Human Biology 3A/B Medical Technology Assignment

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Mark /30

1. An important research programme is under way. It hopes to develop technologies that restore the function of diseased and damaged organs and tissues like bone, cartilage, blood vessels and pancreas. Several scientific disciplines converge in this research: biologists, chemists, nanotechnologists and engineers all work together. The research is directed towards speeding up patient recovery.

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| The hope is to use innovative methods to stimulate the body to generate new tissue by itself, exactly where needed. An example is growing a substantial mass tissue with cells that belong to the patient himself. First, the tissue will grow on a biodegradable material that is placed in the body. This so-called scaffold gradually ‘melts away’ during the healing process. An example of this might be to stimulate the individual's own cells to form bone on a ceramic template at the site of a non-healing fracture.   1. What is this technology called?   **\_\_Tissue regeneration\_\_\_(or tissue engineering)\_\_\_\_**  (1 mark)   1. Give two advantages of this technology?   **NO chance of rejection**  **Quicker recovery time** |

(2 marks)

2. During bypass surgeries, doctors graft veins or arteries from other parts of the patient’s body to replace blocked sections of important arteries, such as the coronary artery. The donor vessels often come from the leg or the wall of the inner chest.

1. What type of tissue grafting is this?

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Autograft**

(1 mark)

1. Give a reason for your choice in question 1.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_The tissue is from the patient’s own body**

(1 mark)

1. What is an advantage of this type of graph?

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ NO chance of rejection and/ or Quicker recovery time**

(1 mark)

3. a. What is meant by Pharmaceutical treatments?

**Chemical substances that are used in the treatment, cure, prevention or diagnosis of disease.**

(1 mark)

b. A man is suffering from a disorder where certain neurons in a part of the brain called the substantia nigra die. Normally, these cells produce dopamine.

What disorder has this man got?

**\_\_\_\_ Parkinson's Disease \_\_\_\_\_\_\_\_\_\_\_\_**

(1 mark)

1. What are the symptoms of this disorder?

\_\_\_\_**Shaking, slow movement, muscle stiffness, stooped posture and impaired speech. One mark for each.**

(2marks)

1. What are the possible pharmaceutical treatments for this disorder?

(2 marks)

**Any two of these:**

**Drugs that contain or mimic the behaviour of dopamine.**

**Drugs that block the effect of Acetylcholine**

**Or drugs that prevent the breakdown of dopamine.**

**Also if the students give the actual name of the drug such as levodopa pay this also.**

4. One group of man-made drugs closely resemble cortisol, a hormone that your adrenal cortex produces naturally .

a. What do we call this group of drugs?

**Corticosteroids**  (1 mark)

1. What disorders can this group of drugs be used to treat?

Any one of the following.

### Anti-inflammatory uses

Inflamed joints and muscles

Allergic reactions

Asthma

Eczema

### The immune system

Autoimmune conditions. Corticosteroids can be used to help treat a range of autoimmune conditions including:

[rheumatoid arthritis](http://www.nhs.uk/conditions/Rheumatoid-arthritis/Pages/Introduction.aspx) – the immune system attacks the joints

[lupus](http://www.nhs.uk/conditions/Lupus/Pages/Introduction.aspx) – the immune system attacks the skin and the joints

[Crohn’s disease](http://www.nhs.uk/conditions/Crohns-disease/Pages/Introduction.aspx) – the immune system attacks the digestive system

[ulcerative colitis](http://www.nhs.uk/conditions/Ulcerative-colitis/Pages/Introduction.aspx) – the immune system attacks the colon

[giant cell arteritis](http://www.nhs.uk/conditions/giant-cell-arteritis/Pages/Introduction.aspx) – the immune system attacks the arteries

[polymyalgia rheumatica](http://www.nhs.uk/conditions/Polymyalgia-rheumatica/Pages/Introduction.aspx) – the immune system attacks the muscles, particularly in the neck and shoulders

[multiple sclerosis](http://www.nhs.uk/conditions/Multiple-sclerosis/Pages/Introduction.aspx) – the immune system attacks the nerves

### Replacement therapy. For example to treat [Addison's disease](http://www.nhs.uk/conditions/Addisons-disease/Pages/Introduction.aspx).

(1 mark)

5. Trini has had a kidney transplant.

a. When would it be appropriate for someone to have an organ transplant?

**When the organ is failing**\_

(1 mark)

b. What type of testing would be given to Trini before the transplant?

**Tissue matching**

**or**

**HLA testing**

**or**

**HLA tissue matching**

(1 mark)

c. Why might immunosuppressant drugs be given to Trini?

\_**to stop her immune system recognising the transplanted tissue as foreign(1) attaching it(1). If the organ is rejected it can fail and the patient can die(1).**

(3 marks)

6. John is 60 years old postman. He is experiencing knee pain due to degeneration of joint cartilage and the underlying bone.

a. What disorder is John suffering from?

\_\_\_\_\_**osteoarthritis**\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(1 mark)

b. What dietary changes could John make to help manage this problem?

**Any two of the following**

**Reduce Kj intake to reduce body mass.**

**Vitamin C, D and E and.**

**Increased Calcium.**

**Glucosamine**

1. marks)
2. If further degeneration of the knee joint occurs, what other options may be available to John to help relieve the pain and lack of mobility caused by this disorder?

**Physiotherapy, pain killing medication, anti-inflammatory medication, joint replacement therapy. One mark each.**

(4 mark)

7. One disease seen in older people is characterized by a build-up of protein [**Plaques**](http://alzheimers.about.com/od/glossary/g/plaques.htm) in the brain. These [**Plaques**](http://alzheimers.about.com/od/glossary/g/plaques.htm) are deposits of the protein [*beta-amyloid*](http://alzheimers.about.com/od/glossary/g/betaamyloid.htm) that accumulate in the spaces between nerve cells Scientists are still studying how plaques are related to the disease. One theory is that they block nerve cells’ ability to communicate with each other, making it difficult for the cells to survive.

a. What disease is this?

\_\_\_\_\_\_\_\_\_\_\_**Alzheimer’s disease**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(1 mark)

b. What are some of its symptoms?

**Memory loss, confusion, mood swings, aggression and withdrawal.**

**One mark for each one.**