End-of-semester worksheet

Instructions for submission

- To identify which question you answer, write ***Q1/1 answer…, Q1/2 answer….,*** **and do not repeat/copy the questions**. This is requested to ensure you do not generate a high similarity score in Turnitin. Note that **if we cannot unambiguously identify the questions your answers address, or you repeat the questions in your answer sheet, we will not mark your submission**.
- To show your understanding of the content, and that you are answering the questions asked (rather than adding all the information you can find about a topic), we strongly suggest that your answers have **a maximum of 250 words** per question. Answers that are excessively long will be marked down as they do not clearly show your understanding of the subject matter. Note that for some questions you can write well under 250 words and still appropriately answer them. Importantly, the quality of your answers does not get better if your answers are too long, state facts irrelevant to the question, or provide an answer to a question you would have liked to see.
- Referencing is not required. Most answers cannot be copy-pasted from your notes, workbook, textbooks, or the internet. In fact, we are deliberately asking questions that make you reflect on and piece together information you have learnt throughout the semester. To get full marks, you will need to clearly **demonstrate that you understood the learning material and are able to apply the acquired knowledge**. When marking, we are looking for connections to be **clearly stated, unambiguously written, and well-reasoned**. We expect high-quality and convincing writing, where the meaning is clear, relevant terminology is used, and which reflects engagement with the unit. Do not be afraid of using dot points wherever you can; simple, concise and clear writing is far superior to a word salad or to several paragraphs without essence.

Hints/feedback from previous semesters

- Take care that your answers have the expected level of depth—it will not be enough, for example, to state that '*drug X decreases blood pressure*'; we expect you to explain the mechanism of and describe the chain of events leading to the desired/known effects.
- In the past some students had just simply replaced certain words in their text they copied from the internet/textbooks. This is **not** paraphrasing but cheating (i.e., plagiarism). In addition, the 'replacement' words tend to alter the meaning and/or may be inappropriate in the context of the answer.
- Any form of academic misconduct (e.g., plagiarism, collusion, or sloppy paraphrasing) will be subject to academic misconduct investigations resulting in mark deductions, cancellation of the assessment task, and/or disciplinary hearings.
- We are particularly keen on seeing **evidence of your critical thinking skills**—i.e., you are supposed to assess all information you obtain from various **reliable** sources (textbooks, lecture material, journal articles). Please be aware that just because Google suggests an answer, it does not mean that it is correct.

Case Study 1 (20 marks total)

Peta is a retired, 65-year-old woman, who has been drinking a couple of alcoholic beverages every night whilst relaxing with her husband. She has also started smoking again, which she has not done since prior to her marriage 40 years ago. In fact, what started as a couple of cigarettes every day has now become a packet a day.

More recently, her friends have noticed that she stumbles quite often, forgets things, is moody, and is flushed in the face almost all the time. When questioned about the amount she drinks, she denies excessive use. She states that while she has 3–4 glasses of vodka every night. However, because she has noticed that she no longer gets the same pleasurable feelings from a couple of glasses as before, she doesn't think the alcohol affects her as much as her friends suggest.

Further, Peta has also lost interest in many things she once enjoyed; dancing, going to the movies, and her art class. She cries at the drop of a hat, finds it difficult falling asleep at night, which led her to drink even more—often until she passes out. She has no energy to get up and just wants to stay in bed all day.

After several unsuccessful attempt, her husband, Ken, finally could convince her to seek professional help about her condition. At the medical clinic, the GP listens to Peta's signs and symptoms, conducts a thorough physical examination, and then prescribes a benzodiazepine (Xanax) and a selective serotonin reuptake inhibitor (Zoloft) for her. Peta is also given information on counselling and is referred to a professional counsellor to talk through her problems and help her with finding adequate coping strategies.

Question 1/1. **Based on the scenario outlined above, identify** two diseases/conditions Peta has and by stating relevant facts from the case study, **justify** your answer. **(3 marks)**

Question 1/2. For one of the diseases/conditions you have identified in Question 1/1, **link** the pathophysiology to the characteristic signs and symptoms of the disease. **(2 marks)**

Question 1/3. For the disease you have selected in Question ½, describe the mechanism of action of the relevant drug Peta is prescribed with and explain how these drug actions help mitigate some of her symptoms. In your answer, relate the drug's mechanism of action to the pathophysiology of the disease. **(3 marks)**

Peta's family was happy with the management plan established by the doctor as Peta was progressing quite well. Unfortunately, however, on a quiet Sunday morning, Peta tripped and fell, which resulted in excruciating pain in her hip. She could not even get up; her husband called the ambulance and tried to comfort her until they arrived. She was taken to hospital, where the X-ray confirmed that she suffered hip fracture. The examination also revealed that although the fracture

had not breached the integrity of the skin, it resulted in numerous fragments of bone at the site of the injury. A bone density test was also completed, which indicated that Peta had a T-score of −2.7.

