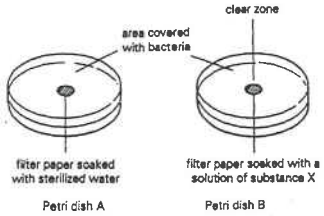
Past HKCEE Questions
Man & Microorganisms
Paper I

1. Using sterile techniques, bacteria were grown in a culture medium in two Petri dishes A and B. A disc of filter paper soaked with sterilized water was placed in dish A. Another disc soaked with a solution of substance X was placed in dish B. The dishes were incubated at 37°C for one day. The results are shown in the diagrams below:



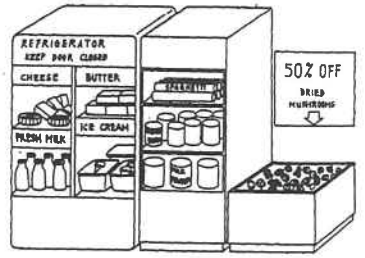
(i) What is substance X? Explain why a clear zone was found in dish B.
(ii) Why was the temperature of the incubator set at 37°C?
(iii) What is the purpose of preparing dish A?
(iv) How many bacterial cells would be formed at the 7th generation from a single bacterial cell which reproduces by binary fission?
(v) Briefly explain how each of the following methods helps to preserve food:
(1) keeping meat in a refrigerator
(2) adding sulphur dioxide to fruit juices
(3) immersing fruits in syrup
(4) keeping food in vacuum-sealed cans.
(HKCEE 1982)

2. A certain bacterium was inoculated (introduced) on sterilized agar plates. It was then covered with a lid and treated in different ways or incubated at different temperatures. The results observed after 24 hours are shown in the table below:

Agar plate	Treatment	Temperature	Observation
A	inoculated	40°C	entire surface cloudy
B	inoculated, a paper disc (soaked with antibiotic X) placed on the surface	40°C	clear zone around the paper disc, remaining surface cloudy
C	inoculated, a paper disc (soaked with antibiotic Y) placed on the surface	40°C	entire surface cloudy
D	inoculated, entire surface covered with vinegar	40°C	entire surface clear
E	inoculated	0°C	entire surface clear
F	not inoculated	40°C	entire surface clear

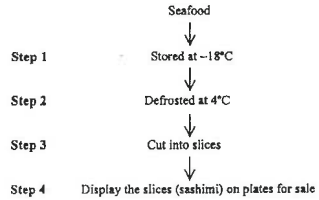
(i) What does this observation on plate A show?
(ii) Compare and explain the effects of antibiotics X and Y on this bacterium.
(iii) Give one possible explanation for the observation on plate D.
(iv) When plate E was re-incubated at 40°C for 24 hours, it then became cloudy. Give a reason for the observations before and after this treatment.
(v) From this experiment; suggest two different methods for preserving food, and indicate the plate from which the principle of each method is derived.
(vi) If plate F was incubated without a lid, a cloudy surface was observed. Give a possible reason for such a result.
(HKCEE 1986)

3. The diagram below shows a corner of a supermarket. The foods shown are preserved by different methods:



(i) State TWO methods of preservation used for these foods and name the foods preserved by each method. (4 marks)
(ii) Briefly explain the biological principle involved in each of the methods mentioned in (i). (2 marks)
(iii) Give TWO reasons why improperly preserved foods are not suitable for human consumption. (2 marks)
(HKCEE 1990)

4. The flowchart below outlines the process of sashimi (刺身) preparation:



(i) What is the biological principle of storing the seafood at -18°C before it is used for making sashimi? (1 mark)

(ii) In order to reduce the risk of food poisoning, suggest a precaution that needs to be taken in
(1) step 3, (1 mark)
(2) step 4. (1 mark)

(iii)
(1) Give two reasons to explain why seafood can be preserved by canning. (4 marks)
(2) Compared with freezing, suggest one advantage and one disadvantage of canning as a method of preserving seafood. (2 marks)
(HKCEE 2001)

5. The following table shows the number of outbreaks of food poisoning due to different causative agents in Hong Kong in 2000:

Period	Causative agent		
	Bacteria	Agricultural chemicals	Biotoxins
January – March	80	2	11
April – June	97	7	11
July – September	189	10	17
October – December	93	37	6
Total	459	56	45

(i) Which period had the greatest number of food poisoning outbreaks due to bacteria? Suggest why the number of outbreaks was the greatest in this period. (3 marks)

(ii) In some cases of bacterial food poisoning, the patient discharges a large amount of watery faeces. Explain why this condition may be fatal. (1 mark)

(iii) Another kind of food poisoning is caused by the consumption of shellfish (e.g. oysters, clams) which contain a high level of a harmful substance. This substance is actually produced in very small quantities by certain marine microscopic algae.
(1) With reference to the table above, into which type of causative agent would you classify this harmful substance? (1 mark)
(2) Explain why shellfish contain such a high level of this harmful substance. (3 marks)

(iv) The following is taken from a pamphlet on the guidelines for lunch box suppliers to Hong Kong schools

Advice for School Lunch Box Suppliers

1. Cook food thoroughly.
2. Keep hot foods at 63°C or higher and cold foods at 4°C or below.
3. Never leave lunch boxes at room temperature for longer than 2 hours.

