BTEC Applied science

Summer project

1. Complete the following tasks which are part of your Energy content of fuels topic

i) Describe acid rain and the effect it has on the natural and manmade environment. Explain how the problem has been reduced since the problem was at its peak and what still needs to be done.

https://www3.epa.gov/acidrain/education/site_students/whyharmful.html

https://ypte.org.uk/factsheets/acid-rain/the-effects-of-acid-rain

ii) Particulates from diesel engines are a major health issue in many cities all over the world, but particularly in the heavily-populated big cities of south-east Asia. Read the following article and research the problems of particulates, smog and air pollution. Write a report explaining the causes and describe some solutions to the current problem.

https://www.bbc.co.uk/news/world-asia-india-41925067

https://www.nationalgeographic.org/encyclopedia/smog/

https://en.wikipedia.org/wiki/List_of_most-polluted_cities_by_particulate_matter_concentration

https://www.independent.co.uk/environment/electric-cars-environmental-impact-greenrenewable-energy-explained-a8624351.html

https://www.nationalgeographic.com/environment/energy/reference/renewable-energy/

https://www.theguardian.com/environment/2013/apr/17/why-cant-we-give-up-fossil-fuels

Physiology of the human musculoskeletal system

Next year one of your assignments will be on the musculoskeletal system. Complete these tasks and make notes on each of these areas, <u>including diagrams and website references</u> <u>in your work</u>

1. The skeleton:

a) Produce an A3 size poster of the human skeleton. This can be drawn or a printed **blank** skeleton diagram which you should then label. Include on your poster

- The Latin names of the bones, labelling all major bones and as many others as possible
- b) Types of bones and bone tissue

Complete the labelling sheets for long bones, compact bones and spongy bones.

- Research each of the following and give a diagram, description and explanation of the composition of the bone together with an example of each and where it is found in the body:
 - o long bones
 - o short bones
 - o flat bones
 - o irregular bones
 - o sesamoid bones
- Describe the difference between compact bone and spongy bone

c) The functions of the skeleton and bone tissue

- Describe the functions of the bones and skeleton considering the following areas:
 - o Movement
 - Protection of internal organs
 - Bone marrow and cell production
 - Storage of minerals
 - Hormones and calcium deposition
 - Effect of weight-bearing exercises on compact bone

2. Joints

a) Research the three different types of joint:

- Fibrous
- Cartilaginous
- Synovial
 - Complete the labelling sheet for a synovial joint
 - Research the following types of synovial joints and give examples:
 - Pivot
 - Hinge
 - Saddle
 - Plane
 - condyloid
 - ball-and-socket

- b) Choose one from each of these pairs of joints and find a blank diagram for each
 - either knee joint OR elbow
 - either shoulder joint OR hip
 - Label both diagrams fully
 - include the names of the muscles attached to each part of the joint.
 - Describe the types (eg adduction, flexion, circumduction)and ranges (eg 120°, 360°) of movement possible in a normal healthy example of this joint

3. Muscles

a) Complete the labelling sheets of muscles of the upper and lower limbs, thorax and abdomen

- Research the major muscle groups in the human body
- Produce a labelled diagram of a whole human body showing their location, annotated to show the importance of main muscle groups in normal movement

b) Complete the labelling sheet of muscle tissue

- Find a labelled diagram of a sarcomere from muscle tissue
- Describe how muscles contract
- Compare slow and fast twitch muscle fibres

4. Research the following musculoskeletal conditions and illnesses and how they are treated. For each one describe how normal movement is affected and evaluate the advantages and disadvantages of the treatments available by referring to the side effects or effects on lifestyle

- Rheumatoid arthritis
- Bone cancer
- Shoulder dislocation
- Rickets (vitamin D deficiency)
- Stress fracture
- Hip dysplasia
- Hypermobility

Remember to include diagrams and website references in your work

COMPACT BONE

INTRODUCTION

This is the strongest type of bone tissue. It is dense and contains few spaces, thus offering a high degree of protection and support for the bone to withstand the pressures exerted by weight and movement. This type of bone is found beneath the periosteum of all bones and accounts for the majority of the diaphyses of long bones.

COLOURING NOTES 15.3

- Identify and label the blood vessels within the central canal and perforating canal. Colour them red and blue. Identify and label the circumferential, concentric and interstitial lamella. Colour all of them orange.
- Identify and label the osteocytes. Colour them pink.
- Identify and label the osteon.
- Identify and label the periosteum. Colour it grey.



