

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS GCE**

G623/02

**APPLIED SCIENCE
Cells and Molecules**

TUESDAY 20 MAY 2014: Morning

**DURATION: 45 minutes
plus your additional time allowance**

MODIFIED ENLARGED

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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Candidates answer on the Question Paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

**Electronic calculator
Ruler (cm/mm)**

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.

Use black ink. HB pencil may be used for graphs and diagrams only.

Answer ALL the questions.

Read each question carefully. Make sure you know what you have to do before starting your answer.

Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 45.



Where you see this icon you will be awarded marks for the quality of written communication in your answer.

This means, for example, you should:

ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear;

organise information clearly and coherently, using specialist vocabulary when appropriate.

You may use an electronic calculator.

You are advised to show all the steps in any calculations.

Any blank pages are indicated.

Answer ALL the questions.

- 1 A group of students training in a pathology laboratory were preparing a presentation about electron microscopy.**

Fig. 1.1 shows a diagram of an electron microscope, used by the students in their presentation.

- (a) State ONE advantage of using an electron microscope, instead of a light microscope, to view cells.**

_____ **[1]**

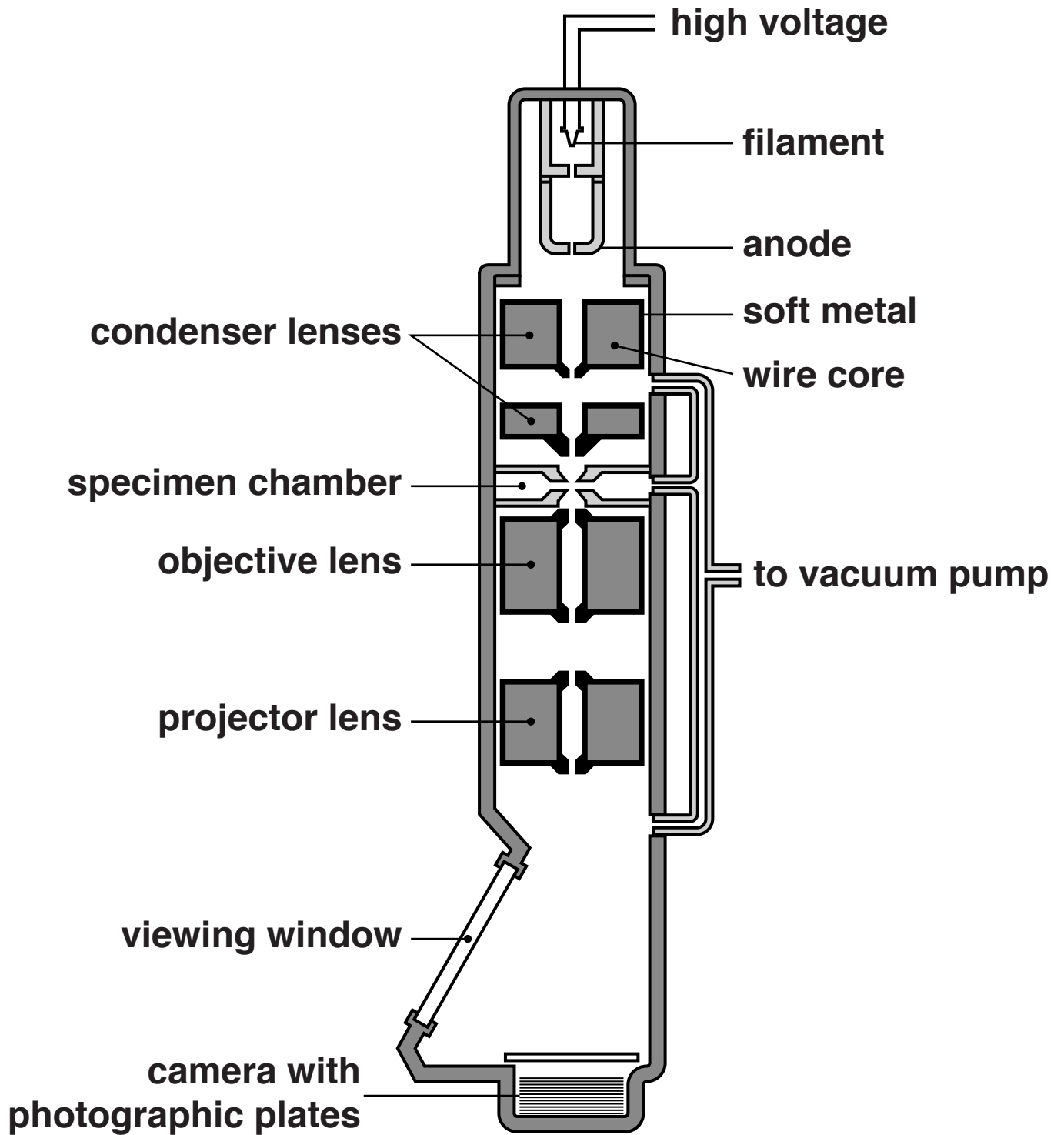
- (b) Using Fig. 1.1, state ONE way that an IMAGE is formed by an electron microscope, which differs from the way an image is formed by a light microscope.**