Explain why points 1 and 3 are crucial in ensuring that food in the lunch boxes is safe to eat. (2 marks)

Past HKCEE Questions
Man & Microorganisms
Paper II

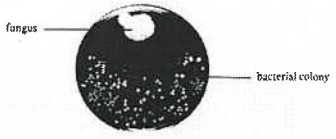
02-11
Honey is not easily spoiled even without refrigeration because of its
A. low pH.
B. low water potential.
C. low oxygen content.
D. low nutrient content.

02-28
Which of the following statements about antibiotics is correct?
A. They are protein in nature.
B. They act against pathogens.
C. They are produced by white blood cells.
D. One kind of antibiotics can kill a specific type of microorganisms only.

03-43
Which of the following foods will turn bad first when stored at room temperature?
A. salted fish
B. instant noodles
C. pasteurised milk
D. vegetables in vinegar

04-40
Which of the following food preservation methods has the least effect on the flavour of the food?
A. heating
B. salting
C. dehydration
D. refrigeration

04-51
The photograph below shows a bacterial culture growing on nutrient agar. The culture is contaminated by a fungus.



Source: Tortora, G.J., Funke, B.R., & Case, C.L., *Microbiology — An Introduction* 4th ed., Redwood City: The Benjamin/Cummings Publishing Company, Inc., 1992.

Which of the following correctly explains the absence of bacterial colonies around the fungus?
A. The fungus digests the bacteria as food.
B. The fungus competes with the bacteria for the nutrients.
C. The fungus needs more space to grow than the bacteria.
D. The fungus produces a substance that inhibits the growth of the bacteria.

Past HKCEE Questions
Man & Microorganisms
Suggested Answers

Paper I

1. (i) X is an antibiotic / name of any antibiotic (penicillin) 1
clear zone is due to absence of bacteria 1
which are killed by X 1
(ii) optimum / favourable / suitable temperature for growth 1
(iii) To serve as a control 1
(iv) 64 1
(v) (1) low temperature slows down microbial activities / multiplication 1
(2) SO_2 kills bacteria present in juice / SO_2 is a preservative 1
(3) syrup has low osmotic potential to dehydrate cells of micro-organisms 1
(4) micro-organisms cannot survive in absence of O_2 in sealed cans 1

2. (i) There is bacterial growth / multiplication 1
(ii)

Inhibition of bacterial growth	explanation	
only X is effective / Y is not effective / X is more effective than Y	X is more specific for this bacterium / this bacterium is more susceptible to X / this bacterium is killed by X	1 + 1

(iii) vinegar can kill this bacterium 1
(iv) at 0°C bacteria not active 1
(v) plate D: pickling of food / putting food in vinegar 1
plate E: refrigeration / keeping food at a low temperature +1
plate B: adding antibiotics
(any 1 pair)
(vi) contamination

3. (i)
- Dehydration: milk powder, dried mushroom, apaghetti, baked bean 1
- Refrigeration: ice cream, cheese, butter, fresh milk 1
- Canning: baked bean, milking powder 1 +
- Adding preservative: baked bean, cheese, butter, ice cream, milk powder 1 +

(any 2 pairs) +
(N.B. 2 examples of food required for each method) 1

(ii)
- Dehydration: without water, microorganisms cannot grow 1
- Refrigeration: low temperature inactivates the microorganisms / lower enzyme activity in microorganisms 1 + 1 + 1
- Canning: bacteria are killed by heating / sealing the can in vacuum prevents entry of microorganism OR depletes the can of oxygen for further growth of bacteria 1 +
- adding preservative: prevent growth
- of microorganism

(any 2 pairs)

(iii) change in quality of food (smell, taste, texture, appearance, etc.) 1
danger of food poisoning / harmful to the body 1

4. (i) To inhibit the growth of microorganisms 1
(ii) (1) Wear gloves when handling the seafood / use a clean knife to cut the seafood 1
(2) Display the sashimi at low temperature / cover the sashimi during display / sashimi must be sold within a short time 1
(accept other correct answers)
(iii) (1) Any two sets below: (1+1, 1+1)I 4
- n the canning process, seafood is subject to high temperature treatment,
- which kills the microorganisms present

or
- There is no oxygen in the cans and this will inhibit the growth of microorganisms

or
- The cans are sealed
- so that further contamination of the food is prevented

(2) Advantage: 1
seafood in cans is more conveniently handled / transported / can be stored for a long time
Disadvantage: 1
canning may cause seafood to lose its original flavour / taste / texture

5. (i) July – September 1
because the temperatures in these months were the highest 1
so the growth / activities of bacteria was the fastest 1
(accept other reasonable answers)
(ii) Because the patient suffers from excessive loss of minerals / water / dehydration 1
(iii) (1) Biotoxins
(2) The harmful substance in microscopic algae is passed to shellfish through feeding
As a shellfish feeds on many algae 1
and the substance can neither be excreted nor broken down by shellfish 1
the substance would be accumulated to a high level in the shellfish 1
Effective communication (C) 1
(iv) Cooking the food thoroughly is to kill all the microorganisms in the food 1
The shorter the time for the food to be left at room temperature, the less the microorganisms can grow in the food 1

Paper II

02-11	B
02-28	B
03-43	C
04-40	D
04-51	D