Question 1/4. **Interpret** the result of the bone density measurement, **indicate** what reading would be considered physiological, and **name** the condition Peta's finding is associated with. **(3 mark)**

Question 1/5. **Describe** the aetiology and pathogenesis of the disease you specified in the previous question. **(5 marks)**

Question 1/6. **Name** the structure where Peta's fracture occurred and—based on the information provided and considering her history—characterize the fracture and **describe** the most likely link between the condition you named under Question 1/4 and her current injury. **(4 marks)**

Case Study 2 (25 marks total)

Rei is a 53-year-old female, who decides to visit her GP as she has been feeling tired a lot. She often feels thirsty and has noticed she needs to urinate more frequently. The GP comments on Rei's skinny appearance and asks if she had any weight changes recently. Rei realises she has been buying smaller sized clothes recently even though she had not experienced rapid changes in weight previously. The doctor examines Rei and notes she has a sweet, fruity odour to her breath. The doctor also orders both urine and blood tests for Rei, which gave the following results:

Assessment/Examination	Results
Urine dipstick test - glucose	+++
Urine dipstick test - ketones	++
Plasma glucose (fasting)	18 mmol/L
Bicarbonate	12.5 mEq/L
Arterial $PaCO_2$	29 mmHg
Blood pH	7.25
Plasma insulin	< 5 mU/L
HbA1c	9%

After diagnosing the condition, her GP helps Rei to develop a management plan.

Question 2/1. **Name** the underlying disease Rei is suffering from and **justify** your answer using two pieces of information from the clinical picture to support your conclusion. **(1.5 marks)**

Question 2/2. **Evaluate Rei's laboratory findings and name** the acute complication Rei was suffering from when she visited her GP and explain your reasoning. **(1.5 marks)**

Question 2/3. **Discuss** the pathophysiology behind the complication. For this answer, ensure you relate to the condition identified earlier. (**4 marks**)

Question 2/4. Possible long-term complications of Rei's present condition are nephropathy and consequent renal failure. **Discuss** the link between Rei's underlying disease and nephropathy. (**3 marks**)

Question 2/5 Discuss the significance of Rei's HbA1c reading. **(2 marks)**

Rei's aunt has been suffering from diabetes mellitus and has been using insulin to manage her condition for 20 years.

Question 2/6. Explain the reasons diabetic patients (may) require exogenous insulin administration and discuss the need for using short- and long-acting preparations. In your answer, explain why administration of insulin tablets would be useless. **(3 marks)**

Rei's aunt has been feeling tired all the time recently despite the successful management of her diabetes. She has also noticed that she has stiff & sore wrists. Intriguingly, the stiffness she experiences in her fingers as well is particularly severe when she goes to have her morning cigarette. She also finds that her fine finger movement when rolling her cigarettes have become much harder. Her GP completes a physical exam and notes that her joints are swollen and warm to touch.

Question 2/7. **Name** the musculoskeletal disorder Rei suffers from, **justify** your answer, and **identify** a risk factor in her history that may have contributed to the aetiology of the disease you specified. **(2 marks)**

Question 2/8. **Compare** and **contrast** the aetiology of Rei's joint disease with the other joint disease we covered in BIOL122. In your answer, **name** both diseases and **describe** two similarities and two differences. **(3 marks)**

Rei's work colleague, Kurt, is a 53-year-old father, who has worked as a gardener all his life. He has been diagnosed with stage IVA melanoma. Kurt underwent removal of the melanoma on his left forearm and a nearby lymph node dissection 7 weeks ago. He has been receiving immunotherapy for his melanoma which has not been successful and therefore he has been placed on chemotherapy. Kurt has been experiencing weight loss over the last 2 months as well as a persistent cough and shortness of breath. A CT scan reveals several, well circumscribed, rounded structures in the periphery of his lungs. A lung biopsy is performed, which confirms the presence of melanoma cells in the structures observed on the CT image.

