Respiration System

C) Circulatory System

D) Injuries of the Musculo-Skeletal System

These assessments incorporate the following unit from the SIS30710 Sport Industry Training Package which include the listed elements

RGRPSH401A Relate anatomical and physiological features to the care and treatment of horses

- Identify basic anatomy and physiology of horses
- Relate anatomy and body systems to the performance of racehorses
- Follow illness and injury management plans

*Further information about this assessment is available at [www.training.gov.au](http://www.training.gov.au)*

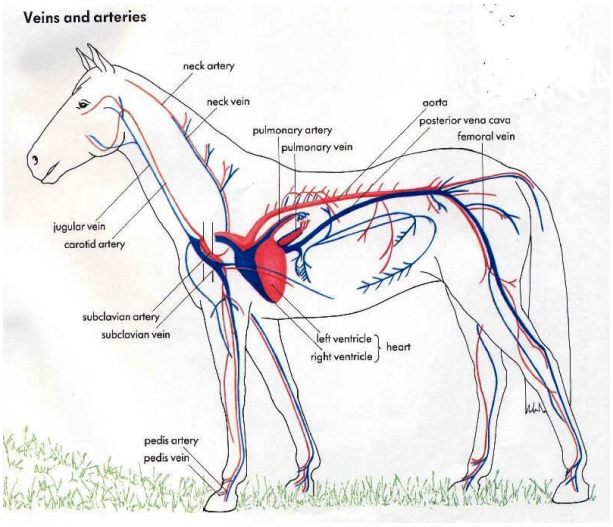
# Circulatory System Introduction

Another important life process is the circulatory system. In this week's reading, an overview of the heart and the process of circulation help to expand your knowledge on the physiology of horses.

# Circulatory System

This system moves blood throughout the body starting at the heart and transports blood cells which contain oxygen, nutrients, gases, hormones, blood cells and waste products around. Blood is propelled through the body by the pumping action of the heart with arteries carrying blood away from the heart and veins bringing the blood back.

Arteries have thick, elastic walls, comprising a muscular component which contracts autonomically (uncontrolled reflex) and determine blood pressure. Arteries divide into smaller arterioles then further into capillaries. It is in the capillaries that the transfer of oxygen, nutrients, hormones, cellular products and waste products takes place.




Veins on the other hand have less muscular component and thinner walls. Blood in the veins flows slower and at low pressure, they also have valves which prevents blood flowing in the wrong direction.

Blood is approximately sixty percent water and is characterised by its red colour which is derived from haemoglobin (iron protein content) of red blood cells. The red colour is brighter in the arteries before the oxygen has been removed then it becomes darker in the veins after removal. Blood is also capable of carrying antibodies to fight infection and makes up ten percent of the total bodyweight of a horse.

Blood has a long way to travel back up the leg, against gravity to get back to the heart. There is a considerable height difference between the hoof and the heart with little muscle tissue in the lower leg to assist in massaging blood back up the leg. To compensate for this horses have a digital cushion in the hoof which compresses and applies pressure to veins to pump blood back up the leg. This works best when the horse bears weight on a hoof which therefore means will work best when the horse is able to move about, for example in a paddock rather than stabled.

# The Heart

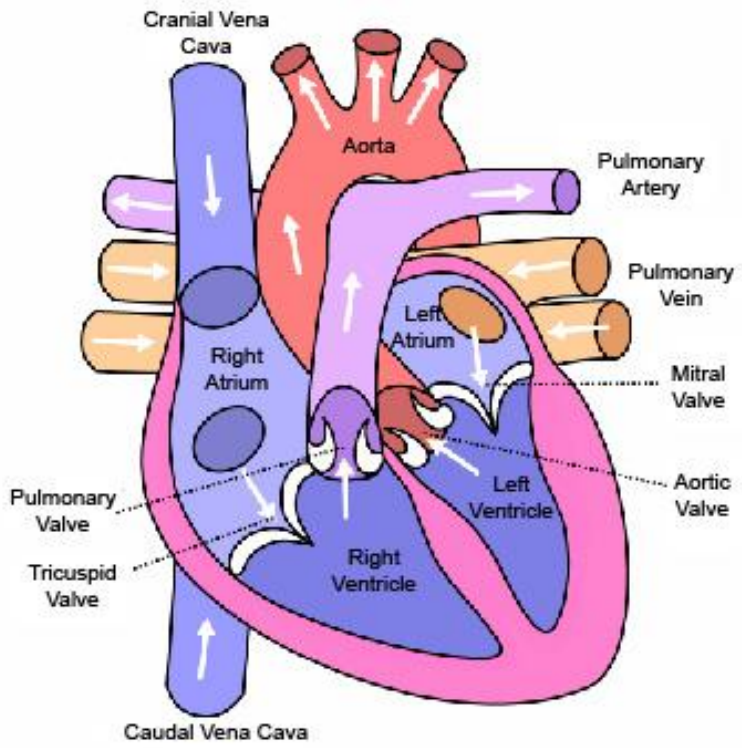
The heart is a muscular organ and consists of four chambers (atriums and ventricles) with outlet and inlet ducts. These chambers are arranged into pairs with the first and second being on the left and a first and second on the right.

