UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

9221966046

BIOLOGY **9700/22**

Paper 2 Structured Questions AS **October/November 2010**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces provided at the top of this page.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1	
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5	
6	
Total	

This document consists of **14** printed pages and **2** blank pages.

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Answer **all** the questions.

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1 Protein production involves a complex sequence of events and a number of cell structures.

(a) The first column in Table 1.1 shows some of the events that occur in the production of a protein in a cell and its eventual release from the cell.

Table 1.1

event	sequence of events (numbers)	cell location (letters)
exocytosis		
protein modification		
secretory vesicle formation		
transcription		
translation		

(i) In Table 1.1, write the sequence in which the events occur, using **1** as the **first** process in the sequence. [2]

(ii) From the list **A** to **F** below, choose **one** cell location for each event and write the letter in Table 1.1. Each letter may be used once, more than once, or not at all.

A Golgi apparatus
B lysosome
C nucleus
D rough endoplasmic reticulum
E smooth endoplasmic reticulum
F plasma (cell surface) membrane [3]

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(b) Describe the process of *exocytosis*.

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..... [3]

(c) One example of protein modification is the removal of the first amino acid, methionine, from a newly formed polypeptide chain to make a functioning protein.

(i) The DNA nucleotide sequence that specifies the amino acid methionine is TAC.

State the mRNA nucleotide sequence that is complementary to the DNA sequence for methionine.

..... [1]

(ii) Suggest **two** other ways in which the polypeptide chain is modified to produce the functioning protein.

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..... [2]

[Total: 11]

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[Turn over

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2 Malaria is an infectious disease that is considered by the World Health Organization to be a disease of worldwide importance.

(a) Explain what is meant by the term *infectious*.

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..... [2]

(b) Name **one** species of organism that causes malaria.

..... [1]

(c) Explain the significance of the following statements in the control of malaria.

(i) The female *Anopheles* mosquito has been more closely studied with regard to malaria than the male *Anopheles* mosquito.

.....

..... [1]

(ii) The infective stages of the malarial organism are present in anti-coagulant produced by the mosquito.

.....

..... [1]

(iii) After circulating in the blood for a short time, the pathogen enters liver cells of the newly infected person and then enters red blood cells.

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..... [2]

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(d) Discuss the factors that determine the distribution of malaria worldwide.

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..... [4]

[Total: 11]

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3 **(a)** Enzymes are globular proteins that catalyse metabolic reactions.

Describe the features of globular proteins.

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..... [3]

(b) Enzymes can be used to remove cell walls from plant and fungal cells. The cells are incubated in a solution that contains a mixture of enzymes.

(i) Suggest an explanation for the fact that a different mixture of enzymes is required to remove the walls of plant cells compared to the walls of fungal cells.

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..... [2]

(ii) Explain why, when plant cells are incubated with enzymes to remove their cell walls, it is important to maintain an optimum pH.

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..... [3]

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(c) A student carried out an investigation into osmosis using red blood cells.

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Red blood cells were placed in sodium chloride (salt) solutions at five different concentrations. For each concentration, a sample was added immediately to a microscope slide and the cells were viewed using a light microscope for a period of time. The observations recorded are shown in Table 3.1.

Table 3.1

concentration of salt solution / %	observation of red blood cells
0.0	swell and burst, numbers decrease
0.4	increase in size
0.9	remain the same size
1.5	decrease in size
3.0	smaller and shrivelled

Explain, in terms of **water potential** and osmosis, the results that the student obtained.

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..... [4]

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(d) The student also carried out a similar investigation using plant cells with cell walls removed. These cells were suspended in a 12% mannitol solution so that the water potential inside and outside of the cells was equal.

Fig. 3.1 is a photomicrograph of these cells.

