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CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

15 JANUARY 2021 (a.m.)



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SUBJECT HUMAN AND SOCIAL BIOLOGY – Paper 02

PROFICIENCY GENERAL

REGISTRATION NUMBER

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SCHOOL/CENTRE NUMBER

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NAME OF SCHOOL/CENTRE

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CANDIDATE'S FULL NAME (FIRST, MIDDLE, LAST)

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DATE OF BIRTH

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FORM TP 2021014



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JANUARY 2021

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

HUMAN AND SOCIAL BIOLOGY

Paper 02 – General Proficiency

2 hours

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in TWO sections.
2. Answer ALL questions.
3. Do NOT write in the margins.
4. Write your answers in the spaces provided in this booklet.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

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01253020/J/CSEC 2021



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SECTION A

Answer ALL questions.

1. (a) Figure 1 and Figure 2 show two processes, A and B, occurring in the lungs during respiration.

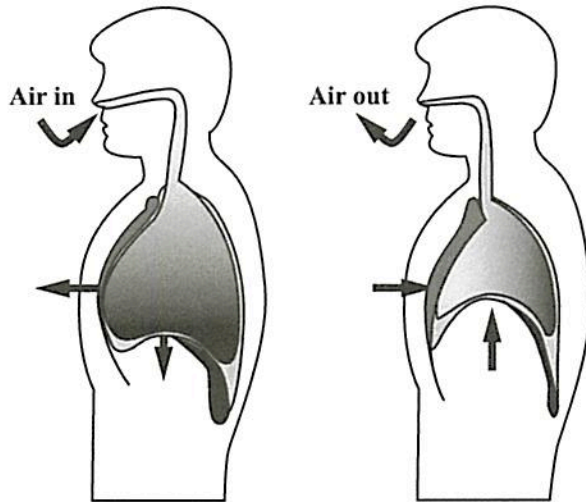


Figure 1. Process A

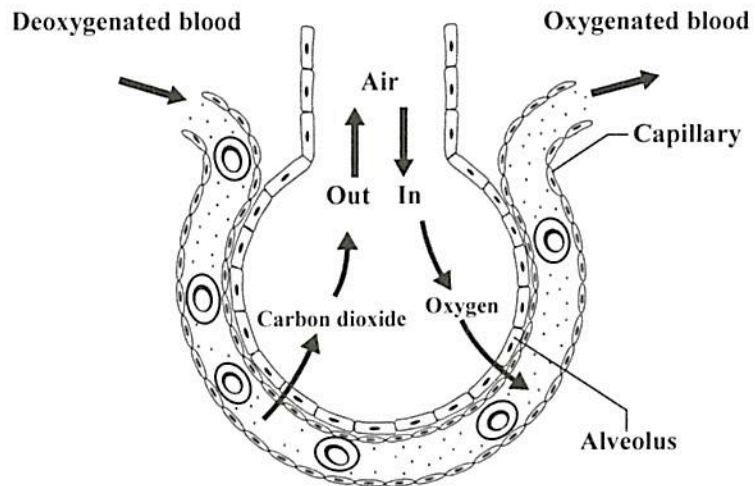


Figure 2. Process B

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(i) Identify EACH process shown in Figure 1 and Figure 2.

Process A

Process B

(2 marks)

(ii) State TWO characteristics of the alveolus and capillary walls which make them suitable for carrying out Process B shown in Figure 2.

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(2 marks)

(b) Figure 3 shows a diagram of the ATP/ADP cycle.

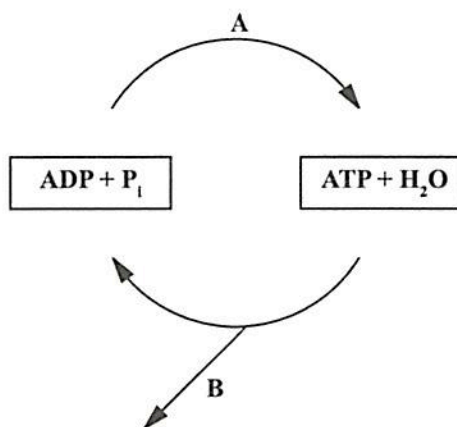


Figure 3. ATP/ADP cycle

State what happens to the energy at Point A and Point B in Figure 3.

Point A

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Point B

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(2 marks)

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- (c) Figure 4 shows a graph of the oxygen uptake before, during and after a period of strenuous exercise.