The ducts and chambers contain valves to direct the flow of blood. The heart has its own cardiac nerve control mechanism which means it functions with contractions in a predetermined sequence without the aid of voluntary and involuntary (autonomic) nervous systems. The walls of the heart are made up almost entirely of smooth muscle. It is a self contained organ and operates within the law of 'all or none' in that a contraction is always complete.

The resting heart rate of a healthy adult horse ranges between 36 – 42 beats per minute. The rate of a heart beat is fixed by genetics (which is maintained by the cardiac nerve control mechanism) but stimuli received in the brain from other body systems can alter the heart rate to alter the rate of blood flow. There are three main stimuli that can do this:-

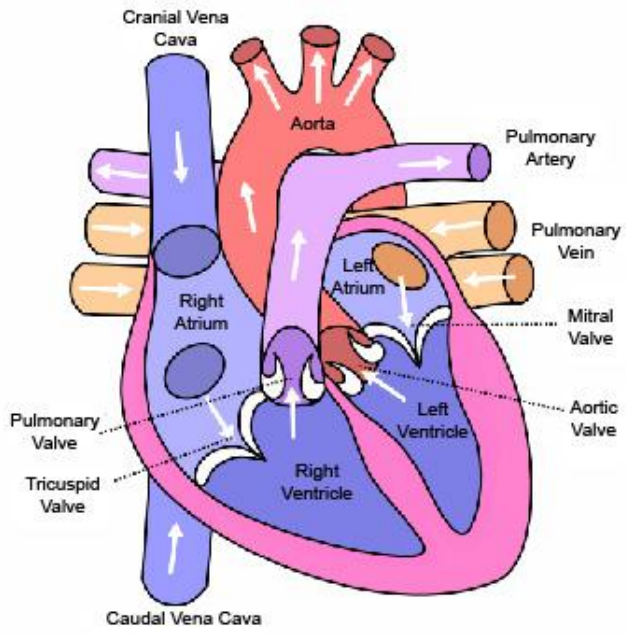
- shock
- high blood pressure
- low blood pressure

It is under these circumstances that the autonomic nervous system can adjust the heart rate to accelerate or decelerate depending upon the information received.



# Circulation of Blood

During circulation blood is pushed by heart contractions into arteries which transport the blood into smaller vessels until it reaches the intended destination such as muscle tissue and organs. Capillaries at the final destination have very thin walls to allow the exchange of substances between tissues.




Using the diagram above as a reference, we will follow a red blood cell on its journey through the heart to get to the body.

- The blood cell enters the heart through the right atrium.
- The walls of this chamber contract which pushes the cell into the Tricuspid valve into the right ventricle.
- Then the right ventricle contracts moving the cell into the pulmonary valve which in turn leads to the pulmonary artery.
- From the pulmonary artery the cell enters the lungs then returns to the heart via one of the pulmonary veins.
- Now the cell enters the left atrium where again the walls contract pushing the cell through the mitral valve.
- The cell is now in the left ventricle where it is pumped into the aortic valve.
- The aortic valve leads to the Aorta which is the main artery in the body.
- The cell is pumped around the body by the heart contractions through capillaries and back into the veins where it will return to the right atrium.

# Extension Lesson

Take your horse's heart rate before, during and after exercise.

Heart rate before exercise: ……..

Heart rate during exercise: ……..

Heart rate after exercise: …….

# Recommended Reading

| Publication:- | Author:- |
| --- | --- |
| Veterinary notes for horse owners | Captain M. Horace Hayes |
| The BHS veterinary manual | P. Stewart Hastie |

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Websites & Images:-

www.irishhorsesociety.com

www.vetgo.com