_____ **[1]**

- (c) Why does the specimen in an electron microscope have to be placed in a vacuum?**

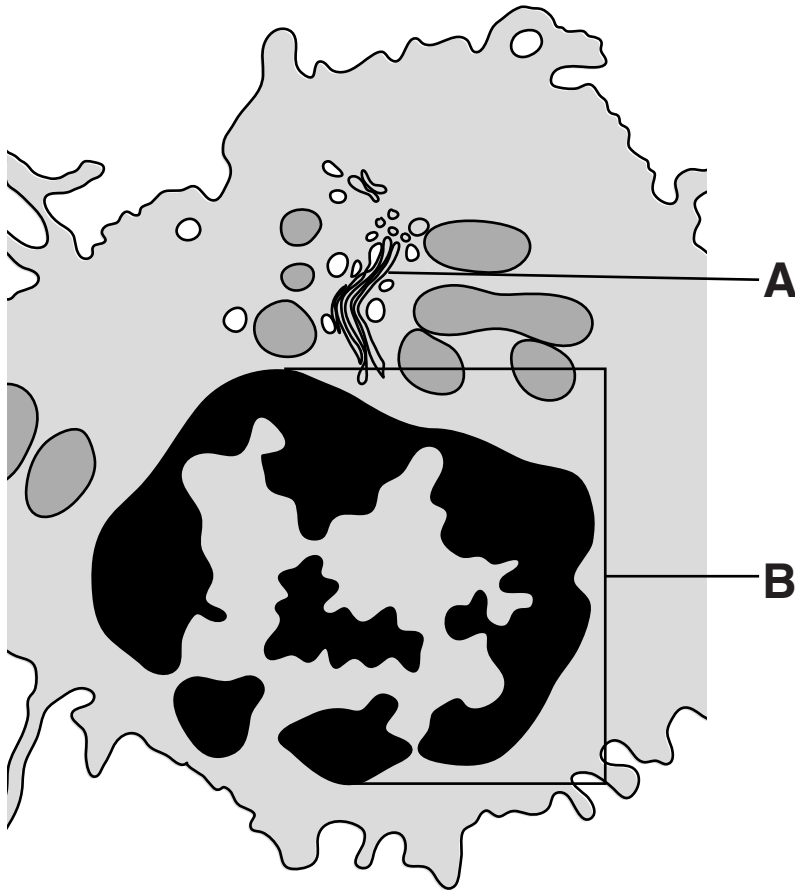
_____ **[1]**

FIG. 1.1



- (d) The students looked at blood cells taken from a hospital patient. One white blood cell is shown in Fig. 1.2.

FIG. 1.2



Name the structures A and B and describe ONE function of each structure.