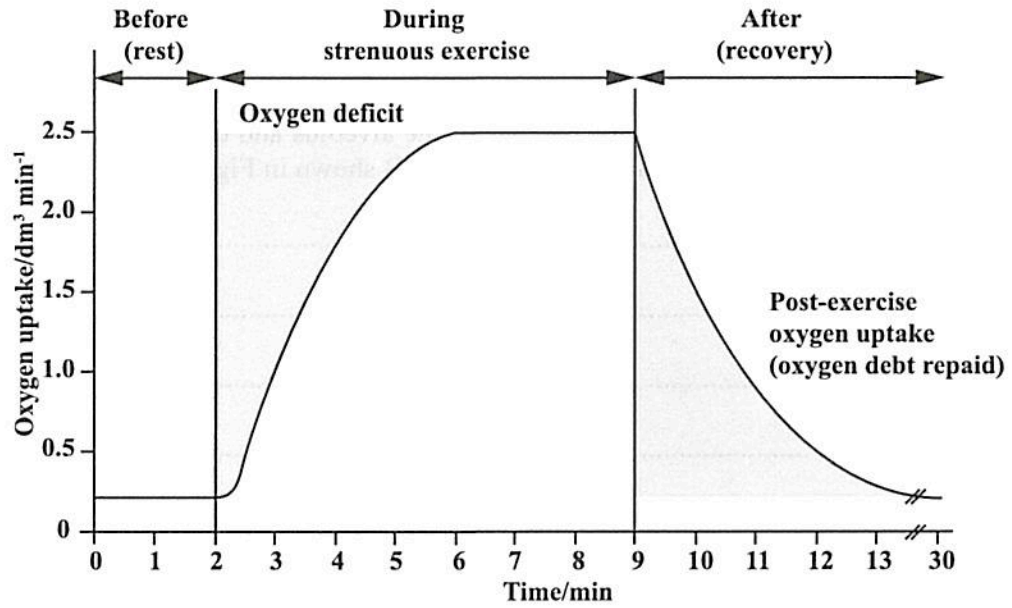


Figure 4. Graph of oxygen uptake before, during and after strenuous exercise

- (i) Use the graph in Figure 4 to determine the time, in minutes, at which the oxygen deficit begins.

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(1 mark)

- (ii) Explain why an oxygen deficit would have developed at the beginning of strenuous exercise.

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(3 marks)

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(iii) State ONE way in which the body would have coped with the deficit in oxygen.

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(1 mark)

(iv) Use the graph in Figure 4 to determine the time, in minutes, at which the oxygen debt is repaid.

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(1 mark)

(v) Explain why the oxygen debt needs to be repaid during the recovery period.

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(3 marks)

Total 15 marks

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2. (a) Figure 5 shows a diagram of the lymphatic system.

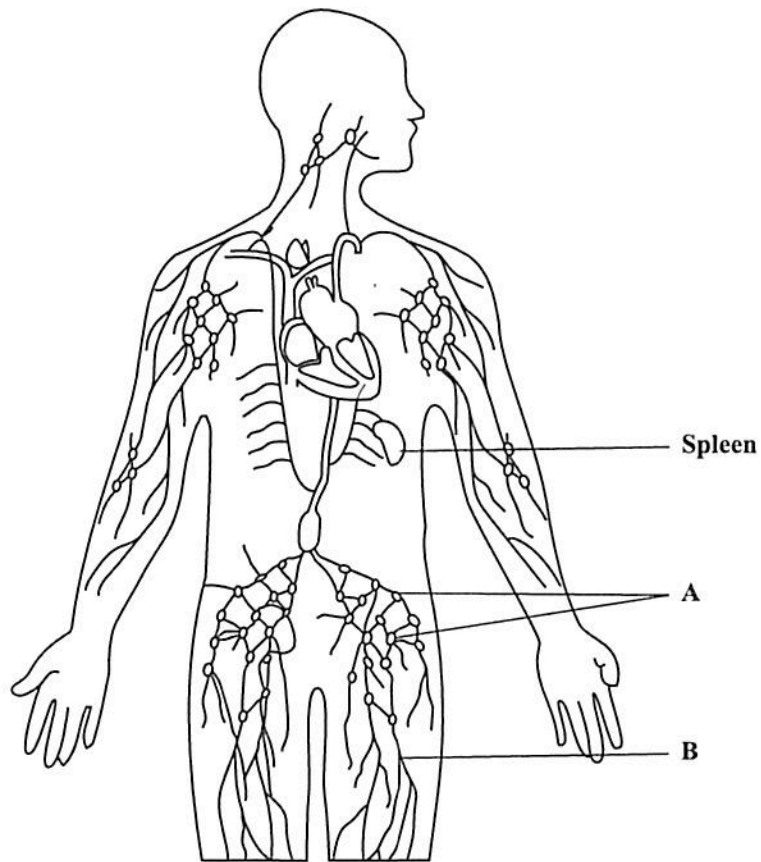


Figure 5. Lymphatic system

(i) Identify the structures labelled A and B.