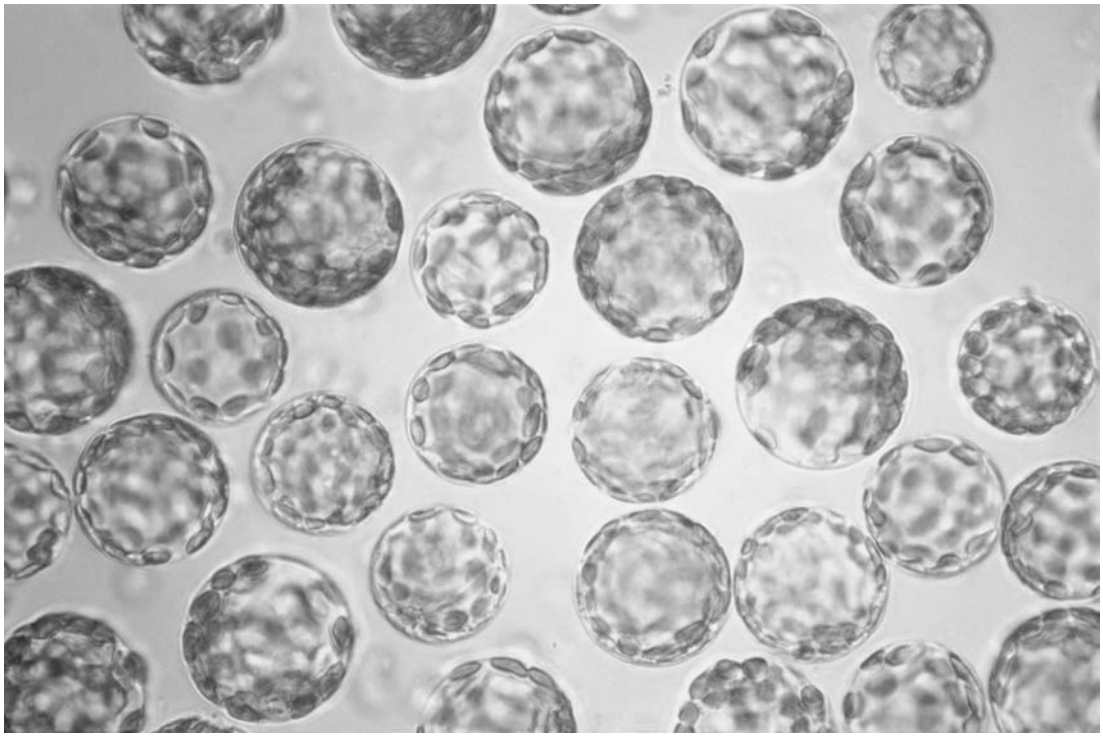


Fig. 3.1

The student removed a sample of these cells. The sample was placed into distilled water and was viewed using a light microscope.

Describe what you would expect the student to observe and explain why this would not occur with normal plant cells.

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..... [2]

[Total: 14]

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4 Fig. 4.1 is an incomplete flow chart showing some of the events of the primary immune response that occur after a person has been given a vaccine.

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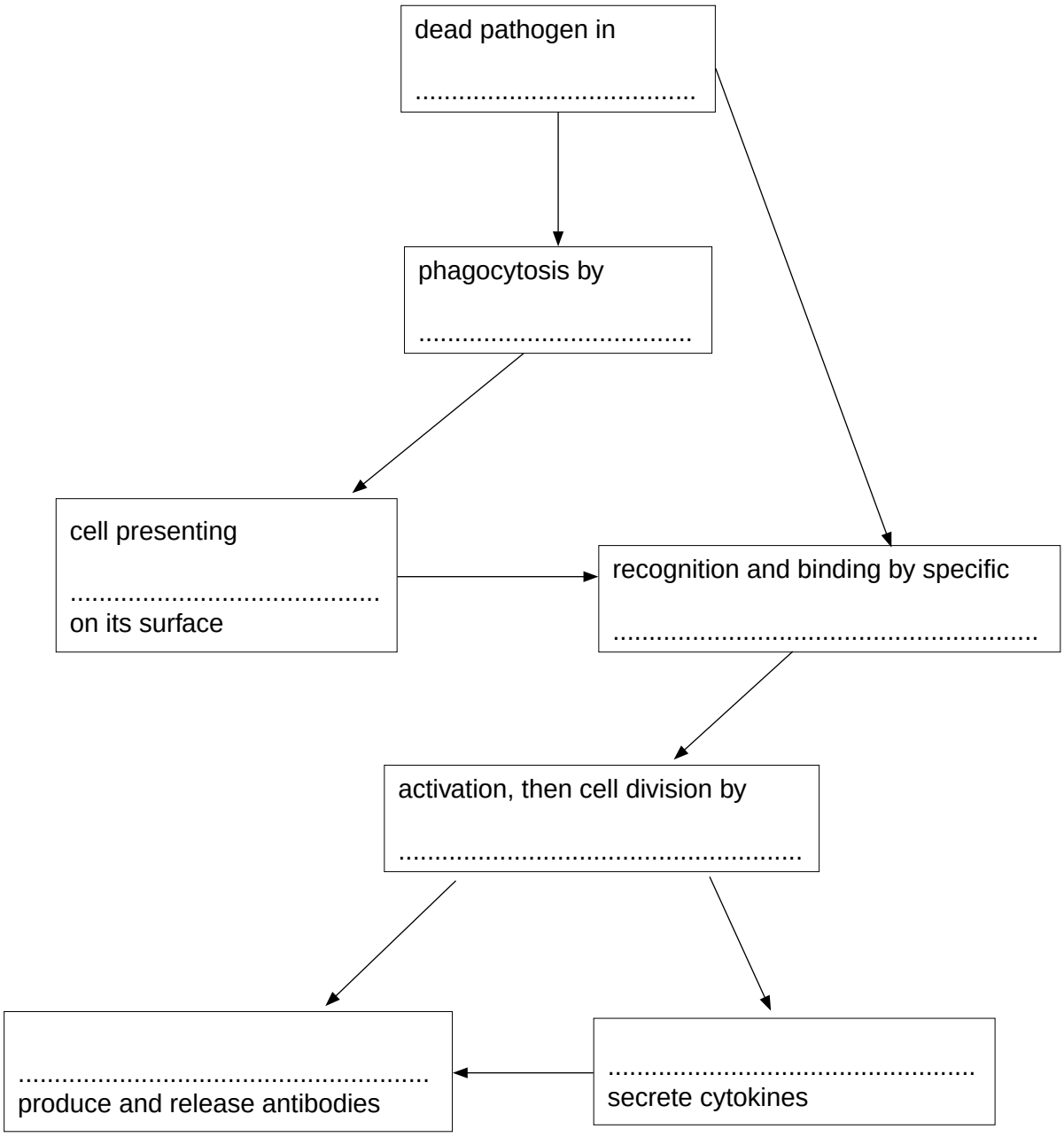