structure A _____

function _____

structure B _____

function _____

_____ [4]

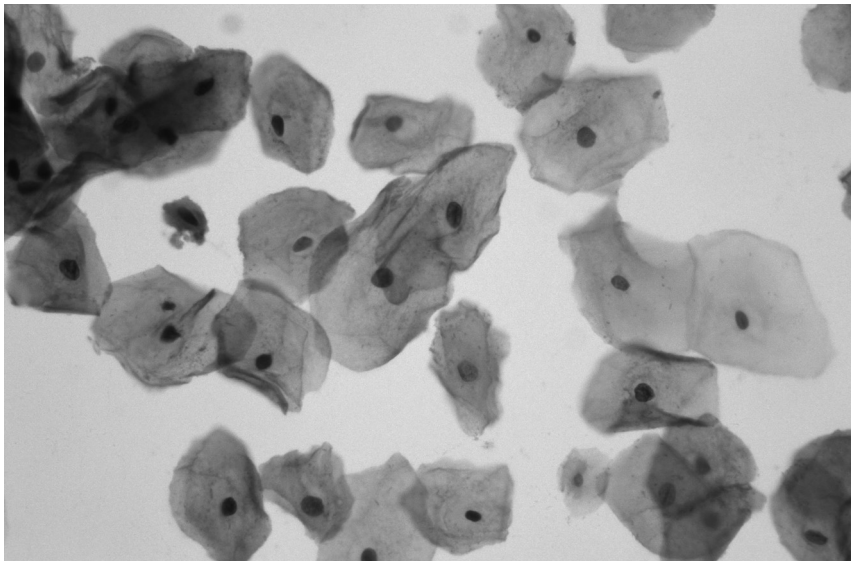
- (e) Suggest ONE reason why scientists in pathology laboratories would choose to use a light microscope instead of an electron microscope to view blood cells.**

_____ [1]

- (f) **Cervical smear tests (Pap Smears) are also analysed in hospital pathology laboratories.**

Fig. 1.3 shows cells collected from the cervix of a woman during a routine smear test, as part of a screening programme for precancerous or cancerous cells of the cervix.

FIG. 1.3

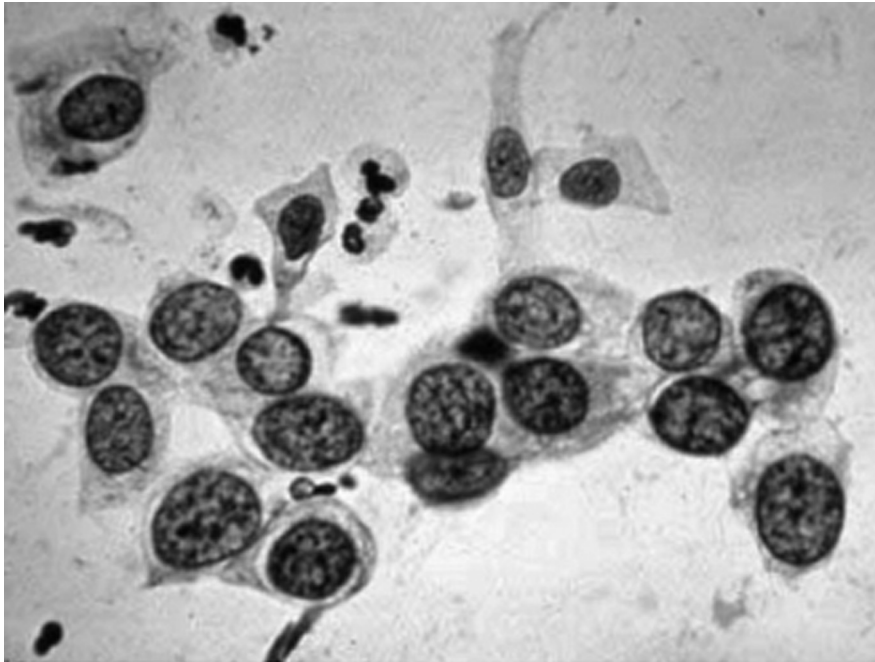


Suggest how these cells may have been prepared for observation using a light microscope after they were placed on a glass slide.

[3]

- (g) Fig. 1.4 shows cells that were taken from the cervix of another woman during a routine smear test.

FIG. 1.4



- (i) Use Fig. 1.3 and Fig. 1.4 to suggest a suitable conclusion or diagnosis that a pathology technician might make about the cells in Fig. 1.4.

_____ [1]

- (ii) Describe TWO pieces of evidence for the diagnosis in (g)(i).

1 _____

2 _____

[2]

[TOTAL: 14]

- 2 Red blood cells can be stored and used for blood transfusions. The red blood cells are separated from the rest of the blood. The red blood cells are mixed with saline (salt) solution when they are used for transfusions. A saline solution that is too concentrated can cause serious damage to the red blood cells, as shown in Fig. 2.1(b).