Structure A

Structure B

(2 marks)

(ii) State ONE function of the spleen.

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(1 mark)



(b) Figure 6 shows blood flowing from an artery to a vein via a capillary bed.

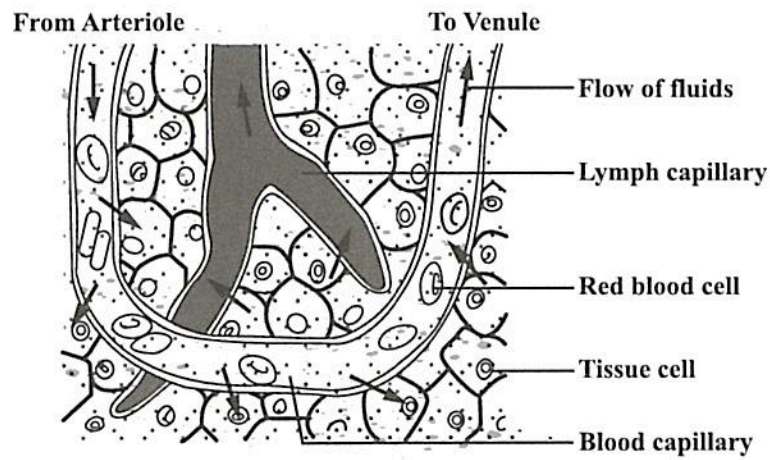


Figure 6. Flow of blood via a capillary bed

With the aid of Figure 6, describe how tissue fluid and lymph are formed.

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(3 marks)



(c) The influenza season has begun and as a result of the coronavirus epidemic, Ravi decides to take a course of antibiotics to prevent him from contracting the coronavirus. To further protect himself, Ravi decides to become vaccinated against the coronavirus.

(i) Explain to Ravi why taking antibiotics is NOT a wise course of action.

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(2 marks)

(ii) Name the specific type of immunity that Ravi would have developed after his vaccination against the coronavirus.

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(1 mark)

(iii) After receiving the vaccine, Ravi falls ill a few days later. Explain why Ravi becomes ill in spite of being vaccinated.

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(3 marks)

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- (iv) Ravi's friend Rishi has just returned from a region in which several individuals are infected with the coronavirus. Despite being exposed to the virus, Rishi did not contract the viral infection and thus did not develop symptoms of the disease.

Explain why Rishi did NOT develop any symptoms though he had been exposed to the virus.

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(3 marks)

Total 15 marks



3. (a) Define the term 'cell differentiation'.

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(2 marks)

(b) Figure 7 and Figure 8 show photographs of two types of cells, A and B.

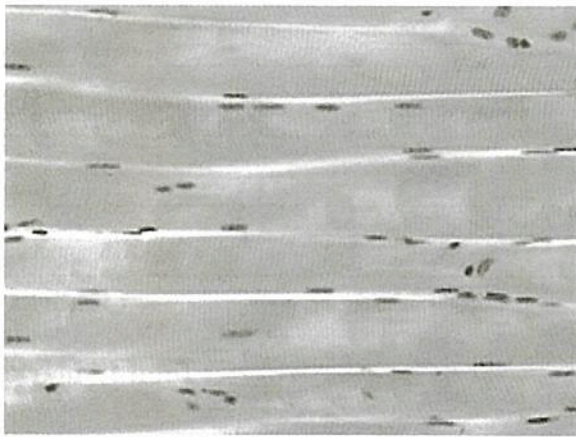


Figure 7. Cell A

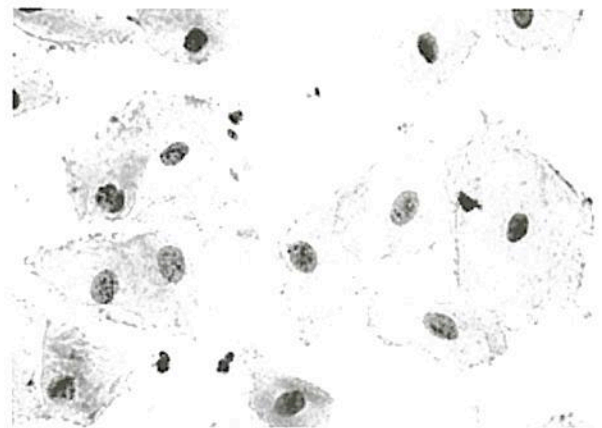


Figure 8. Cell B

Identify EACH type of cell shown in Figure 7 and Figure 8 and state its function.