Fig. 4.1

(a) Choose the correct term from the list below to complete Fig. 4.1.

lymphocytes	**antigens**	**mitosis**	**vaccine**
T_h-lymphocytes	**plasma cells**	**macrophages**	

[3]

(b) Explain why the person is unlikely to become ill if they are infected by the same pathogen some months later.

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..... [3]

(c) Some parents decide that their children should not take part in a vaccination schedule.

Suggest how a country-wide vaccination schedule can give protection against infection to **unvaccinated** children.

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..... [2]

[Total: 8]

5 State the term that applies to each of the descriptions **(a)** to **(e)**.

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(a) Storage polysaccharide in animals made of chains of 1,4 linked α-glucose with 1,6 linkages forming branches.

..... [1]

(b) A plant that has adaptations to enable it to live in areas where water is in short supply.

..... [1]

(c) Any cell containing one complete set of chromosomes.

..... [1]

(d) The name of the trophic level to which photosynthetic organisms belong.

..... [1]

(e) A process carried out by bacteria that involves the conversion of atmospheric nitrogen into nitrogenous compounds that can be used directly by plants.

..... [1]

[Total: 5]

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6 Fig. 6.1 is a section through lung tissue showing an alveolus and its blood supply.

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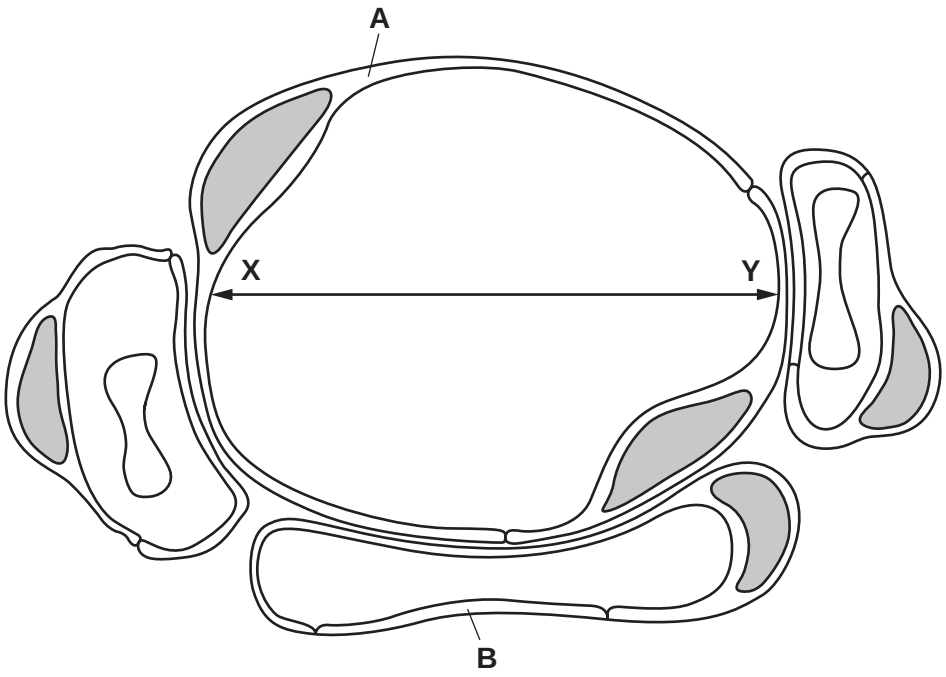


Fig. 6.1

(a) **(i)** Name the type of epithelial cell shown by label lines **A** and **B**.