FIG. 2.1(a) Normal red blood cells

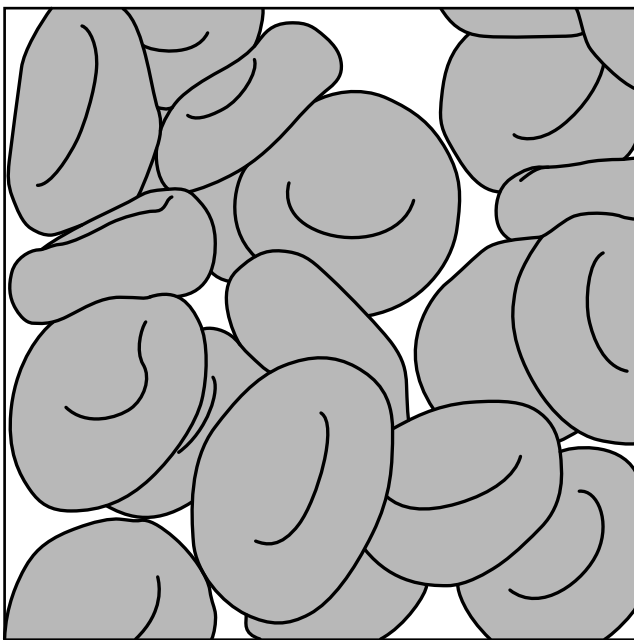
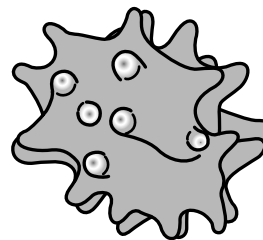


FIG. 2.1(b) Red blood cell in a concentrated saline solution



- (a) Use Fig. 2.1(a) and Fig. 2.1(b) to **DESCRIBE** and **EXPLAIN** the effects of a concentrated saline solution on red blood cells.

[4]

(b) Full blood counts are common clinical procedures carried out in hospital laboratories.

State ONE method used in hospital laboratories to obtain a full blood count from a blood sample and give ONE advantage of this method.

method _____

advantage _____

[2]

- (c) Table 2.1 compares the results of blood samples taken from three patients.

TABLE 2.1

	Patient 1	Patient 2	Patient 3
Number of white blood cells per dm^3	5.0×10^9	5.3×10^9	100×10^9
Number of red blood cells per dm^3	4.5×10^{12}	3.0×10^{12}	4.7×10^{12}
Haemoglobin/ g dm^{-3}	150	80	150

- (i) Calculate the percentage decrease in blood haemoglobin levels in patient 2 compared with patient 1.

percentage decrease = _____ % [2]

- (ii) One patient has anaemia and one patient has a form of cancer.

Use the data in Table 2.1 to identify the patient with a form of cancer and give a reason for your answer.

patient _____

reason _____

_____ [2]

- (d) Technicians in hospital laboratories use a stage micrometer and a graticule to determine the relative sizes of red blood cells. This helps to diagnose cases of anaemia.**

The following list includes some statements about how to use a stage micrometer and a graticule. Some of the statements are correct and some are not correct.

Put a tick (✓) in the box next to each CORRECT statement.

The width that each division on the graticule represents, changes with magnification.

☐

The stage micrometer is placed in the eyepiece of the microscope.

☐

The intervals between the lines on the stage micrometer scale are usually 0.5 cm.

☐

The graticule and stage micrometer scales are superimposed for each objective lens of the microscope.

☐

Once calibrated, the scale on the graticule can be used to measure cell dimensions.

☐

[2]