Question 2/9. Discuss the significance of Kurt's CT and histology findings. **(2 marks)**

Question 2/10 Further laboratory testing has indicated a p53 gene mutation in Kurt's melanoma cells. Explain the possible link between Kurt's p53 mutation and his melanoma, and considering Kurt's profession, name a possible environmental factor that may have caused his mutation. (3 marks)

Case Study 3 (25 marks total)

Twenty-one-year-old Shane has long been suffering from asthma and is now experiencing an asthma attack while taking an afternoon walk with his sister. It is a cold, windy, early spring weekend. She complains of acute shortness of breath and has audible wheezing, episodic cough, and chest tightness with itchy red watery eyes and a stuffy, runny, itchy nose. These symptoms become worse within 5 minutes. Her sister called 000, and paramedics promptly attended to Shane, who was fully conscious, appeared wide-eyed and frightened, and unable to breathe effectively. She was immediately transferred to the nearest hospital for full respiratory function assessment and treatment of acute asthma.

A physical exam reveals a heart rate (HR) of 120/min and a respiratory rate (RR) of 38/min with signs of accessory muscle use. Chest auscultation reveals decreased breath sounds bilaterally, with inspiratory and expiratory wheezes. Shane is coughing up small amounts of sputum and has an arterial oxygen saturation of 90%.

Nebulised salbutamol, oxygen by facial mask, and systemic corticosteroid were administered. A second small-volume nebuliser treatment was ordered 20 minutes later. Chest auscultation revealed diminished wheezes; RR was 24/min at this time, and HR was 102/min. Over the next 24 hours Shane showed steady improvement and was discharged for follow-up with her local GP to review her asthma action plan and change any medications as needed to help prevent future exacerbations.

Question 3/1. Choose two risk factors from the case study above and explain how they may have contributed to the pathogenesis of Shane's current acute asthma attack. In your answer, discuss the role of histamine in Shane's present condition. **(8 marks)**

Question 3/2. **Explain** the mechanisms of action of salbutamol in the treatment of acute asthma and **describe** its benefit in Shane's condition. (**4 marks**)

Question 3/3 Discuss the link between Shanes elevated HR and RR and her acute asthma attack. **(3 marks)**

Shane's grandmother, Maria, is a 67-year-old retired, clinically obese woman, who lives with her life partner, Robin. She enjoys sitting down to a movie every night with a large packet of salt and vinegar chips or a tub of cookies and cream ice cream. She has always loved a glass or two of wine with dinner but now figures she can have a few more since she no longer has to get up for work. Maria doesn't like to exercise; her only form of exercise is walking around Coles on Friday whilst doing her weekly shopping. Her sister has asked her to join her walking group on numerous occasions, but Maria would rather stay home and bake. Maria's mother moved in with her many years ago when her father passed away from a heart attack at the age of 60. Her mother isn't in the best of health: she has type II diabetes and hypertension, which are under control.

One day Maria decides to visit her neighbour, taking with her a batch of freshly baked cookies. Whilst walking to her neighbour's house, she notices that she is short of breath and is feeling a slight pain in her chest, but when she sits down, she feels fine, so she dismisses it once again, putting it down to her poor fitness. However, on her way home she begins to feel light-headed and weak and feels like she is going to be sick. She notices that she has been feeling like this quite a lot lately, even when resting in the evening, so she decides to make an appointment with her GP for later in the week.

At the medical clinic, the GP takes Maria's blood pressure reading. It has been elevated on a number of occasions, and today is no different—the reading shows 140/95 mmHg. The GP prescribes an ACE inhibitor and tells Maria she really needs to make some lifestyle changes. He writes a referral for her to see a cardiovascular specialist for an ECG and a coronary angiogram to determine why Maria has been short of breath and unwell.

One day, whilst waiting for her results, Maria starts to feel more nauseous and dizzier than usual. She starts to feel clammy and sweaty, and her face seems grey in colour. The chest pain returns but now feels like a crushing pain, and she can't breathe. Robin dials 000, and she is rushed to hospital. An ECG shows that Maria has an ST elevation, and a blood test indicates that she has high levels of cardiac-specific troponin in her blood. Maria is given heparin intravenously as well as an anti-platelet and a fibrinolytic drug. She is taken into surgery, where a coronary angioplasty is performed.

Question 3/4 **Name** the condition Maria was suffering from when she was rushed to hospital and **discuss** <u>two</u> clinical findings that support your suggestion. **(3 marks)**

Question 3/5. **Explain** the expected benefits of a fibrinolytic drug in the above case study by referring to its pharmacodynamics and pharmacological effects. (**4 marks**)

Maria has recovered and in addition to the ACE inhibitor has been placed on a diuretic.

Question 3/6. Based on what you learnt about pharmacodynamics in BIOL122and considering the drugs that Maria is currently prescribed in BIOL122, **explain** why care is needed if Maria is planning on taking aspirin **(3 marks)**

END OF WORKSHEET