STRUCTURE OF A LONG BONE

INTRODUCTION

The structure of a bone can be discussed in terms of the parts of a long bone. This is one that is longer in length than width, e.g. the femur (thigh bone). A long bone consists of the following parts: diaphysis, epiphysis, metaphysis, articular cartilage, periosteum, medullary cavity and endosteum.

COLOURING NOTES 15.2 -

- Identify and label the:
 - Epiphysis Diaphysis
 - Nutrient foramen
 - Epiphyseal line.
- Identify and label the blood vessel. Colour it red.
- Identify and label the articular cartilage. Colour it grey. Identify and label the compact bone. Colour it purple. Identify and label the endosteum. Colour it yellow. Identify and label the medullary cavity. Colour it pink. Identify and label the periosteum. Colour it orange. Identify and label the spongy bone. Colour it green.

SPONGY BONE

INTRODUCTION

Spongy bone is always found inside the bone and is protected by a layer of compact bone. It tends to be found in bones that have low levels of stress or where pressures are exerted from a range of directions. The spaces mean that spongy bone is much lighter than compact bone thereby reducing the overall weight of bones, allowing them to move easily when pulled by skeletal muscle.

COLOURING NOTES 15.4

- Identify and label the spaces containing blood vessels and bone marrow.
- Identify and label the trabeculae. Colour them pink.

Identify the articular cartilage and colour it grey. Identify the blood vessel and colour it red. Identify the compact bone and colour it yellow.





COMPONENTS OF SKELETAL MUSCLE

INTRODUCTION

Skeletal muscle is the most abundant of the three types of muscle in the body accounting for approximately 40–50% of a person's total body weight. Skeletal muscle is striated (when looked at under a microscope it appears to have light and dark stripes) and is under voluntary control of the nervous system. It has four key functions: production of body movements, maintaining body position, storage and movement, and generation of heat.

COLOURING NOTES 15.15

- Identify and label the actin and myosin filaments. Colour them blue.
- Identify and label the blood vessels. Colour them red.
- Identify and label the epimysium. Colour it orange.
- Identify and label the fascicle. Colour it yellow.
- Identify and label the fasciculi. Colour them green.
- Identify and label the myofibril. Shade it purple.
- Identify and label the nucleus. Colour it black.
- Identify and label the perimysium. Colour it pink.
- Identify and label the sarcolemma and endomysium.
- Identify and label the sarcomere. Colour it red.
- Identify and label the striations.

SYNOVIAL JOINT

INTRODUCTION

This type of joint is the most common type in the body. A synovial joint has a distinct characteristic in having a space, the synovial cavity, between the ends of the articulating bones. The large range of movement in synovial joints defines them functionally as diarthroses as they are freely movable. Friction at the articulating surfaces is low because the articular cartilage is elastic and the joint is filled with fluid. Synovial joints all have the same characteristics and contain an articular cartilage, an articular capsule and a joint cavity.

COLOURING NOTES 15.14

Identify and label the articular capsule. Colour it blue.

Identify and label the articular cartilage. Colour it grey.
Identify and label the bone. Colour it yellow.

Identify and label the synovial fluid. Colour it green.
Identify and label the synovial membrane. Colour it orange.



MUSCLES OF THE UPPER LIMBS

COLOURING NOTES 15.17

- □ Identify and label the biceps muscle. Colour it green.
- Identify and label the deltoid muscle. Colour it orange. Identify and label the flexor carpi radialis. Colour it
- brown.
- Identify and label the latissimus dorsi. Colour it pink.
- Identify and label the teres major muscle. Colour it purple.
- Identify and label the teres minor muscle. Colour it blue.
- Identify and label the trapezius muscle. Colour it yellow
- Identify and label the triceps muscle. Colour it red.



MUSCLES OF THE LEGS

COLOURING NOTES 15.19

- Identify and label both biceps femori muscle. Colour them purple.
- Identify and label the calcaneus (Achilles) tendon.
- Colour it brown. Identify and label the gastrocnemius muscle. Colour
- it pink. Identify and label the gluteus maximus muscle. Colour
- it red.
- Identify and label the rectus femoris muscle. Colour it orange.
- Identify and label the tibialis anterior muscle. Colour it green.
- Identify and label the vastus lateralis muscle. Colour
 - it yellow. Identify and label the vastus medialis muscle. Colour it blue.



Physiology of the human lymphatic system

Next year one of your assignments will be on the lymphatic system. Complete these tasks and make notes on each of these areas, <u>including diagrams and website references in your</u> <u>work</u>

1. The lymphatic system:

a) Produce an A4 size poster of the human body showing the main organs, structures and glands making up the lymphatic system. This can be either be drawn or a printed **blank** lymphatic system diagram which you should then label.