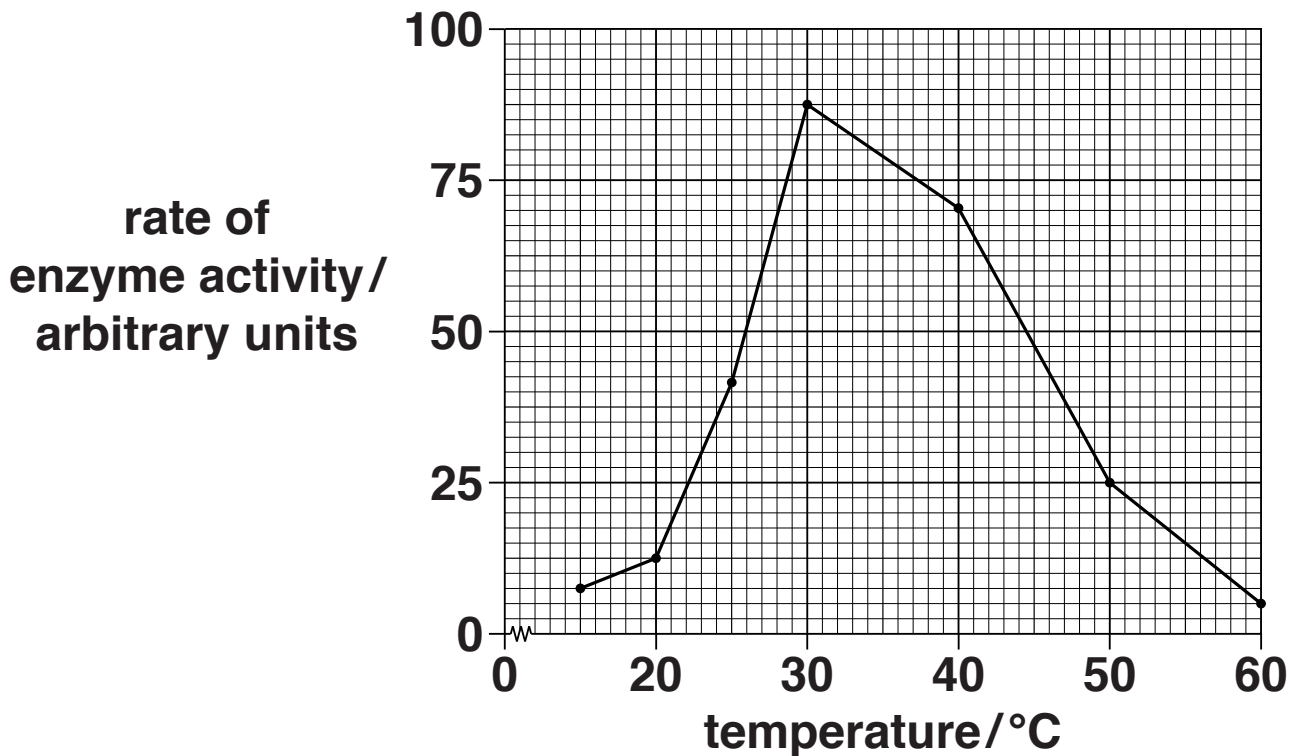
[TOTAL: 12]

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- 3 The enzyme polyphenol oxidase is released when the cells of plants are damaged. This enzyme causes colourless chemicals called phenols to be converted into brown products called melanins. The brown colour develops when fruits such as apples are peeled or cut into slices.

Fig. 3.1 shows the effect of temperature on the activity of polyphenol oxidase, as measured by the quantity of melanins produced over a fixed time at each temperature.

FIG. 3.1



- (a) Describe TWO effects of increasing the temperature on the activity of the enzyme polyphenol oxidase. Use data from Fig. 3.1 in your answer.**

[3]

- (b) Explain the effect of temperatures above 30 °C on the MOLECULAR STRUCTURE of the enzyme polyphenol oxidase.**

[3]

[TOTAL: 6]

- 4 (a) A teacher produced a series of revision cards for students to complete.

Imagine you are one of the students. Use the clues to complete the boxes in the revision cards 1–8 below.

example:

A storage polysaccharide found in plant cells.

s	t	a	r	c	h
---	---	---	---	---	---

1. A double layer of phospholipids in the cell membrane.

--	--	--	--	--	--	--

2. The name that describes 'water hating' molecules.

--	--	--	--	--	--	--	--	--	--	--

3. Type of covalent bond formed between glycerol and a fatty acid.

--	--	--	--	--

4. Type of reaction that occurs between two amino acids to form a dipeptide.

--	--	--	--	--	--	--	--	--	--	--

5. Name of the model used to describe the structure of the cell membrane.

--	--	--	--	--

--	--	--	--	--	--

6. The reagent used to test for a reducing sugar.

--	--	--	--	--	--	--	--	--

7. Name of the C–O–C bond formed between two monosaccharide molecules.

--	--	--	--	--	--	--	--	--	--

8. A type of chemical that catalyses the hydrolysis of a protein.

--	--	--	--	--	--

- (b) The students then revised their learning about food tests.

Imagine you are one of the students. Complete Table 4.1 below.

TABLE 4.1

Name of food molecule	Reagent(s) used	Observation if test is positive
Starch	Iodine solution	
		Milky emulsion
	Biuret solution	

[5]

[TOTAL: 13]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined pages. The question number(s) must be clearly shown in the margins.

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