(i) Cell A

Function

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(2 marks)

(ii) Cell B

Function

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(2 marks)



- (c) Complete the table below by naming the correct cell structure for EACH scenario. The first row has been completed for you.

Scenario	Cell Structure
Bindi is suffering from extreme fatigue due to the failure of her cells to produce ATP. Which cell organelle is MOST likely defected?	Mitochondria
Dr Wong has observed that his houseplant is wilted. Which cell organelle is MOST likely impacted?	(i)
Aaron hopes to remove carbon dioxide from the air by stimulating the growth of plants. Which cell organelle would be important in reducing carbon dioxide levels?	(ii)

(2 marks)

- (d) The motor neurons in an arm have lost their myelin sheaths. Explain how this loss will affect the movement of the arm.

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(3 marks)

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- (e) Five-year-old Ana thinks that her sunflower pinwheels shown in Figure 9 are alive. She says, “*They move and when they get tired, they stop moving. I have so many pinwheels, they must have babies.*”

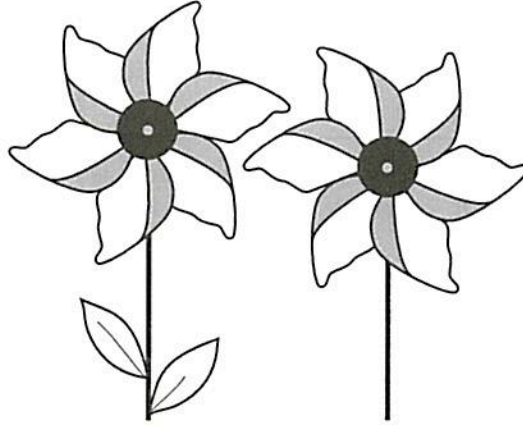


Figure 9. Sunflower pinwheels

By referencing any FOUR characteristics of life, explain to Ana why a sunflower pinwheel is NOT alive.

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(4 marks)

Total 15 marks

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4. (a) Moise's class is asked to prepare a poster which highlights important facts about acquired immunodeficiency syndrome (AIDS).

(i) Name the causative agent of AIDS.

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(1 mark)

(ii) State ONE method that can be used to limit the spread of AIDS.

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(1 mark)

(b) Pregnancies in which mothers have contracted a sexually transmitted infection (STI) can result in birth defects.

(i) Identify TWO STIs which could result in birth defects.

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(2 marks)

(ii) State TWO effects that STIs may have on a newborn baby.

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(2 marks)



- (c) Table 1 shows the number of births per thousand in three countries related to three different birth control methods.

TABLE 1: NUMBER OF BIRTHS PER THOUSAND IN THREE COUNTRIES WITH RESPECTIVE BIRTH CONTROL METHOD

Country	Birth Control Method	Number of Births per Thousand
X	Condom	45
Y	Rhythm method	65
Z	Withdrawal of penis	70

- (i) Identify the country with the HIGHEST number of births per thousand and state ONE likely reason why the associated birth control method resulted in the highest birth rate.

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(2 marks)

- (ii) Identify the birth control method in Table 1 which is MOST effective against preventing pregnancy. State ONE reason why this method is the most effective at preventing pregnancy.

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(2 marks)

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- (iii) Suggest TWO reasons why the number of births per thousand when using condoms in Country X is still relatively high when compared with the use of the rhythm method in Country Y.

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(2 marks)

- (iv) Apart from having lower birth rates, state ONE **other** benefit associated with the use of condoms during sexual intercourse.

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(1 mark)

- (v) Suggest TWO **other** non-surgical methods of birth control that would be MOST effective for reducing the incidence of pregnancy.

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(2 marks)

Total 15 marks



SECTION B

Answer ALL questions.

5. (a) (i) Explain what is meant by a 'balanced diet'.

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(2 marks)

- (ii) Identify the Caribbean food group that should be consumed in the LARGEST amount and the Caribbean food group that should be consumed in the SMALLEST amount.

Largest amount

Smallest amount

(2 marks)

- (b) State TWO benefits of including fibre in the diet.

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(2 marks)

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(c) In some developing countries, night blindness is mainly caused by a deficiency of vitamin A in the diet. This usually occurs as these countries do not have access to fresh fruits and vegetables that contain vitamin A.