Include on your poster:

Lymph vessels, Waldeyer's ring, lymph nodes (cervical, sentinel, axillary and supratrochlear, cisterna chyli, abdominal, mesenteric, inguinal, and popliteal), lymphatic ducts, Peyer's patches, valves, thymus, tonsils, lacteals and spleen

- Describe the function of the following:
 - Lymph nodes
 - o Spleen
 - Thymus
 - Lymphatic ducts

b) Lymph and lymph vessels

Complete the labelling sheets for the lymphatic system, lymphoid organs and tissues and lymph vessels.

- Research each of the following and give a diagram, description and explanation of its function in the body
 - o Lymph
 - Lymphocyte
 - Valves in lymphatic vessels
 - o Lacteals
- Compare the function and components of blood and lymph in a table as fully as possible

2. Disorders of the lymphatic system

Research the following lymphatic conditions and illnesses and how they are treated. For each one describe how normal function of the lymphatic system is affected and evaluate the advantages and disadvantages of the treatments available by referring to the side effects or effects on lifestyle

- Lymphadenitis
- Lymphoedema
- Hodgkin's lymphoma
- Lymphatic filariasis

Remember to include labelled diagrams and website references in your work

LYMPH VESSEL

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INTRODUCTION

Lymphatic vessels have a tubular structure similar to that of blood vessels. The lymphatic vessels also have valves to prevent lymph backflow and the smooth muscle in the vessel walls contracts rhythmically to move lymph along. This is assisted by the contraction of adjacent muscles and large arteries.

COLOURING NOTES 12.11 -

- Identify and label the valves. Colour them blue.
- □ Colour the rest of the vessel green.
- Colour the lymph yellow.

Using black, draw an arrow to show the direction of lymph flow through the vessel.

Physiology of the human digestive system

Next year one of your assignments will be on the digestive system. Complete these tasks and make notes on each of these areas, <u>including diagrams and website references in your</u> <u>work</u>

1. The digestive system:

a) Produce an A4 size poster of the human body showing the main organs, structures and glands making up the digestive system. This can be either be drawn or a printed **blank** digestive system diagram which you should then label.

Include on your poster:

Mouth, pharynx, oesophagus, stomach, small intestine (duodenum, ileum, jejeunum), large intestine (caecum and appendix, ascending, transverse, descending and sigmoid colon), rectum, anus, liver, pancreas, gall bladder.

- Describe the role of the following in digestion:
 - o Mouth
 - Oesophagus
 - o Stomach
 - o Small intestine
 - Large intestine
 - Pancreas
 - o Gall bladder
 - o Liver

b) Balanced diets

List the seven components of a healthy diet and the types of food each can be found in. For each one of these components, including two vitamins, find out what symptoms are caused by a deficiency

- Complete the labelling sheets for the digestive tract and the small intestine
- Research the villi in the small intestine and describe how they are adapted for absorption of nutrients

2. Disorders of the digestive system

Research the following disorders of the digestive system and how they are treated. For each one describe how normal function of the digestive system is affected and evaluate the advantages and disadvantages of the treatments available by referring to the side effects or effects on lifestyle

- Stomach ulcers
- Coeliac disease
- Inflammatory bowel diseases (IBD)
- Irritable bowel syndrome (IBS)

Remember to include labelled diagrams and website references in your work

VILLI OF THE SMALL INTESTINE

INTRODUCTION

The small intestinal structure is modified to maximise absorption, with the mucosal wall structured into villi, and microvilli (also known as the brush border), increasing the surface area for absorption and also producing some enzymes. It is at the surface of microvilli that final digestion occurs through the action of brush border enzymes.

COLOURING NOTES 8.8

- Identify and label the intestinal glands.
- Colour the artery red.
- Identify and label the villi. Colour them pink.

Colour the vein blue. Identify and label the lacteal. Colour the lymph vessel and lacteal yellow.



STRUCTURE OF THE DIGESTIVE TRACT

INTRODUCTION

Tubular structures are muscular, enabling them to move contents within and through them, and the digestive tract uses this movement to mechanically digest (i.e. break down into smaller particles) and propel contents along its length.

COLOURING NOTES 8.2

- Identify and label the circular layer. Colour it red.
- Identify and label the epithelium. Colour it pink.
- Identify and label the lamina propria. Colour it purple.
- Identify and label the mesentery. Colour it brown.
- Identify and label the muscularis mucosa. Colour it blue.
- Identify and label the outer longitudinal layer. Colour it green.
- Identify and label the serosa. Colour it orange.
- □ Identify and label the submucosa. Colour it yellow.
- Identify and label the following:
 - o Artery
 - Lymph vessel
 - Vein
 - o Villi.