..... [1]

(ii) Describe how the elastic fibres of the alveoli contribute to the healthy functioning of the lungs.

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..... [2]

(b) The actual diameter of the alveolus along the line **X**–**Y** is 220 micrometres (µm). Calculate the magnification of Fig. 6.1.

Show your working and give your answer to the nearest whole number.

answer × ..... [2]

(c) Outline two features of a gas exchange surface **that are shown on Fig. 6.1**.

1. .....

.....

2. .....

..... [2]

(d) Fig. 6.2 is a simplified diagram of the circulatory system of a human, showing gas exchange in the lungs and in respiring tissue. The partial pressures of oxygen (pO_2) and carbon dioxide (pCO_2) at four locations are also shown.

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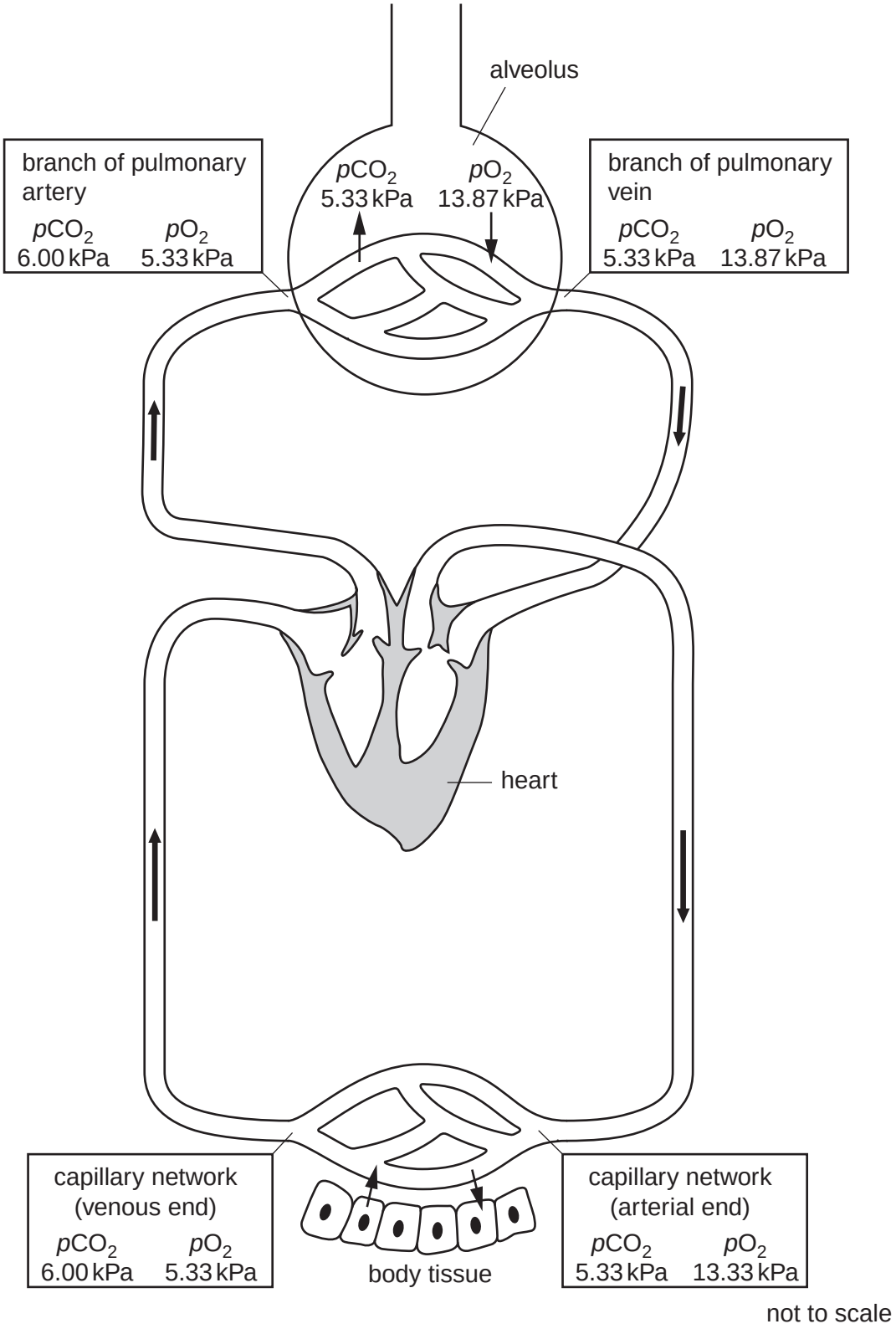


Fig. 6.2

With reference to Fig. 6.2, explain how the differences in *p*O2 and pCO_2 in the alveolus and in blood enable gas exchange in the lungs **and** respiring tissue.

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..... [4]

[Total: 11]

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