(i) Explain how genetic engineering could be used to produce vitamin A. Your response should include the following terms: plasmid, plant cell with vitamin A gene, DNA and bacteria.

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(5 marks)

(ii) State TWO advantages of using genetic engineering to produce vitamin A.

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(2 marks)

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- (iii) Suggest TWO ways in which genetic engineering could be used to improve food production.

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(2 marks)

Total 15 marks

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6. (a) Describe TWO ways in which water can be purified in the home.

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(4 marks)



- (b) A few months after an earthquake, six students brought samples of water from their respective villages to the school laboratory to test for the presence of bacteria. Figure 10 shows the agar plates at the end of the experiment.

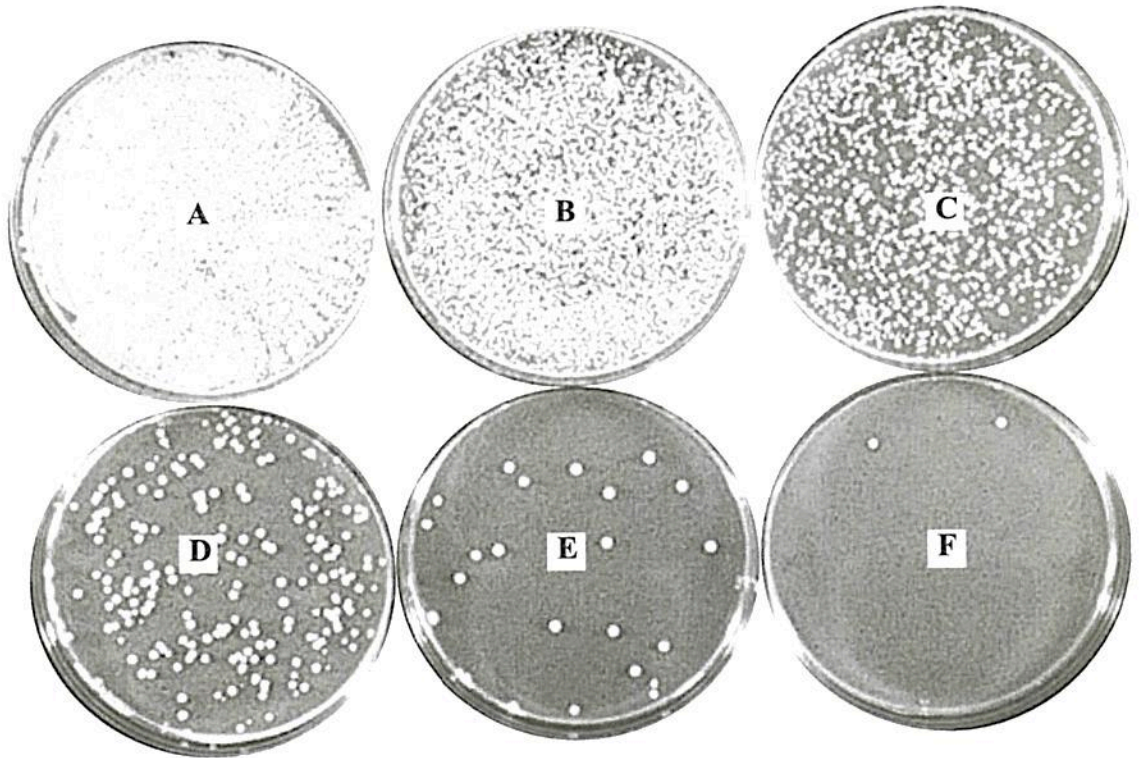


Figure 10. Agar plates at the end of the experiment

- (i) Identify the sample which shows the LEAST number and GREATEST number of bacterial colonies.

Least number

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Greatest number

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(2 marks)

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- (ii) Explain TWO ways in which the water sample with the GREATEST number of bacterial colonies could have become contaminated.

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(4 marks)

- (iii) Discuss how the breakdown of a waste water facility could pose major health problems for the members of a community.

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(3 marks)

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(iv) State the TWO methods used in the treatment of sewage.

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(2 marks)

Total 15 marks

END OF TEST

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EXTRA SPACE

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SUBJECT: HUMAN AND SOCIAL BIOLOGY – Paper 02

PROFICIENCY: GENERAL

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3. Keep it in a safe place until you have received your results.

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Sign the declaration below, detach this slip and hand it to the candidate as his/her receipt for this booklet collected by you.

I hereby acknowledge receipt of the candidate's booklet for the examination stated above.

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Supervisor/Invigilator

Date: _____

